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1998

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citation for published version (APA)

Broersma, L., den Butter, F. A. G., & Kock, U. (1998). *A national accounting system for labour market flows: an application to the Netherlands*. (Research Memorandum; No. 1998-59). Algemene en Ontwikkelingseconomie (AOE).

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An Application to The Netherlands

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Research Memorandum 1998-59

December 1998



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A National Accounting System for Labour Market Flows

An Application to The Netherlands

by

Lourens Broersma[†], Frank A.G. den Butter[‡] and Udo Kock[§]

November 1998

Abstract

This paper develops a national accounting system for the construction of consistent time series data for worker and job flows at the macro level. The construction method is applied for The Netherlands, and is based on the availability of actual time series and a number of additional assumptions. The reliability of the data depends on the availability of data from primary sources and can, in principle, be applied in each country, yielding an additional module to the labour accounts in the national accounts. We find our flow data to correspond to evidence found in surrounding countries and evidence derived from panel data sets following the seminal work of Davis and Haltiwanger on job destruction and creation. A sensitivity analysis applied to our main assumptions gives an indication of their importance.

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1 Introduction

Nowadays the flow approach has become mainstream for policy oriented analysis at the macro level in labour economics (Blanchard and Diamond, 1989, Burda and Wyploz, 1994, Mortensen, 1996, and Contini and Revelli, 1997). Unlike traditional labour economics which focuses on stocks such as employment and unemployment, and on net changes therein, the flow approach takes full consideration of labour market dynamics. The key variables in this approach are various worker flows and job flows, which are driven by different shocks which hit the economy. For instance, an aggregate demand shock, be it cyclical or structural, may have a different effect on job creation and destruction, and on resulting worker and job flows, than a technology or a reallocation shock. Moreover, the modelling of the matching of workers and jobs, which is a key element in this approach, has its background in search theory (Pissarides, 1990, and Blanchard and Diamond, 1992).

Up to now empirical analyses of labour market dynamics, especially in relation with the cyclical situation, has been conducted mainly on the basis of panel data sets (e.g. Davis, Haltiwanger and Schuh (1996) for the US; Albaek and Sorensen (1995) for Denmark, Broersma and Gautier (1997) for the Netherlands, Konings (1995) for the UK and Konings, Lehmann and Schaffer (1996) for Poland). However, empirical research on labour market flows based on panel data faces a number of problems. In studies of job flows, job creation and destruction are mostly measured in a time discrete way, following Davis, Haltiwanger and Schuh (DHS, 1996). They measure job creation as the difference between the number of new jobs in opening establishments plus the number of new jobs in expanding establishments between time t and $t+1$. Job destruction is measured as the difference between the number of eliminated jobs in contracting establishments and the number of eliminated jobs in closing establishments between time t and $t+1$. Depending on the frequency used, be it annual (Broersma and Gautier, 1997) or quarterly (DHS), this underestimates the job flows as job creation and destruction at the plant level because simultaneous job destruction and creation within the sample period is not captured. Furthermore, most of the studies on job flows in the DHS tradition cover only one sector of the economy, generally manufacturing. In these studies it is assumed that this sector resembles the whole economy, but this is obviously a strong assumption.

This paper develops a method to use information from macro data for analysing labour market flows. It shows how a consistent data set of annual time series for labour market flows at the macro level can be constructed in case of The Netherlands. Our construction method of these flow data aims at providing the empirical analysis of labour market dynamics with a data set which can be linked to macroeconomic time series from the National Accounts. Consequently it enables to integrate models of labour flows into more fully fletched models of the economy which are used in policy analysis. It also allows to extend cyclical analysis based on National Accounts' data with a complementary analysis of cyclical dynamics at the labour market (see Den Butter and Van Dijk, 1998, for the use of these data in an empirical macro model of labour flows).

As the data set constructed by us uses continuous data at the macro level, some problems with respect to the panel data mentioned above are circumvented. However, as not all data needed to make the data set consistent, are available from primary sources, we have to make some assumptions, which may restrict the accuracy of that part of the data set that is influenced by these assumptions. Moreover, our data will, of course, not provide insight into the sources and propagation of idiosyncratic shocks, which is an important topic in the micro-macro analysis of labour market dynamics.

The contents of the paper is as follows. The next section discusses some advantages and disadvantages of our construction methods as compared to the use of panel data sets. Section 3 gives an overview of all relevant flows and stocks at the macro level for which time series data are to be constructed. Section 4 discusses the construction method of the data and indicates what assumptions are needed in order to complete the data set. We present a sensitivity analysis with respect to the major assumptions. It shows how changes in the assumptions may affect the contents of the stylised facts which are derived from the data. The data which are constructed for the reference period 1970-1995 are presented in section 5. It discusses stylised facts on labour market flows, exposed by the data. The next section compares our results with results from other studies of Dutch labour market flows and with results from other countries. Finally section 7 concludes.

2 Why construction of macro data?

Worker flows and job flows are connected in various ways. For example, job destruction is a driving force of the inflow into unemployment and job creation generates employment inflow. A major feature of the construction of our data set is that we exploit these linkages between worker flows and job flows. It would, by the way, also be desirable to utilise these linkages in the analysis of panel data by linking panel data of workers to that of employers (DHS, 1996: p. 126). However such data sets are not yet available for most countries (see Albaek and Sorensen, 1995, for one of the very few studies based on a panel where workers are linked to employers).

We note that worker flows are also frequently investigated in isolation of job flows by means of panel data. For instance, Blanchard and Diamond (1990) measure transitions between employment, non-participation and unemployment by following individuals in adjacent months and tracing changes in **labour** market status. Their approach is time discrete, but underestimation due to multiple transitions within their interval of observation is likely to be small because their time interval is one month. Yet, worker flows measured by panel studies may be inaccurate in case there is misclassification of **labour** market status. In this respect it appears to be especially difficult to distinguish between unemployed workers and non-participants, i.e. workers out of the **labour** force.

Our data on flows of workers and jobs are based on published data from the Council for Supervision of Social Insurances (CTSV, 1996a). These data stem from administrative sources that register the social security transactions of almost all Dutch citizens. The use of these data sources causes our approach to differ in various respects from the data construction of **labour** flows based on panel data. This enables us to avoid some of the limitations which are inherent to the use of flow data derived from panels.

The first difference is that in our system flows of workers and jobs are measured in a continuous manner. For example in case of unemployment this implies that we observe every flow into unemployment if the person receives unemployment compensation. Therefore our data include multiple transitions within the observation interval which would be disregarded in panel data. As a result all worker and job flows are taken into account (see Schettkat, 1996). Secondly, in our data set, flows of workers and jobs are calculated at the macro level instead of the sector level, so that our approach covers the whole economy. The sector specific panel data studies might give an incomplete

impression of **labour** market dynamics if there are differences in job and worker flows among industries. Using panel data for the Dutch manufacturing sector Broersma and Gautier (1997) calculated that in the period 1979-93 the average annual number of created and destroyed jobs was 15 % of total employment, whereas for the same sample period we find a much higher annual job turnover rate of 26 % for the whole economy.

Thirdly, as mentioned before, worker flows and job flows are treated in an integrated way in our analysis. We do this by introducing vacancies into our analysis of **labour** market flows. The following example illustrates this point. If an unemployed worker finds a job this can either be a job for which a vacancy existed or it could be a newly created job (a latent vacancy). In the former case there is a worker flow. However no job is created because we consider that to be the case when the vacancy was created. If the unemployed worker finds a job without filling a vacancy, again there is a worker flow from unemployment to employment. But now there is also a job flow because a new job was created, as no vacancy existed previously. This illustrates how we explicitly take account of the connections between worker and job flows.

A further advantage of our approach is that it includes job to job movements in a consistent way. As DHS indicate, omitting job movers is an important missing piece in their story (1996: 149). As a consequence they are not able to analyse vacancy chains. A vacancy chain is the process in which a person moving from one job directly to another induces a 'chain of vacancies' in which a number of people switch jobs. The length of the vacancy chain may vary considerably with the cyclical situation (see Schettkat, 1993 and 1996b). Variation in the vacancy chain can induce an upward shift of the UV-curve, which in that case should not be associated with a deterioration of the functioning of the **labour** market. In this paper we define the average length of the vacancy chain to be equal to unity when all jobs of job movers are destroyed and the length to be equal to infinity when none of these jobs is destroyed, and all new vacancies emerge because of job quitting.

Furthermore most panel data studies disregard the flow of workers who quit and leave the labour force or unemployed who stop searching. Again this will make the cyclical analysis using these data less accurate than using our data set.

Finally there may be a practical advantage of our approach, which is still somewhat speculative. In principle our approach can be applied in each country and depending on

the availability of data from primary sources these data sets can be constructed at comparatively low costs. If at some stage standardisation could be achieved for the input data of the system, it would enable the construction of uniform data sets for various countries so that the developments with respect to labour market dynamics across these countries are comparable in a similar way as when using data from the National Accounts.

For the construction of the data we use all available information • to our knowledge • on these flows from various sources. However, for The Netherlands there are not sufficient data available from published sources for the construction of the full data set, even now that we exploit the relationships that exist by definition between various worker and job flows. For that reason we need a number of additional assumptions in order to set up the remaining time series. As mentioned in the introduction, this is a disadvantage compared to the approach that uses aggregated panel data, where at least a part of job creation and destruction is observed directly.

The assumptions are based on (scant) information at the micro level, but are also selected on the basis of restrictions on the flow data, e.g. that flows do not become negative. We note that in order to come to a consistent set of data we need time series for all variables in the system and cannot leave one series out. That is because the data set uses a closed accounting framework like in the National Accounts. Of course, the fact that we have to make these assumptions for the construction of our data set, has a negative influence on the accuracy of the data. Yet we note that in the construction of National Accounts' data some specific assumptions have to be made as well in order to make the data set consistent. This is, for instance, the case for a number of production items. Moreover, in National Accounting corrections are made when there is a discrepancy between the aggregate income and the expenditure data. But admittedly these assumptions and corrections in the construction of National Accounts may probably give rise to smaller inaccuracies than in our system of labour flows.

3. Stocks and flows at the macro level

Figure 1 shows all stocks and flows to be included into a comprehensive national accounting system of labour market flows at the macro level. The figure displays 27 relevant flows and 6 relevant stocks: Employed (*E*), two stocks of Unemployed (*U*), two

stocks of people outside the labour force or Non-participants (N) and Vacancies (V). Unemployment is defined as the sum of unemployed who receive unemployment insurance payments (U_I) and the number of unemployed who receive welfare (U_W), $U = U_I + U_W$. Employment (E) includes all persons who have a regular job for at least 12 hours a week, including those who are temporary ill, and all self employed. Non-participation includes everyone above age 14 who is no part of the labour force and is defined as the sum of disabled workers (N_D) and other non-participants (N_O), $N = N_D + N_O$. Non-participants not being occupational disabled include people on retirement and early retirement, students and people on social assistance'. In our accounting system the group of other non-participants is a rest category. For the consistency of the system there is no need to have data on it. Yet it can be set to the working age population WP (all people above age 14) minus employed, unemployed and disabled workers, so $N_O = WP - E - U - N_D$. Our construction method implies that every Dutch citizen above age 14 is allocated to one of the three main groups (employment, unemployment and non-participation). Children under age 14 are left out. We also abstain from emigration and immigration in our construction method and we do not include deaths, except for workers (we will come back to this issue later). As it is not possible in our accounting system to be in more than one group at the same time, we disregard part time unemployment.

Figure I here

The flow approach distinguishes various types of worker and job flows (see Hamermesh, Hassink and Van Ours, 1994, for a taxonomy at the micro level). In every period many people change labour market status. Unemployed find jobs, employed quit or are laid off or they move out of the labour force and become non-participants. Note

¹ The Dutch welfare program consist of two parts. The first part applies to unemployed workers. They have to apply regularly for jobs to stay eligible for benefits. In this paper we refer to the benefits for this group as welfare or unemployment assistance. The other part of the program is referred to as social assistance and applies to people who do not have a job but are not obliged to search for one, for example because they have to take care of young children. Because this group does not engage in active job search they are no part of the labor market and they are not referred to as unemployed.

that in the Netherlands temporary layoffs are rare², so almost all of the separations from employment are quits or permanent layoffs. Apart from these movements of workers between unemployment, employment and non-participation there are also movements that are not associated with a change in labour market status. Unemployed who receive unemployment insurance move to welfare if their maximum eligibility period expires. All disabled workers who reach retirement age (which is formally the age of 65 in The Netherlands) move out of the disability provisions but of course do not enter the labour force. Workers who become disabled at an early age or who were born disabled never enter the labour force and hence go from other non-participation to occupational disabled at the moment they are entitled to disability benefits.

The flows of persons are indicated by the general symbol F_{xy}^z , which denotes the flow from x to y , $(x, y) = \{U_w, U_I, E, N_D, N_O\}$, with, when relevant, $z = j$ in case of newly created jobs and $z = v$ in case of jobs for which a vacancy existed. z is omitted if no job flow is involved. Job flows are indicated $VI_{,}$ for vacancy inflow and VO_{XY} for vacancy outflow, which represent the job flow associated with the flow of a person from x to Y , $(X, Y) = \{U, E, N, M\}$.

Figure 1 provides some more detailed insight into the connections between worker flows and job flows that we exploit in the construction of our data set. For instance, job leavers may have left their jobs because it became obsolete and they were laid off. In that case employment outflow coincides with job destruction and there is not only a worker flow but also a job flow. In general outflow from employment to involuntary unemployment will be the result of job destruction (mainly workers who are laid off). But it is also possible that the job of the person who is laid off is not destroyed and becomes vacant ($VI_{,}$) so that this job can be taken by someone else with adequate capabilities. When a worker finds another job, retires or dies, the job may also continue to exist and become vacant ($VI_{,}$, $VI_{,}$ and VI_{EM}). In the traditional literature on labour economics this is referred to as replacement demand. If the job disappears there is job destruction, but in case of continuation we register only a worker flow and not a job flow. When a vacancy is created for a new job ($VI_{,}$) it will always imply job creation and hence expansion demand. Hence, in our terminology (unfilled) vacancies count as jobs.

² In 1995 about 0.25 percent of total unemployment insurance payments was due to short time unemployment.

Figure 1 also pictures an other connection between flows of persons and flows of jobs that is relevant for the construction of our data. When an unemployed person finds a job by filling a vacancy, it leads both to an outflow from unemployment to employment and to an outflow of vacancies ($F_{UE}^v = VO_{UE}$). The same applies job movers and non-participants who find a job by filling a vacancy ($F_{EE}^v = VO$, and $F_{NE}^v = VO_{NE}$). In contrast to some previous work on labour market flows, the data set assumes that not all new jobs are taken by filling a vacancy, but that persons may also take a job for which no ‘official’ vacancy existed. This is also part of job creation. In this case one can think of a worker who starts his own business (included in F_{EE}^j) or a firm who creates a new job just to employ a highly productive school leaver (included in F_{NE}^j). More in general, all flows indicated by index j include jobs of employers, who successfully searched using informal channels or who did not register their vacancies or both. These so called latent vacancies play an important role in the labour market. As yet, in recent years an increasing number of job searchers finds a job by filling a vacancy (OSA, 1994). Hence, flows into and out of the stock of vacancies form an important part of a consistent data set of labour market flows. If a job searcher finds a job by filling a vacancy, by definition this generates a vacancy outflow. Some vacancies are destroyed, for example because the employer thinks filling the vacancy is no longer beneficial or because the vacancy is difficult to fill (VO ,). These scrapped vacancies are part of job destruction.

This outline of various types of job and worker flows shows that in general labour turnover - the sum of job movers and the flows of persons into and out of employment - is larger than job turnover - the sum of job creation and job destruction. The reason is that employees change jobs, or retire, whereas their jobs continue to exist. If there is much job hopping the difference between labour turnover and job turnover, and consequently the length of the vacancy chain, may become quite large³. This difference between labour turnover and job turnover is often referred to as the amount of excess job turnover.

³ It may also happen that within a firm, due to technological progress, someone changes his or her job and this change does not involve a quit and a hire. In that case we have simultaneous job destruction and job creation (job flows), and hence job turnover without labour turnover. However, these kinds of job flows within the firm are, like in the panel studies, not included in the macro data of this paper.

4. Construction Method

Our system of labour market flows of Figure 1 consists of 6 stocks (two unemployment, two non-participation, employment and vacancies) and twenty-seven flows of which eighteen are worker flows and nine are job flows. In constructing the data set we proceeded in three steps:

Step 1

First we have identified and collected data from primary sources. All stocks and eight flows are available from primary sources.

Step 2

The second step is to make assumptions for some of the flows that lack information from primary sources. It turned out that we had to make twelve assumptions - of which some are related - to close our accounting system.

Step 3

The final step is to use the stock and flow information gathered in the previous steps to derive the resulting seven flows by means of definition equations. Three flows are directly linked through definition equations as by definition employment inflow by filling a vacancy leads to an outflow of a vacancy. When an unemployed worker finds a job by filling a vacancy, this vacancy vanishes. The same applies to non-participants and job movers, so

$$VO, = F_{EE}^v$$

$$VO, = F_{UE}^v$$

$$V_{NE} = F_{NE}^v$$

Four flows are defined by means of stock-flow equations. These flows can be derived from a very simple accounting rule which says that the change in a stock (S) equals inflow minus outflow (SI-SO), all measured over the unit period of observation. From this simple rule it follows that inflow can be calculated as the sum of the change and the outflow ($SI = \Delta S + SO$) and that outflow can be calculated as inflow minus the change in the stock ($SO = SI - \Delta S$).

Table 1 gives an overview of all flows of workers and jobs and their composition. At the end of the paper there is a list of symbols which also provides information on the specification of the stock-flow equations.

Table 1 here

In the remainder of this section we will discuss the arguments underlying our assumptions and we will illustrate how sensitive our data set is with respect to these assumptions. Most direct information appears to be available on employment outflow (to unemployment insurance, occupational disability and other non-participation) and on the flow out of unemployment insurance provisions (to employment and non-participation). Therefore the assumptions are related to flow data with respect to occupational disability, welfare, job creation and the vacancy chain.

Assumption 1 and 2

Our first two assumptions regard the outflow out of occupational disability. We directly observe the total outflow out of occupational disability and we avail of separate data on disabled workers who die, reach retirement age or recover from their disability. Those who retire obviously go from occupational disability to other non-participation (denoted as $N_{D(65+)}$), but for those who recover from their disability (denoted as $F_{D(\text{recovery})}$) we do not know whether they find a job, become unemployed and go to welfare⁴ or leave the labour force. In a recent study by the Council for Supervision of Social Insurance (CTSV, 1996b) it was found that one year after a re-examination of disabled workers had indicated (partial) recovery from occupational disability, 73 % of these workers did not resume working or increased the number of hours worked if they were partially disabled. Half of these workers did not receive some other social benefit a year after (partially) recovering and obviously left the labour force. The other half did receive some other social benefit, so they left the labour force and receive social assistance or they became unemployed and are entitled to welfare (i.e. unemployment assistance'). On the basis of this panel data

⁴ Occupational disabled who become unemployed are assumed not to be entitled to unemployment insurance provisions, since it is a prerequisite for receiving an unemployment insurance benefit to have recent previous work experience.

⁵ See footnote 1.

evidence we assume that those who did not receive a benefit ($73 \% * 0.5 = 36.5 \%$) plus half of those who did receive a benefit ($73 \% * 0.5 * 0.5 = 18.25 \%$) left the labour force ($36.5 \% + 18.25 \% \approx 55 \%$). The other half of those who did receive a benefit one year after (partially) recovering are assumed to be unemployed ($73 \% * 0.5 * 0.5 \approx 20 \%$),

$$F_{N_D N_O} = N_{D(65+)+} + 0.55 * N_{D(recovery)} \quad [A-1]$$

$$F_{N_D U_W} = 0.20 * N_{D(recovery)} \quad [A-2]$$

These two assumptions can also be supported by scattered information from the IPS, the Income Panel Survey (CBS, 1996, Table 59). From some scattered data on the transitions between income groups for the year 1989 it appears that 6 % of those who received occupational disability payments received no income a year later or they received pension payments or welfare. This amounts to 50.7 thousand persons, which is close to the flow from occupational disabled to non-participation of 49.9 thousand that we find for the same year based on assumption [A-1]. The IPS reports for 1989 that 8.4 thousand persons moved from occupational disability to welfare, measured in terms of income transfers. Using assumption [A-2] we find a flow of 5.7 thousand persons.

Assumptions 3 and 4

These assumptions relate to welfare. With respect to inflow into welfare from other non-participants, only for a few years in the 1980's some information on the flow of school-leavers into unemployment is available, which indicates that this flow amounts to some 60 to 70 % of the school-leavers. Because in the 1980's the situation at the labour market was unfavourable, we assume that the average percentage over the entire sample is somewhat lower than the above figures. Hence we assume that 50 % of the total number of school-leavers does not find a job right after they graduated and therefore receive unemployment welfare,

$$F_{N_O U_W} = 0.50 * N_{O(schoolout)} \quad [A-3]$$

For the reverse flow, from welfare to other non-participation, we base our assumption on a recent survey from the Dutch Ministry of Social Security and Employment (1994), which gives some information on the composition of the total outflow out of welfare ($U_W O$). It appeared that in 1990 61.5 % of those who left welfare found a regular job, 5 % found an additional job and 33.5 % left welfare because of other reasons, e.g. people who marry and are no longer entitled to unemployment welfare or unemployed who reach retirement age.

We do not consider additional jobs and therefore assume that 40 % of the total outflow out of welfare enters non-participation,

$$F_{U_w N_o} = 0.4 * U_w O \quad [A-4]$$

Assumptions 5-8

We need this set of assumptions to construct the macro data on job creation. In our system of worker flows we distinguish job searchers filling a vacancy and job searchers who take up a job for which no vacancy existed, in which case employment inflow coincides with job creation. As there is no information on the relative importance of these two types of flows into employment, we have to make assumptions on one of them. We assume that the inflow into employment without filling a vacancy is a fraction of the total flow into employment. This fraction ξ is the share of total hires which do not lead to an outflow of vacancies in a particular year, $\xi = (H - VO_f) / H$, where H is the number of hires and VO , is the number of filled vacancies,

$$F_{EE}^j = \xi F_{EE} \quad [A-5]$$

$$F_{UE}^j = \xi F_{UE} \quad [A-6]$$

$$F_{NE}^j = \xi F_{NE} \quad [A-7]$$

Unlike in most other assumptions these fractions ξ are not fixed over the whole observation period but are time dependent. The assumptions imply that if the number of hires increases but the number of filled vacancies does not, there will be more hiring without filling a vacancy. In order to determine the fraction ξ we need information on the number of filled vacancies. Vacancies can disappear because they are being filled or because they are being scrapped. As the total vacancy inflow and the stock of vacancies is known from primary sources we can easily derive total vacancy outflow, $VO = VI - \Delta V = VO_s + VO_f$. It boils down to the fact that we have to make an assumption on the number of scrapped vacancies in order to distinguish between filled and scrapped vacancies. According to a survey from the Organisation for Strategic Labour Market Research (OSA, 1988) 40 % of the vacancies are difficult to fill. We assume that every year 75 % of these vacancies are scrapped, so that $(0.75 * 0.40 = 0.30)$,

$$vo_s = 0.30 * V \quad [A-8]$$

Assumptions 9-12

Our last set of assumptions relates to the vacancy chain and to the rate of excess job turnover. From primary sources only the total vacancy inflow is available, but little information exists in The Netherlands on the share of jobs which becomes vacant again after a worker has, for some reason, left his or her job. Apparently this share, and therefore the excess job turnover rate, will depend on the cyclical situation. Unfortunately, as we have no information on this aspect, we can do no better than assume fixed shares with respect to the various categories of persons who left their job. Survey information from the OSA (1994) indicates that if a worker moves to a different job to replace a colleague who left the organization, in 66 % of the cases the vacant position will be filled. This gives us some idea on the amount of vacancy inflow in case of job mobility. We assume that 65 % of the jobs of workers who move to a different employer will not be destroyed⁶,

$$VI_{EE} = 0.65 * F_{EE}, \quad [A-9]$$

which is based on this evidence. Moreover we avail of no information that could help us to link vacancy inflow to worker flows in case of quits to non-participation, layoffs or when a worker dies. We assume that this share will be very low in case of a layoff, because in The Netherlands hiring-and-firing is not allowed. Vacancy inflow generated by workers who leave the labour force due to occupational disability is likely to be lower than vacancy inflow due to job movements because in The Netherlands there is a lot of hidden unemployment among occupational disabled (Aarts and De Jong, 1992, Hassink, Van Ours and Ridder, 1997). By way of rough guesstimation we assume that

$$VI_{EU} = 0.01 * F_{EU} \quad [A-10]$$

$$VI_{EN} = 0.25 * F_{EN}, \quad [A-11]$$

where F_{EN} actually consists of two flows, namely employment outflow to occupational disability and other non-participation. We combine these two flows in order to simplify notation.

⁶ Broersma and Hassink (1997) find that in 1990 about 17 % of the quits are used for job destruction and hence 83 % of the jobs is refilled. As the business cycle reached a peak in 1990 this share can be regarded an upper bound. The lower bound is likely to be below the 65 % refilling that we assume, as in 1994, the year on which our assumption is based, the Dutch economy was recovering from a recession. Furthermore the data set used by Broersma and Hassink only contains continuing firms. In general, Broersma and Hassink conclude that quits are important for job destruction.

Furthermore we assume that for a part of the jobs of workers who die a new vacancy is created,

$$VI_{EM} = 0.25 * F_{EM}, \quad [A-12]$$

where $F_{EM} = 0.05 * E$, which and represents the number of workers who die. This is based on Hartoch et al. (1988).

Apart from using as much scattered information from surveys and qualitative information a major criterion for the empirical feasibility of our assumptions reported above is that the construction method does not yield negative values for one of the variables.

Sensitivity Analysis

The sensitivity analysis with respect to the 12 assumptions described above is set up in such a way that by changing the assumptions one by one, it is shown to what extent the time series of the flow data depend upon these assumptions. Thus, the analysis may reveal which assumptions are crucial and would have priority when collecting more direct empirical evidence on labour market flows. For each additional series of flow data that can be observed directly, we can dispense with one or more assumptions.

The results of the sensitivity analysis are summarised in Table 2. The table gives the mean of some crucial flow data and the keynote indicators of labour market dynamics over the reference period for the basic set of assumptions and for 6 alternatives. The results of the alternatives are discussed below. In general the differences between the alternatives from the sensitivity analysis and the basic version of our labour market flow data are rather small, indicating that the sensitivity of the construction method with respect to most assumptions is relatively modest.

Table 2 here

1. In the first alternative we assume that only a fraction of occupational disabled who recover become unemployed (5 %) and that the vast majority leaves the labour force (90 %). It turns out that changing assumption A-1 and A-2 has no significant effect on the worker flows and other labour market indicators. We also considered alternatives where

only 35 % of those who recover leave the labour force, with the about the same results.

2. This alternative of assumption 2 assumes that all students who leave school become unemployed, instead of 50 %. It implies higher unemployment flows and hence also lower unemployment duration. Assuming that non of the school leavers would become unemployed would give opposite results. Some composite flows like job creation and destruction are not affected although the underlying flows may be so. However, when constructing these keynote series a positive change in such underlying series is being compensated by an equally sized negative change in another.

3. Under assumption A-4,40 % of the workers who left welfare was assumed to leave the labour market. As an alternative we assume here that only 10 % leaves the labour market. This assumption does not affect any of the indicators of labour market dynamics considered by us.

4. Here, as alternative to assumption A8 we assume that 40 % of the vacancies is scrapped, i.e. all vacancies that are difficult to fill, instead of 75 % of the basic projection. Again this assumption appears not to have any significant effect on the indicators.

5. In this alternative we fix ξ and set it to 0,10 which implies that most jobs are filled via a vacancy. Job creation falls significantly due to the fact that less people take up a job for which no vacancy existed. This information on the share of jobs which are taken by filling a vacancy appears to be important for a proper measurement of job destruction.

6. Under this alternative assumption 50 % of the separations due to workers who leave the labour force generates a vacancy, instead of 25 %. Furthermore 70 % instead of 65 % of the jobs of people moving to another job are refilled. VO_{EU} and VO_{EM} remain unchanged. The vacancy chain index rises because more job movers leave a vacancy behind. Excess job turnover, which is defined as the amount of job turnover that exceeds net employment changes, $JT_{exc} = JT - |\Delta E|$, also rises. For the same reason job destruction is lower. Job creation also lower. This is due to a lower value for VI_j . **In** fact, in some years negative values for VI_j occur under this assumption. It shows that the series on inflow of new vacancies, which has its data constructed in a rather residual manner, needs particular attention in the calibration procedure in order to meet he non-negativity restriction.

The results of Table 2 show that, on average, the keynote indicators of labour market dynamics are not very sensitive to changes in the assumptions needed for construction of the data set. However, in some cases these averages hide quite large shifts in the time profile of the indicators. Yet Table 2 shows that some keynote indicators, namely inflow into employment, outflow of employment and labour turnover do not depend on the assumptions and can be derived directly from published sources using the definition equations of the construction method. For the other indicators and for the consistency of the accounting system, these assumptions are, however, essential. The most crucial assumptions are those on the extent to which a vacancy arises in case of separations to unemployment, non-participation, occupational disability or job-movers. More direct information on the time series basis of this induced job destruction appears vital for a proper analysis of labour market dynamics.

5. Characteristics of Flow Data for The Netherlands

Table 3 and 4 give the characteristics of the major indicators on worker and job flows constructed using the accounting system. The tables also show the cyclical nature of these indicators of labour market dynamics by correlating them to the growth rate of the volume of industrial production - a major cyclical indicator for The Netherlands. All variables are in thousands of persons or jobs. The indicators of duration are in weeks. See for further details and results Kock (1998).

Table 3 here

With respect to worker flows, Table 3 shows that the flow from employment to unemployment and vice **versa** and the flow of job movers (F_{EE}) are particularly large. The flow of new and filled vacancies is quite large as well. From their correlation with the cyclical indicator it appears that layoffs (F_{EU}) are obviously counter-cyclical and employment inflow from unemployment (F_{UE}) is pro-cyclical.

The observation that the flow of workers out of the labour force, F_{EN} , is counter-cyclical, can be attributed to the fact that a large part of this flow consists of workers becoming

disabled and that this flow has been highly anti-cyclical. In The Netherlands the disability act is commonly believed to have been used as a device to get rid of workers in bad times, so that they did not have to be laid-off. The opposite flow, F_{NE} , is slightly pro-cyclical. There appears to be no correlation between the business cycle and the inflow of non-participants into unemployment. The flow of job movers, is clearly pro-cyclical. The last part of Table 3 shows the main characteristics of some keynote indicators of labour market dynamics and their cyclical movement in The Netherlands. In conformity with other studies labour turnover is pro-cyclical according to our data. The quits, Q , with job movers as major component, are pro-cyclical as well and the lay-offs are counter-cyclical. The number of total hires, H , is pro-cyclical, as well as the flow of new hires into employment. This flow, EI , is composed of workers previously unemployed or out of the labour force. The first component is highly pro-cyclical, as far as filling a vacancy is concerned, the latter is only slightly pro-cyclical. The outflow out of employment and the inflow into unemployment both show the expected counter-cyclical pattern, whereas the outflow out of unemployment is slightly pro-cyclical.

Table 4 here

From Table 3 and 4 it appears that gross labour flows are substantial as compared to net changes in employment and unemployment. Moreover, the difference between the minimum and the maximum indicates that in most cases there is much variation. It appears that labour turnover is some 70 % larger on average than job turnover. Hence, the creation and destruction of workplaces can only account for some 60 % of worker flows. This is in agreement with evidence on excess job turnover from other countries (cf. Burda and Wyplosz, 1994, Salvanes, 1998).

In Table 4 we turn to job creation and job destruction. Job creation is pro-cyclical. Job destruction seems not to be affected much by the business cycle. As a result job turnover is pro-cyclical. This evidence from our macro-data is somewhat at variance with evidence from micro surveys which often show job turnover to be countercyclical, i.e. most labour reallocation occurs in bad times. However, recently the notion of countercyclical job turnover has been challenged by Boeri (1997). Both inflow and outflow of vacancies are pro-cyclical, which implies that more vacancies are posted in an economic upsurge, and also more vacancies are being filled during that period.

Table 4 also shows some duration characteristics. These average indicators of duration are calculated assuming steady state conditions, i.e. inflow equals outflow. Employment duration is related negatively to the business cycle, because in a downturn workers stick to their job. Unemployment duration seems hardly influenced by the business cycle, where we might have expected a negative relation because in recessions unemployed workers generally find it more difficult to find a new job. However if we analyse the two components of unemployment separately it turns out that unemployment duration of unemployed who receive insurance payments is indeed negatively correlated with the business cycle. Unemployment duration of workers receiving welfare however, shows no such pattern. The reason is that this group of unemployed consists mostly of long-term unemployed who have a very small probability to find a job anyhow, either in good times or in bad times. As expected, in an upturn the duration of vacancies increases. The vacancy chain is also negatively linked to the business cycle. However, this is due to our assumptions A-9, A-10, A-11 and A-12 of constant job destruction rates with respect to job leavers, and because the creation of new vacancies is pro-cyclical. More information on the cyclical nature of the extent to which vacancies are opened when workers leave their job, may amend our observation on the negative cyclicity of the length of the vacancy chain.

Figure 2 here

Figure 2 depicts the time path of some of our major indicators of labour market dynamics. The shaded area in the figures indicates periods of economic downturn according to the business cycle indicators for The Netherlands. Chart A confronts job creation and job destruction rates with net job growth as the difference. The rates are calculated by dividing total job creation and job destruction by the total labour force at the beginning of the period. Notice that both flows move fairly synchronised from 1984 onwards. In the severe economic recession preceding that year job creation fell dramatically, whereas the trend in the rise of job destruction, which started in 1979, continued. Since 1984, job creation has exceeded job destruction, with the exception of 1993. This underlies the almost continuous growth in employment in The Netherlands from the second half of the 1980's onwards.

Chart B shows the development of job turnover, labour turnover and excess job turnover. Notice that after the economic recession in the beginning of the 1980's excess job turnover is substantially higher than before. There was an increase in job turnover in the period 1972-74 and 1979-80. However, the most remarkable increase occurred after 1984, when the Dutch economy faced major restructuring. The positive trend in employment flows since the beginning of the 1980's is likely to be facilitated by the policy of labour market deregulation and the restructuring of the social security system, especially in the second half of that decade. Increased labour market dynamics could reflect the positive economic results of employers and employees co-operating and jointly with the national government developing and implementing economic policy; the so called 'Dutch model' (see Teulings and Hartog, 1998, chapter 8).

Chart C of Figure 2 illustrates the time series on the inflow rate into employment of workers from both unemployment and non-participation and the outflow rate of workers into these two pools. The difference between employment inflow and outflow is the net change in employment. The series show a slight upward trend with cyclical variations. Moreover, the series have rather similar fluctuations, just like the unemployment in- and outflow rates, which are presented in Chart D. Notice that the huge increase in unemployment in the early 1980's, was due to a large increase in the inflow of unemployed, which rose with about 45 % from 1979 to 1982. Hence, unemployment duration increased (see also Chart F).

Charts E and F show that besides unemployment duration also employment duration increased in the early 1980's, namely to 8 years. A reason is the dramatic fall of job-to-job movement during the recession. The large increase in job mobility in the second half of the 1980's again induced a decrease in employment duration. As noted, unemployment duration increased in the early 1980's from some 35 weeks to almost 1,5 year in 1983.

6. A Comparison

Another way of assessing the plausibility and characteristics of our data, is to compare inflow and outflow rates with other studies on labour market flows. We will introduce a number of definitions concerning labour market dynamics, that will be of use when comparing the results. The number of hires H is simply the sum of job movers and the inflow into employment and the number of separations S is defined as the sum the outflow

out of employment and the number of job movers. Labour turnover LT consists of all the flows in and out of employment and the flow of job movers. Job turnover JT is the sum of job creation and destruction.

Recently, the empirics of labour market dynamics and labour market flows in The Netherlands has been the subject of a number of studies. Hamermesh, Hassink and Van Ours (1994) construct data on worker and job flows for the Dutch economy using a panel data set of firm-level observations. This study gives the flows of total hires, separations and job creation and destruction as a percentage of employment, for the year 1990. Broersma and Gautier (1997) conducted a study on labour market flows for The Netherlands which provides other evidence to compare our results with. They analyse time series of job flows for the Dutch manufacturing sector over the period 1979-1993. These series are based on firm-level employment observations, which are aggregated to give job creation and destruction rates. Table 5 compares their results on major indicators of labour market dynamics with ours.

Table 5 here

Table 5 shows large differences in magnitude of the labour market flows from the three sources. We have no simple explanation for the difference in worker flows. Yet we feel that our values are reliable when they are compared to those found in other countries (see below). The differences in job flows can largely be traced back to differences in the data collection. The panel survey data used by Hamermesh, Hassink and Van Ours does not take the opening of new and closure of existing firms into account. Therefore, these authors underestimate job creation and destruction. Moreover, they only include firms with more than 10 employees. This is also the case in the study by Broersma and Gautier, although the differences in results are much smaller here. This study is limited to the manufacturing sector, whereas our constructed series of job creation and destruction refer to the entire economy. Moreover, our data take account of the fact that in the second half of the 1980's the level of employment increased strongly in The Netherlands, mainly because of the rise in part-time jobs (our data refer to numbers of workers and jobs). Most part-time jobs were created in the service sector and not so much in manufacturing. This fact largely accounts for the difference in magnitude between the job flows found here and those reported by Broersma and Gautier.

Finally, in Table 6 we compare the results we found for The Netherlands to those reported for some other countries. The study of Burda and Wyplosz (1994) provides data on worker flows in a number of industrialised countries for the year 1987. The OECD (1996) has information on job flows for the year 1991.

Table 6 here

This shows that the unemployment flow rates are lowest for The Netherlands as compared to the other European countries for which data are reported. This implies that unemployment duration in The Netherlands will be relatively high; once unemployed, there seems to be less chance of leaving unemployment in The Netherlands than in other European countries. It may have to do with the generous social security system and the relatively high replacement rates. Overall labour turnover, as measured by the separation rate and the hiring rate, does not seem to be much different in The Netherlands as compared to other countries. Measured by the rates of job creation and job destruction the Dutch labour market can be qualified as relatively dynamic.

7. Conclusions

Nowadays we witness an outburst of theoretical and empirical studies on structural change and its consequences for labour market dynamics. Following the seminal work of Davis and Haltiwanger (see Davis, Haltiwanger and Schuh, 1996) most empirical studies concentrate on the cyclical nature of labour market dynamics and use micro data from panel data sets for assessing the size of the labour market flows. In contrast, this paper considers data at the macro level and discusses the construction method of a consistent set of time series data on all relevant flows of persons and jobs, which play a role in the flow approach to labour markets. Hence, these data may be used for building a comprehensive model of labour market flows, which can be an empirical counterpart of the theoretical models. The construction method of the time series data is based on a coherent accounting system, just like the national accounts. In fact, in line with recent developments in the methodology of national accounting, our system of labour flow data could be added as separate module to the national accounts.

Our method uses both data on stocks and flows of persons, and on stocks and flows of jobs (vacancies). Hence, the construction method combines the information contents of both types of data as it takes account of the relationship between worker flows and job flows in a consistent manner. Primary data from published sources are used as much as possible for the construction of the data set. Yet these primary data, and the definitions implicit in the accounting system, do not suffice for the construction of the whole data set. Therefore a number of additional assumptions are needed. These assumptions are based on scattered information from micro studies or on global information at the macro level. We performed a sensitivity analysis in order to investigate to what extent changes in the assumptions would alter the average values and the time profile of the data. This sensitivity analysis showed that especially more direct information on job destruction associated with job movers would enhance the quality of the data.

We note that our construction method, like in the case of national accounting, is applicable to each country. The more information is available from published sources, the less additional assumptions are needed. And the sensitivity analysis may tell what data should have priority to be collected from direct sources by statistical agencies.

Our framework includes flows of persons who take a job for which no vacancy existed (so called latent vacancies). Although these flows are usually neglected in models of the flow approach, our calculation shows that these flows, which form part of the job creation process, can be quite substantial. Moreover, we investigated the cyclical nature of all flows and composite indicators of labour market dynamics and compared these characteristics with results from panel data reported in other studies, both for The Netherlands and for some other OECD countries. This comparison confirmed that our data are plausible with respect to size and time pattern.

Obviously, in order to increase the reliability of the data set of this paper, we would need more information on the assumptions or, preferably, more directly observed time series on labour market flows. A further scope for future research is the disaggregation of the data set with respect to the various characteristics of workers and of jobs and with respect to the flows through the duration classes. In that case the system takes account of heterogeneity in the stock variables, e.g. heterogeneous employment and unemployment (short term unemployed versus long-term unemployed). Such disaggregation would also be desirable for a comprehensive national accounts' module of labour market flows.

List of Symbols and Specification of Stock-flow Equations

Stocks

E	Employment
U_I	Unemployment insurance
U_W	Welfare (unemployment assistance)
N_O	Other non-participation (out of the labour force)
N_D	Occupational disability
V	Vacancies
J	Jobs ($E+V$)
L	Labour force ($E + U_I + U_W$)

Flows of persons

F_{xy}^z	Flow from x to y , $(x, y) = \{U_W, U_I, E, N_D, N_O\}$, with $z = j$ in case of newly created jobs and $z = v$ in case of vacancies.
F_{EE}^j	Job-movers who find a job for which no (registered) vacancy exists.
F_{EE}''	Job-movers who find a job by filling a vacancy.
F_{UE}^j	Unemployed who find a new job for which no (registered) vacancy exists.
F_{UE}^v	Unemployed who find a new job by filling a vacancy.
$F_{U_I E}$	Unemployed receiving unemployment insurance payments who find a job for which no (registered) registered vacancy exists or by filling a vacancy.
$F_{U_W E}$	Unemployed receiving welfare who find a job for which no (registered) registered vacancy exists or by filling a vacancy ($U_W O - F_{U_W N_O}$, where $U_W O$ is the total outflow from welfare).
F_{NE}^j	Non-participants who find a job for which no (registered) registered vacancy exists.
F_{NE}^v	Non-participants who find a job by filling a vacancy.

F_{N_oE}	Other non-participants (e.g. school leavers and workers re-entering the labour market) who find a job for which no (registered) registered vacancy exists or by filling a vacancy ($EI - F_{U_wE} - F_{U_I E} - F_{N_D E}$, where EI is the total inflow into employment).
$F_{N_D E}$	Occupational disabled who find a job for which no (registered) registered vacancy exists or by filling a vacancy ($F_{N_o N_D} + F_{EN_D} - \Delta N_D - F_{N_D N_o} - F_{N_D N_w}$).
F_{EU_I}	Workers who become unemployed and are entitled to unemployment insurance payments.
F_{EN}	Workers who quit their job and leave the labour force.
F_{EN_o}	Workers who quit their job and leave the labour force excluding occupational disabled (e.g. retirement and early retirement).
F_{EN_D}	Workers who become occupational disabled and leave the labour force.
F_{NU}	Non-participants who register as unemployed.
$F_{N_o U_w}$	Other non-participants (e.g. school leavers) who register as unemployed ($0.50 * N_{O(schoolout)}$).
$F_{N_D U_w}$	Occupational disabled who recover but and register as unemployed ($0.20 * N_{D(recovery)}$).
$F_{U_I U_w}$	Unemployed who's entitlement to unemployment insurance payments expires and register to receive welfare.
F_{UN}	Unemployed leaving the labour force ($F_{U_I N_o} + F_{U_w N_o}$).
$F_{U_I N_o}$	Unemployed receiving unemployment insurance payments who leave the labour force.
$F_{U_w N_o}$	Unemployed receiving welfare who leave the labour force ($0.4 * U_w O$, where $U_w O$ is the total outflow from welfare).
$F_{N_o N_D}$	Other non-participants who become occupational disabled.
$F_{N_D N_o}$	Occupational disabled who retire or recover but do not re-enter the labour market ($N_{D(65+)} + 0.55 * N_{D(recovery)}$).

Flows of jobs

VI_{XY}	Vacancy inflow which represents the job flow associated with the flow of a person from X to Y , $(X, Y) = \{U, E, N, M\}$.
VO_{XY}	Vacancy outflow which represents the job flow associated with the flow of a person from X to Y , $(X, Y) = \{U, E, N, M\}$.
VI_j	Vacancies for new jobs ($VI - VI_{EE} - VI_{EU} - VI_{EN} - VI_{EM}$).
VI_{EE}	New vacancies because of job mobility ($0.65 * F_{EE}$).
VI_{EU}	New vacancies because of workers who become unemployed ($0.01 * F_{EU}$).
VI_{EN}	New vacancies because of workers who leave the labour force ($0.25 * F_{EN}$).
VI_{EM}	New vacancies because of workers who die ($0.25 * F_{EM}$).
VO	Outflow of vacancies ($VI - AV = VO + VO_f$).
V_s	Scrapped vacancies ($0.30 * V$).
VO_f	Filled vacancies ($VO_{EE} + VO_{UE} + VO_{NE}$).
VO_{EE}	Vacancies filled by job movers (F_{EE}^v).
VO_{UE}	Vacancies filled by unemployed (F_{UE}^v).
VO_{NE}	Vacancies filled by non-participants (F_{NE}^v).

Indicators of labour market dynamics

LT	Labour turnover ($F_{UE} + F_{NE} + F_{EU} + F_{EN} + 2 * (F_{EE})$).
H	Hires ($EI + F_{EE}$, where EI is the total inflow into employment).
LO	Workers who are Laid off (F_{EU}).
Q	Workers who quit their job ($F_{EN} + F_{EE}$).
S	Separations ($EO + F_{EE}$, where EO is the total outflow out of employment).
JT	Job turnover ($JC + JD$).
JC	Job creation ($VI_j + F_{EE}^j + F_{UE}^j + F_{NE}^j$).

JD	Job destruction $(VO_s + (F_{EE} - VI_{EE}) + (F_{EU} - VI_{EU}) + (F_{EN} - VI_{EN}) + (F_{EM} - VI_{EM})).$
E_{du}	Average employment duration in years ($E/0.5* LT$)
U_{du}	Average unemployment duration in weeks ($(U/0.5* (UI + UO))*52$)
V_{du}	Average vacancy duration in weeks ($(V/0.5* (VI + VO))*52$)
V_{ch}	Average length of the vacancy chain ($1 + (VZ, /((VI - VI_{EE})))$)

Data Sources and Description

Stocks

- U_I Number of persons receiving unemployment insurance benefits, excluding civil-servants and self-employed. About 70 percent of the working population is covered by the unemployment insurance (WW). Source: CTSV (1996a), Kroniek van de Sociale Zekerheid, Table 6.6, 6.2 and own calculations.
- U_W Number of persons receiving welfare, i.e. RWW and IOAW. Source: CTSV (1996a), Kroniek van de Sociale Zekerheid, Table 2.1.
- E Number of workers (employees and self-employed) with a regular job of 12 hours a week or more. Source: CPB (1996), Lange reeksen.
- N_D Number of occupational disabled. In 1976 self employed and civil servants became eligible for these benefits. Whenever using the first difference in the number of occupational disabled we included a dummy for 1976 for these two groups to remove the peak in that series. Source: CTSV (1996a), Kroniek van de Sociale Zekerheid, Table 5.5.
- N_O Number of non-participants (above age 14) other than occupational disabled. Source: CBS, Bevolkingsstatistiek.
- V Number of vacancies. Source: CBS, Sociaal Economische Maandstatistiek and Muysken et al. (1991).

Flows

- $F_{U_I U_W}$ Inflow into welfare from unemployment insurance, excluding civil servants and self-employed. We use data that represent unemployed receiving unemployment insurance payments who are no longer entitled to these benefits because they have reached the maximum term. Outflow due to reaching the maximum term can also take place to non-participation, but we make the reasonable assumption that these people continue to be part of the labour market and all flow into welfare. Source: CTSV (1996a), Kroniek van de Sociale Zekerheid, Table 6.2.
- F_{EE} Job movers. Source: Hartog, Mekkelholt and Ophem (1988), OSA (1995) and CBS.

$N_{D(65+)}$	Flow out of occupational disability due to retirement. Source: CTSV (1996a), Kroniek van de Sociale Zekerheid, Table 5.17.
$F_{N_0N_D}$	Flow from non-participation to occupational disability. We use data representing the inflow into occupational disability of early disabled and some minor groups of occupational disabled. Before 1976 this data was not observed, so we included a dummy to remove the peak for that year. Source: CTSV (1996a), Kroniek van de Sociale Zekerheid, Table 5.13.
$F_{U_I E}$	Inflow into regular employment from unemployment insurance, excluding civil servants and self-employed. Source: CTSV (1996a), Kroniek van de Sociale Zekerheid, Table 6.2.
$F_{I N_0}$	Flow from unemployment insurance to non-participation, excluding civil servants and self-employed. We use data that represent the flow out of unemployment insurance due to reasons other than outflow due to maximum term and reemployment. We assume that this entire outflow goes to non-participation, although a small sample of these people will flow to employment, for example because they started their own business. Source: CTSV (1996a), Kroniek van de Sociale Zekerheid, Table 6.2.
$F_{E U_I}$	Outflow out of regular employment to unemployment insurance, excluding civil servants and self employed. Source: CTSV (1996a), Kroniek van de Sociale Zekerheid, Table 6.2.
$F_{E N_0}$	Flow from regular employed to non-participation. $F_{E N_0} = F_{E A O W} + F_{E V U T}$, representing the flow into retirement and into early retirement respectively.
$F_{E A O W}$	Inflow into retirement of regular employed. This flow is calculated as the change in the number of old-age benefit receivers plus the number of deaths in the cohort with age over 65 (the outflow out if retirement), multiplied by the participation rate of persons in the age of 60-64. These calculations are made for male and female separately and added to get $F_{E A O W}$. Source: Participation rate in OECD (1995), Labour Force Statistics, other data in CBS, Statistical Yearbook.
$F_{E V U T}$	Inflow into early retirement of regular employed. Source: CBS, Statistical Yearbook.

F_{EN_D}	Flow from employment to occupational disability. For this we use data representing the inflow into occupational disability of workers, civil servants and self-employed. Before 1976 this flow includes only workers. In that year also self employed and civil servant became eligible for occupational disability benefits, so for these two groups we included a dummy for 1976 to remove the peak in the series. From 1994 a 10 % upward correction was applied to correct for changes in the registration method. Source: CTSV (1996), Kroniek van de Sociale Zekerheid, Table 5.13.
F_{EM}	Number of workers who die, calculated as 0.5 % of total number of workers, based on Hartog et al. (1980). Source: CBS.
$N_{O(\text{schoolout})}$	Number of students who leave school, college or university. Source: CBS, Onderwijsstatistieken on the Internet at www.cbs.nl .
$N_{D(\text{recovery})}$	Flow out of occupational disability due to recovery. From 1994 a 10 percent upward correction was applied to correct for changes in the registration method. Source, CTSV (1996a), Kroniek van de Sociale Zekerheid, Table 5.17.
VI	Inflow of vacancies. Source: CBS, Sociaal Economische Maandstatistiek and Van Ours (1991).

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Table 1 **Composition of worker and job flows**

<i>Flows</i>	<i>Obtained from</i>
Job movers	
F_{EE}	Primary source
F_{EE}^j	Assumption A-5
Employment inflow	
F_{UE}^j	Assumption A-6
F_{NE}^j	Assumption A-7
F_{U_1E}	Primary source
F_{U_wE}	Assumptions: A-2, A-3, A-4 Primary sources: AU,, $F_{U_wN_o}$
F_{N_oE}	Assumptions: A- 1, A-3, A-4 Primary sources: ΔN_D , ΔE , ΔU_w , F_{U_1E} , $F_{N_oN_D}$, $F_{U_1U_w}$, F_{EN_o} , F_{EU_1}
$F_{N_D E}$	Assumptions: A- 1, A-2 Primary sources: AN,, $F_{N_oN_D}$, F_{EN_D}
Employment outflow	
F_{EU_1}	Primary source
F_{EN_o}	Primary source
F_{EN_D}	Primary source
Unemployment inflow	
$F_{N_oU_w}$	Assumption A-3
$F_{N_D U_w}$	Assumption A-2
$F_{U_1U_w}$	Primary source
Non-participation inflow	
$F_{U_1N_o}$	Primary source
$F_{U_wN_o}$	Assumption A-4
$F_{N_oN_D}$	Primary source
$F_{N_D N_o}$	Assumption A- 1
Vacancy inflow	
VI_j	Assumptions: A-9, A-10, A-11, A-12 Primary source: total vacancy inflow VI
VI_{EE}	Assumption A-9
VI_{EU}	Assumption A- 10
VI_{EN}	Assumption A- 11
VI_{EM}	Assumption A- 12
Vacancy outflow	
$V_s = 0.30*V$	Assumption A-8
$V \hat{E}E = \hat{E}E^v$	Definition
$VO_{UE} = F_{UE}^v$	Definition
$VO_{NE} = F_{NE}^v$	Definition

Table 2 **Sensitivity analysis for the assumptions**

	<i>basic version</i>	<i>I</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
<i>EZ</i>	513	513	513	513	513	513	513
<i>EO</i>	477	477	477	477	477	477	477
<i>UI</i>	444	440	562	444	444	444	444
<i>UO</i>	418	414	536	418	418	418	418
<i>JC</i>	698	698	698	698	706	334	630
<i>JD</i>	668	668	668	668	676	668	599
<i>JT</i>	1366	1366	1366	1366	1383	1002	1229
<i>LT</i>	2152	2152	2152	2152	2152	2152	2152
U_{du}	46.4	46.8	36.4	46.4	46.4	46.4	46.4
V_{ch}	3.2	3.2	3.2	3.2	3.2	3.2	4.5

1: $F_{N_D N_O} = N_{D(65+)} + 0.90 * N_{D(recovery)}$, $F_{N_D U_W} = 0.05 * N_{D(recovery)}$

2: $F_{N_O U_W} = N_{O(schoolout)}$

3: $F_{U_W N_O} = 0.1 * U_W$

4: $V_s = 0.40 * V$

5: $\xi = 0.10$

6: $VI_{,,} = 0.70 * F_{EE}$, $VI_{EN} = 0.50 * F_{EN}$ and $VI_{EM} = 0.50 * F_{EM}$

Table 3 **Characteristics worker flows and indicators of labour market dynamics in The Netherlands, 1970-1995**
(x 1000 workers)

	<i>Mean</i>	<i>Maximum</i>	<i>Minimum</i>	<i>Standard deviation</i>	<i>Correlation with cyclical indicator</i>
F_{EE}	594	806	272	146	0.35
F_{UE}	290	468	184	70	0.11
F_{NE}	224	371	59	91	0.07
F_{NU}	123	145	96	14	0.02
F_{EU}	322	611	143	119	-0.17
F_{EN}	130	155	96	18	-0.20
LT	2152	2755	1415	358	0.25
H	1107	1450	675	200	0.32
LO	322	611	143	119	-0.17
Q	723	961	405	144	0.32
EI	513	825	337	149	0.10
EO	477	772	264	128	-0.19
UI	444	737	246	124	-0.16
UO	418	707	274	117	0.08

Table 4 **Characteristics of job flows and duration indicators in The Netherlands, 1970-1995**
 (flows x 1000 jobs, duration denoted in weeks)

	<i>Mean</i>	<i>Maximum</i>	<i>Minimum</i>	<i>Standard deviation</i>	<i>Correlation with cyclical indicator</i>
<i>JT</i>	1366	1847	1016	263	0.23
<i>JC</i>	698	981	465	156	0.37
<i>JD</i>	668	905	541	116	0.02
<i>VI_j</i>	223	528	7	153	0.27
<i>VO_f</i>	632	953	277	186	0.25
<i>U_{du}^{du}</i>	259.46	363.72	210.16	171	-0.29 -0.04
<i>V_{du}</i>	6	13	3	2	0.55
<i>V_{ch}</i>	3	8	2	2	-0.17

Table 5 **Comparison of Dutch worker and job flows**

	<i>This study</i>	<i>Hammermesh, Hassink and Van Ours</i>	<i>Broersma and Gautier</i>
H_t/E_{t-1}			
1990	0.27	0.12	
1979-1993	0.21		
S_t/E_{t-1}			
1990	0.24	0.10	
1979-1993	0.20		
LT_t/E_{t-1}			
1990	0.50	0.22	
1979-1993	0.41		
JC_t/E_{t-1}			
1990	0.17	0.04	
1979-1993	0.14		0.07
JD_t/E_{t-1}			
1990	0.14	0.03	
1979-1993	0.13		0.08
JT_t/E_{t-1}			
1990	0.32	0.07	
1979-1993	0.26		0.15

Table 6 Comparison of Dutch labour market flows with worker flows in some other countries

	UI/U^1	UO/U^1	E/E^1	EO/E^1	H/E^1	S/E^1	JC/E^2	JD/E^2	JT/E^2
United States	2.38	2.43			0.25	0.27	0.12	0.11	0.23
Japan	1.18	1.16	0.09	0.09			0.05	0.04	0.09
France	1.51	1.51			0.29	0.31	0.12	0.13	0.25
Germany	1.49	1.46			0.22	0.21	0.10	0.07	0.17
Spain	2.21	2.12							
United Kingdom	1.12	1.29	0.07	0.07			0.08	0.06	0.14
Netherlands	0.94	0.79	0.12	0.10	0.25	0.22	0.15	0.14	0.29

¹ Source: Burda and Wyplosz (1994). For Germany, France and Spain unemployment is defined as the number of new registrations at employment offices, whereas we use the ILO unemployment definition for The Netherlands. All data refer to 1987. United States and Japan are based on survey data and are therefore less comparable with the results for other countries.

² Source: OECD (1996). Data refer to 1991. Germany and United States based on plant data, United Kingdom based on firm data, Japan only based on continuing firms and our Dutch flows are based on labour flows.

Figure 2 Various characteristic flow and duration series for the Dutch labour market, 1970-1995

The shaded areas correspond to a downturn in the CPB business cycle indicator.

Chart A Rates of job creation and job destruction (percentage of labour force)



Chart B Rates of labour turnover and job turnover (percentage of labour force)



Chart C Employment inflow and outflow rates (percentage of labour force)



Chart D Unemployment inflow and outflow rates (percentage of labour force)

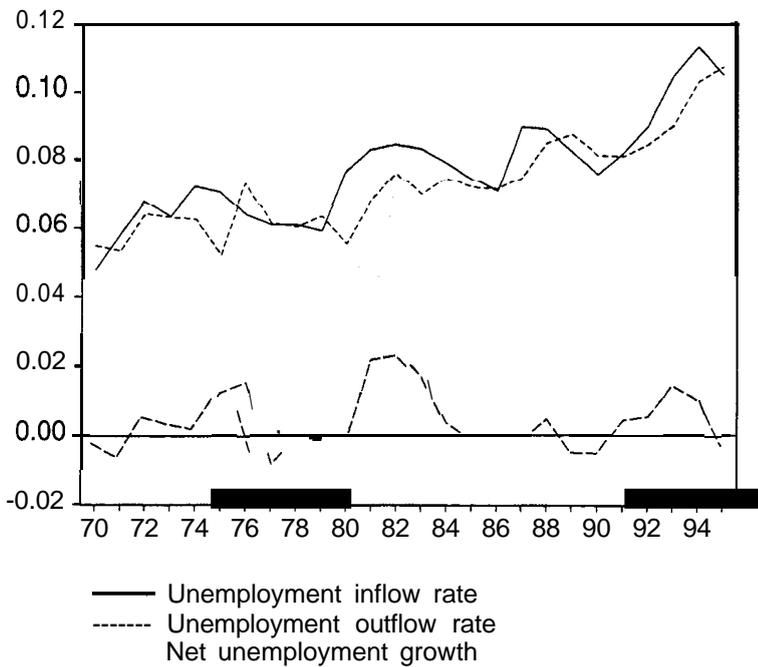


Chart E Employment duration (in weeks)

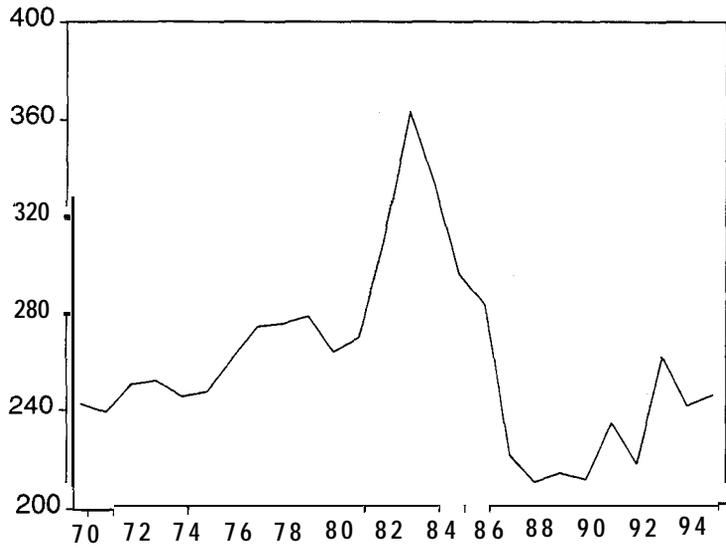


Chart F Unemployment and vacancy duration (in weeks)

