DISCUSSION PAPER SERIES

IZA DP No. 1670

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July 2005

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

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IZA Discussion Paper No. 1670
July 2005

ABSTRACT

Age-Specific Cyclical Effects in Job Reallocation and Labor Mobility*

We present an empirical analysis of job reallocation and labor mobility using matched worker-firm data for the Netherlands to investigate how firms adjust their workforce over the cycle. Our data cover the period 1993-2002. We find that cyclical adjustments of the workforce occur mainly through fluctuations in job creation for young and prime-age workers while for old workers they occur mainly through fluctuations in job destruction. Moreover, we find that business cycle fluctuations are used to rejuvenate the workforce. Workforce reductions are most harmful for old workers; for them the flow out of employment is a one-way street.

JEL Classification: J23, J62, J63

Keywords: job creation, job destruction, accessions, separations, matched worker-firm data

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* The authors would like to thank the Ministry of Social Affairs and Employment for the use of the AVO dataset, and Marcel Kerkhofs and Trudie Schils for their comments on a previous version of this paper. Anne Gielen gratefully acknowledges financial support from the Institute for Labor Studies (OSA).

1 Introduction

In a dynamic labor market firms continuously adjust their workforce. Firms are simultaneously hiring new workers and losing incumbent workers due to quits, dismissals, or retirement. At any moment in time there is both a lot of job creation and a lot of job destruction, even at the level of the individual firm. Firms may adjust the age-structure of their workforce for different reasons. On the one hand, young workers may be laid off first, because as yet they did not invest very much in firm-specific human capital and therefore have a lower productivity than older workers (Becker, 1964). It may also be easier to get rid of young workers because firing costs increase with age, tenure and wage. On the other hand, older workers may be laid off first, because they are overpaid due to the upward-sloping age-earnings profile (Lazear, 1979). Lazear (1995) combines both views in the "efficient layoff" rule, which states that both young and old workers will be laid off before prime-age workers.

When it comes to actual workforce reductions, older workers indeed bear a disproportionate share of the burden of a recession (OECD, 1995a). For young workers being laid off may not cause big problems because they are very mobile anyway and will find a new job easily. For old workers, who need much more time to find a new job, problems are dependent on the cycle. In a boom there will not be many redundancies, and perhaps only old workers close to their retirement will be laid off. In a slump more workers will lose their job and the situation for old workers may be more problematic. Part of those that lose their job do so a long time before retirement age. Therefore, old workers being laid off in a slump may end up becoming long-term unemployed.

The current paper investigates in detail how Dutch firms adjust their workforce over the business cycle. We use a unique dataset consisting of matched worker-firm data with information about job creation and job destruction as well as about worker mobility. Our data cover the period 1993-2002, which allows us to study job and worker flows over a full cycle. Figure 1.a illustrates the course of the employment and unemployment rate, both defined as a percentage of the working age population. The figure shows that in the early 1990s the Dutch labor market was in a slump. In later years employment grew rapidly, even to the extent that it was called

the Dutch "employment miracle". At the same time unemployment decreased dramatically. In the beginning of the twenty-first century the labor market again entered a slump with a decline in employment and increase in unemployment. Our study adds to the existing literature by investigating to what extent cyclical fluctuations in job reallocation and worker mobility are age-specific. Figures 1.b and 1.c illustrate how the employment rate and the unemployment rate for different age groups varied over the business cycle in the Netherlands. For almost all age groups the employment rates increased as of 1995 and decreased after 2001. Similarly, unemployment rates increased at the beginning of the 1990s, but decreased thereafter until 2001, as of which they increased again. Note that there are large differences in unemployment rates for the different age groups over the cycle. In the downturn period 1993-1995 there was much more difference in unemployment rates between young and old workers than there was in the boom period 1999-2001. Hence, youth unemployment is much more sensitive to cyclical variations than unemployment of older workers.

The set-up of the paper is as follows. In section 2 we give a brief overview of previous empirical studies on job reallocation and labor mobility. Section 3 presents our data and some stylized facts, which suggest that firms may exploit cyclical fluctuations to change the age-structure of their workforce. Section 4 reports the results of our empirical analysis. The results from both the firm and worker level analyzes suggest that business cycle fluctuations are used to rejuvenate the workforce via worker inflow. Section 5 concludes.

2 Empirical studies on job and worker flows

Job reallocation, the sum of job creation and job destruction, is often found to increase in recessions because job destruction increases more than job creation declines (OECD, 1995). Davis and Haltiwanger (1990, 1992) and Blanchard and Diamond (1990) find such an asymmetry in U.S. manufacturing. According to Davis and Haltiwanger (1990) the countercyclical job reallocation is caused by job creation being time-consuming, and job destruction not needing much time. Caballero and Hammour (1991) using the same firm-level data conclude that recessions are a time of "cleaning-up", where outdated or unprofitable techniques and products are

pruned out of the productive system and new technology is adopted. This adjustment takes place in recessions, when the opportunity cost of forgone production is lowest.

While in the U.S. job reallocation increases in cyclical downturns, in Europe job reallocation shows less cyclical movement (OECD, 1996). Moreover, Boeri (1996) for example finds that in most of the countries the variance of job creation is larger than the variance of job destruction. Also Albaek and Sørensen (1998) using Danish firm-level data over the period 1980-1991 find that job destruction does not show more variation than job creation, so there is no evidence of asymmetry.

There is an important distinction between job flows and worker flows. Job flows are the result of job creation and job destruction by a firm, whereas worker flows represent changes in the labor market status of a worker. Worker flows consist of accessions to firms and separations from firms. Accessions may be due to recruitment either for existing but vacant posts, or for newly created vacancies. Separations may lead to vacancies or to jobs disappearing. Labor reallocation, the sum of accessions and separations, measures changes in individuals among jobs, regardless of whether the jobs themselves are newly created, ongoing or whether the jobs themselves disappear (OECD, 1996). Job creation necessarily implies at least an equivalent number of hired workers. Similarly, job destruction necessarily implies at least an equivalent number of separations. In the Netherlands job reallocation accounts for approximately one-third of worker reallocation (Hamermesh et al., 1996). Albaek and Sørensen (1998) find accessions to be procyclical and separations to be countercyclical, with labor reallocation being procyclical.

There have only been a few studies on age-specific job flows and worker flows over the business cycle. Blanchard and Diamond (1990) find clear cyclical differences among different age groups in the U.S.. In a recession, young workers have the highest increase in the flow from employment to unemployment (EU) and the largest decrease in the flow from unemployment to employment (UE). Cyclical movements for prime-age workers are concentrated in EU flows. Finally, the cyclical behavior for older workers reflects elements of both young and prime-age workers. They share with prime-age workers the small increase in EU flows and with young workers the large decrease in the UE flows. The conclusion that especially young and old workers are negatively affected by recessions is confirmed in OECD (1990). Workers under 25

years old are most likely to lose their job during an economic downturn. The accession rate of older workers is disproportionally low, also because older workers have had fewer years of schooling than young workers (OECD, 1998). Our paper adds to the existing literature by including both job and labor turnover in the analysis. Moreover, we investigate the role of firms in cyclical job and worker flows.

3 Data and stylized facts

3.1 Data

We use the so-called AVO data which contains administrative information of workers and firms in the Netherlands and covers the period 1993-2002.[1] The data are obtained by means of a two stage sampling procedure. In the first stage, a sample of firms is drawn, using a stratified design (by economic sector and firm size). In the second stage, a sample of workers within each firm is drawn. Information is collected from the wage administration of the firm for two distinct moments in time: October of the year of the survey (denoted by t) and October of the previous year (denoted by *t-1*). A distinction is made between workers working at the firm at both moments in time ('stayers'), workers working at the firm only at time t ('entrants'), and workers working at the firm only at time *t-1* ('leavers'). In addition to the information that is collected for all sampled workers, the new labor market position is registered for the workers who left the firm. Also, for workers who enter the firm the former labor market position is registered.

The AVO dataset contains matched worker-firm information and has a repeated cross-section set-up. It contains many observations; every year on average about 1900 firms and 44,000 workers are sampled. The dataset contains firm-specific characteristics. Furthermore, worker and job characteristics are available, such as age, gender, tenure, education, job complexity level, and occupation.[2] Also, as indicated before, the time period available covers a full economic

[1] "AVO" is in Dutch: "Arbeidsvoorwaardenontwikkeling" (see Arbeidsinspectie, 2003). The data are from the Working Conditions Survey of the Dutch Ministry of Social Affairs and Employment. Unless otherwise indicated the graphs and tables in this paper are based on the AVO data.

[2] See Appendix A and Arbeidsinspectie (2003) for a detailed variable description. Since the 1993 sample contains no information on public sector workers, we excluded firms from this sector in other years as well.

cycle. And, a great advantage of the repeated cross-section set-up is that it includes new founded firms, which may account for a large part of new jobs created. The data also have some limitations. Since workers are observed at two moments in time, we do not know the number nor the characteristics of the workers who were hired after October of year t-1 and leaving the firm before October of year t. Another limitation of the dataset is that it does not provide financial information about the firms such as value added, output, profits, capital and investment.[3] A third limitation is that data are available at the firm rather than the establishment level, such that job creation and destruction resulting from movements between establishments within the same firm are ignored, because they offset each other at the firm level. A final limitation is that this dataset does not have a panel set-up, so workers cannot be followed during several consecutive years. Nevertheless, on balance the AVO-data are well-suited for the purpose of analyzing age-specific cyclical fluctuations in job reallocation and labor mobility. Table 1 gives estimated population averages for some key variables. Note that the inflow and the outflow rates change over the business cycle, although inflow rates fluctuate more than outflow rates do.

3.2 Measuring job flows and worker flows

Job destruction, job creation and job reallocation are defined following Davis and Haltiwanger (1999). We denote the level of employment at firm j in calendar year t as $e_{j,t}$ and we denote the change of employment at this firm between calendar year t and calendar year *t-1* as $\Delta e_{j,t}$. The job destruction rate (JD) in calendar year t in the class of firms S, according to sector s and size class g, that firm j belongs to, is specified as:

$$JD_{S,t} = \frac{\Sigma_{j \in S^-}(|\Delta e_{j,t}|)}{\Sigma_{j \in S}(e_{j,t} + e_{j,t-1})/2} \tag{1}$$

where S^- represents the subset of firms within class S with $\Delta e_{j,t}<0$. In the same way job creation rate (JC) is defined as:

Firms from the service sector and semi-public sectors were included in all samples.

[3]This is due to the fact that the data were designed to study changes in wages and therefore only information from the wage administration of firms was obtained.

$$JC_{S,t} = \frac{\Sigma_{j \in S^+}(\Delta e_{j,t})}{\Sigma_{j \in S}(e_{j,t} + e_{j,t-1})/2} \tag{2}$$

where S^+ represents the subset of firms within class S with $\Delta e_{j,t}>0$. Furthermore, the job reallocation rate (JR) is defined as the sum of job creation rate and job destruction rate.

$$JR_{S,t} = JC_{S,t} + JD_{S,t} \tag{3}$$

Finally, the job separation rate (JS) and job accession rates (JA) are defined as a share of average employment.

$$JS_{S,t} = \frac{\Sigma_{j \in S} F_{j,t}}{\Sigma_{j \in S}(e_{j,t} + e_{j,t-1})/2} \tag{4}$$

$$JA_{S,t} = \frac{\Sigma_{j \in S} H_{j,t}}{\Sigma_{j \in S}(e_{j,t} + e_{j,t-1})/2} \tag{5}$$

where F is the number of workers that have left the firm in a particular period, and H denotes the number of workers that entered the firm in a particular period. Note that by definition it holds that:

$$JC_{S,t} - JD_{S,t} = JA_{S,t} - JS_{S,t} = \Delta e_{S,t} \tag{6}$$

Defined like this, the job destruction rate and the job creation rate use no information on real job flows, but are based on the net employment change at the employing unit.[4] Although these measures are used very frequently in the literature, they are imperfect and understate the true levels of gross job destruction and creation. Since individual jobs are not identified, some newly created and newly destroyed jobs may not show up as plant-level employment changes (Davis et al., 1996). For example, if a firm changes the composition of its workforce by replacing 6 administrative jobs by 6 management jobs, in reality 6 jobs are created and 6 jobs are destroyed. However, because the total number of jobs remains the same, by definition

[4]This is the standard definition of job flows in the literature which is chosen for practical reasons, because information about gross employment changes or worker flows is absent. See for example Davis and Haltiwanger (1990, 1992, 1999).

(1)-(5) no job destruction and job creation is measured. Hence, the measure for job destruction and creation provide a lower bound for true job flows. According to Burgess et al. (2000) this is a problem with employer-level datasets. In our dataset, this problem is partly solved by the fact that also information is available on worker flows. Worker flows provide an upper bound for true job flows, because every job destroyed requires at least one separation. Therefore, our matched worker-firm dataset provides both an upper and a lower bound on true job flows. That is, the measure of job destruction, equation (1), provides a lower bound for true job destruction, because an employment decline needs at least an equal amount of destroyed jobs. On the other hand, the separation rate, equation (4), provides an upper bound for true job destruction, because some workers leave positions that will be filled again with new workers. Similarly, the measure of job creation, equation (2), provides a lower bound for true job creation, because an increase in the workforce needs at least an equal amount of newly created jobs. On the other hand, the accession rate, equation (5), provides an upper bound for true job creation, because some new workers fill positions that become vacant, for example, because of quits. One of the issues we will investigate is to what extent the narrow definition of job flows (JD and JC) provides the same information on age-specific cyclical turnover as the broad definition (JS and JA).

3.3 Stylized facts

Table 2 shows some stylized facts concerning the dynamics in job and worker flows over the period 1993-2002. In the first column the net change in employment indicates the course of the business cycle. Job destruction seems to be a-cyclical, since it decreases during the upturn period 1995-1998, but it increases in the period thereafter, which was also a period of economic upturn. Furthermore, job creation dominates job destruction and therefore job reallocation is procyclical as well. Table 2 also shows that job separations and accessions are highly correlated over time. There are substantial sectoral differences in worker and job flows. Job destruction and job creation is much lower in manufacturing than in other sectors, which is in line with the findings of Davis and Haltiwanger (1999) and Blanchflower and Burgess (1996). Finally, the table shows that in small firms there is relatively more job mobility and worker

reallocation. This finding is consistent with Davis and Haltiwanger (1999), who find that job reallocation in the U.S. is decreasing with employer size. Broersma and Gautier (1997) using Dutch manufacturing data find that job reallocation is decreasing with firm size, but they add to that in small firms job reallocation takes place over the entire cycle, whereas in large firms job reallocation has a counter-cyclical pattern.

Preliminary evidence of firms exploiting business cycle fluctuations to change the age-structure of the workforce is presented in Figure 2. As shown the mean age of worker inflow is relatively constant over the cycle, whereas the mean age of worker inflow is lower in recessions than it is in business cycle upturns. This suggests that older workers may be used as reserve labor.

4 Empirical analysis

In this section the variability in job and worker turnover is estimated for different age groups. On the firm level, workforce adjustments over the business cycle are investigated to see whether firms exploit cyclical fluctuations to change the age-structure of the workforce. On the worker level, we focus on the determinants of workers' separations and accessions.

4.1 Job reallocation and labor mobility

Our baseline model explaining job and worker turnover is:

$$y_{s,g,t} = \alpha^y_{s,g} + \alpha^y_t + \beta^y \Delta e_{s,t} + \epsilon^y_{s,g,t} \tag{7}$$

where the dependent variables are job destruction rate ($y = JD$), job creation rate ($y = JC$), job reallocation rate ($y = JR$), separation rate ($y = JS$), and accession rate ($y = JA$) defined by sector (s), size class (g) and calendar year (t).[5] This approach enables us to follow groups of firms (based on sector and firm size) over time instead of individual firms. Hence, we create a

[5] A comparable approach is used in Gomez-Salvador et al. (2004). By definitions (1)-(5), all of the dependent variables are larger than or equal to zero. Our dataset has a few observations with value zero. As part of a sensitivity analysis, we also used the logarithm of one + the flow rates as dependent variables. This does not change our conclusions.

pseudo-panel. We estimate a fixed effects model where $\alpha^y_{s,g}$ refers to fixed effects for sector and firm size combinations, and α_t to year dummies; Δe concerns the employment growth rate, our cyclical indicator, and β represents the effect of the cycle. Note that the effect of the cycle is identified because employment changes are different across sectors. Finally, ϵ is the error term, which we assume to be i.i.d.

The parameter estimates of our baseline model are presented in the upper part of Table 3. As shown the effects of the cyclical indicator are according to expectations. If sectoral employment goes up there is less job destruction and more job creation. Because the effect of the cycle on job destruction is smaller than the effect of the cycle on job creation, job reallocation reacts positively to an upswing of the Dutch economy. Note that this result runs counter to the literature which states that turnover is concentrated in cyclical downturns. In accordance with the findings by Albaek and Sørensen (1998), we find that the worker accession rate increases in an economic upturn. The cyclical sensitivity of separations may be insignificant, because it consists out of layoffs, which behave countercyclical, and quits, which react procyclical. It seems to be that these two effects offset each other.

Table 3 also shows that that business cycle fluctuations have an effect on job destruction but not on separations. This is due to the fact that part of the separations concern quits, which are highly procyclical. Moreover, a firm can choose to destroy a job either by firing a worker or by deciding not to fill a job after a worker has quit. If the latter is chosen, there is no effect of job destruction on worker separations. Similarly, the business cycle does not equally affect job creation and accessions, since accessions arise not only because of newly created jobs but also because of jobs that have become vacant because a worker has quit. This implies that the use of only job destruction and job creation measures yields biased estimates of cyclical effects on worker turnover. By focussing only on the job destruction measure, one would overestimate the change in true job destruction caused by business cycle fluctuations, whereas using only the job creation measure will lead to underestimations of the effect on true job creation.

The lower part of Table 3 presents the results of some sensitivity analyzes. The effect of employment changes as presented in the upper part of the table may be influenced by the calendar time dummies. After all, these dummies might represent the evolution of aggregate

employment changes. The lower part of Table 3 shows that omitting the calendar time dummies does not have a big effect on most of the parameter estimates for the sectoral employment change. Furthermore, it is shown that if we include both aggregate employment changes and employment changes at the sectoral level the results are very similar. It appears that separations react only to aggregate employment changes, whereas accessions are affected by both aggregate and sectoral employment changes. This is due to changes in the number of quits. In a boom more workers quit, therefore accessions will have to increase more to compensate for the quits.

4.2 Age-specific job reallocation and labor mobility

Our main interest is in age-specific effects of job reallocation and worker mobility. We distinguish three age categories of workers: young (up to 29 years), prime-age (30 to 49 years), and old (50 years and older).[6] Figure 3 shows the observed differences between these age groups in terms of cyclical variation in job destruction and job creation. There is more job destruction among old workers, while there is much more job creation among young workers. To some extent, of course, this has to do with the outflow of workers from firms being related to retirement and inflow of workers to firms being related to job market entrants. Nevertheless, as shown in Figure 4 when it comes to accessions and separations there is much more dynamics in youth employment.

To estimate whether job turnover is different for workers of different ages, equation (7) is re-estimated. Now $y_{s,g,t,k}$ is the dependent variable, where k denotes the age group ($k = 1, 2, 3$). Note that for labor mobility $y_{s,g,t}$ is a weighted average of $y_{s,g,t,k}$ for the different age groups. This does not hold for job turnover.[7] The parameter estimates are shown in the upper part of Table 4. From this table we can draw a number of conclusions. Conditional on firm fixed effects (sector and firm size) and the business cycle, there are age-specific differences in job turnover

[6]The lower boundary of 29 is chosen to make sure also some high educated workers are included in the group of young workers. On the other hand, the upper boundary of 49 is chosen, since people in the Netherlands gradually become eligible for early retirement schemes as of the age of 50 years old.

[7]Note that $y_{s,g,t,k}$ uses more detailed information than $y_{s,g,t}$. Consider for example a firm replacing an old worker by a young worker. In the previous approach, the net employment change would be 0, therefore we would have no job creation and job destruction. However, in the age-specific approach, we identify a job destruction flow for old workers equal to 1 and a job creation flow for young workers equal to 1.

and worker turnover. Jobs for older workers are destroyed relatively more often. Note that this is not due to more employment stability among other age groups, but to more dynamics in employment among other age groups. That is, although there is also a large outflow of prime-age workers[8], the inflow of prime-age workers into firms is much higher than for older workers. Similarly, we find there is less job creation for old workers compared to prime-age workers. For young workers there is relatively more job creation than for prime-age workers. Both prime-age and young workers experience a lot of employment dynamics. However, the accession rate for young workers is much higher than for prime-age workers, whereas the separation rate differs only slightly. This means that more jobs are created for young workers than for prime-age workers. This also explains the absence of a difference between job destruction among young workers and among prime-age workers. The higher accession and separation rates imply that for most separating young workers another young worker is hired.

Again, it is obvious that information about the broad definition (worker flows) provides additional information to the narrow definition (job creation and job destruction) about true job flows. The narrow definition for example concludes that there is less job destruction for old workers, whereas the broad definition illustrates how the true number of jobs destroyed for old workers is brought about, i.e., not just by layoffs, but also by less accessions. Hence, by including broad definitions of job flows, more information is available on how jobs flows are originated.

To investigate the age-specific cyclical sensitivity of job flows in more detail we include interaction terms between the age groups and the sectoral employment change, which serves as an indicator for business cycle fluctuations in our estimation. Again we estimate a fixed effects model based on sector and firm size. The results are given in the middle part of Table 4. Old workers face less job destruction in business cycle upturns. This can be explained by elderly separations that decrease in upturns. The decrease in separations is larger than the decrease in job destruction. This can be due to the fact that older workers are less likely to retire in

[8]The reason that separations among older workers do not differ significantly from separations among prime-age workers may be the large variation in elderly separations. Dohmen and Pfann (2004) show that the separation probability among 50-54 year old workers is relatively low, but this is offset by the high separation probability for people older than 60.

upturns (Samorodov, 1999). Also for young workers job destruction decreases in upturns. This is because of more accessions. More vacant jobs are filled again instead of being destroyed. In economic upturns, more jobs are created for both young and prime-age workers. For both groups this can be explained by an increase in accessions. If the number of separating people remains the same, the only way for all the new hired workers to find a job is by job creation. Thus, cyclical adjustments of the workforce occur mainly through fluctuations in accessions for young and prime-age workers while for old workers they occur mainly through fluctuations in separations. Moreover, for old workers we find that accessions are negatively affected by business cycle upturns. This suggests that old workers are used as reserve labor. After a recession lots of young workers are willing to work when the economic situation improves, which reduces accession probabilities for old workers. Hence, the results imply that especially young and old workers are harmed by a recession, but young workers recover more quickly during economic upturn than old workers.

In the previous specification the calendar time dummies reflect *all* aggregate yearly economic changes. To identify the effect of the evolution of aggregate employment changes on job and worker flows, we estimated the fixed effects model again replacing the calendar time dummies for aggregate employment changes. The results are presented in the lower part of Table 4. Note that aggregate employment changes enter the model significantly. This suggests that part of the information in the calendar time dummies is correlated with aggregate employment changes. The general economic situation does not have an age-specific effect on job destruction. On the other hand, an aggregate economic improvement is especially beneficial for young workers via job creation and to a lesser extent for old workers. The positive effect of aggregate employment dynamics on separations for young and prime-age workers reflects a change in the number of quits. Note that older workers are less likely to quit, therefore we find a negative coefficient for sectoral employment change for old workers reflecting the cyclical sensitivity of layoffs. Finally, despite the fact that accessions increase for all age groups in an aggregate economic upturn, it is still young and prime-age workers who benefit the most from an economic upturn, since for these groups accessions also respond to sectoral employment growth. We conclude that firms exploit cyclical fluctuations to adjust the age-structure of their workforce. Once more, the use

of job destruction and creation measures alone appears to be too restrictive to capture the full picture of employment dynamics.

4.3 Job separation and accession rates by age

To study the age-specific differences in worker mobility in more detail we take a closer look at separations and accessions at the individual level. We specify logit models in which the probability of individual job separation or accession depends on individual characteristics, calendar time and cyclical effects, and fixed effects for sector and firm size combinations. The logit model for separations explains whether or not an individual leaves the firm between t-1 and t. So it concerns the behavior of *all* workers present in the firm at time t-1 and it is 'forward looking'. A logit model for accessions is somewhat unusual because it concerns what happened to individuals between t-1 and t for all workers present in the firm at time t and is 'backward looking'. Nevertheless, we estimate this model for reasons of symmetry. The estimated coefficients are shown in the upper panel of Table 5. It appears that tenure has a negative effect on the separation rate. This may be caused by the presence of specific human capital, which makes workers less likely to quit and less likely to be laid off. Probably, for the same reason we find that employment dynamics is lower for workers in high complex jobs compared to workers in low complex jobs. Next to that, job mobility rates are lower for workers with collective wage contracts.[9] Finally, Table 5 illustrates that age effects remain significant, even after controlling for important worker and job characteristics. As in the firm-level analysis, we find that the probability of a separation among young and old[10] workers is relatively high compared to prime-age workers, whereas the probability to enter a firm decreases with age.

The general cyclical sensitivity of separations and accessions is reflected in the year dummies. Apparently, the cyclical pattern of quits in separations dominates the cyclical pattern of layoffs, since the number of separations increases during upturns. Also, accessions react positively to business cycle upturns. Next to the general cyclical sensitivity, we also investigate age-

[9] Gomez-Salvador et al. (2004) argue that the lower separation probability for workers with CAO wage contracts is due to unions whose presence improve the worker-firm relationship, making job separation more costly.

[10] No significant effect in firm-level analysis.

specific cyclical sensitivity by including both employment changes on the firm level (Δe_i) and on the sectoral level (Δe_s). This enables us to disentangle internal and external cyclical effects. The results indicate that economic improvements outside the firm make young and prime-age workers more likely to separate because of an increase in quits caused by more job vacancies in other firms in the sector. For old workers the opposite holds, which might be due to the fact that older workers are less likely to quit. Moreover, in business cycle upturns old workers may be less forced to separate. On the other hand, cyclical changes within the firm affect all worker separations in the same direction, possibly by means of layoffs. For accessions we find that both cyclical improvements within and outside the firm increase the probability of entering a firm.

Just as in the firm-level analysis we are also interested in the effect of aggregate employment changes on worker flows. Hence, we estimated the logit models again replacing the calendar time dummies by aggregate employment changes. The results are shown in the lower panel of Table 5. The age-specific cyclical effects do not change much. For young and prime-age workers aggregate employment growth has a positive effect on separations due to more quits. For accessions we find that firm-specific and sectoral employment growth is beneficial for all age groups, whereas aggregate employment growth is only beneficial for young and prime-age workers. Older workers benefit especially from firm-specific or sectoral employment growth, because their specific human capital is valued more in jobs related to their previous job.

Since we would like to know which age groups are affected most by cyclical fluctuations, we predict the probability of separation and accession for the separate age groups in different stages of the economic cycle (Table 6). It appears that separations of young and prime-age workers increase by cyclical fluctuations outside the firm. Again, this is due to changes in quits. Note that quits react more to sectoral employment change than to aggregate employment change. This is due to the fact that specific human capital can be more easily transferred to a related job within the same sector. For old workers a negative effect of external cyclical change on separations is found, because old workers are less likely to quit. Hence, the effect of the cycle on layoffs dominates the effect on quits. Internal employment growth reduces separations for all age groups, possibly by means of layoffs, though the relative effect is largest for old workers.

Hence, Table 6 suggests that workforce adjustments by firms via worker outflow mainly affect old workers, since young and prime-age workers have a possibility to prevent layoffs by changing jobs. For accessions we find that both internal and external economic improvements increase the probability of accession. This increase is largest for young workers. Hence, just as in the firm-level analysis we find that young workers benefit most from cyclical upturns. Finally, note that the differences in accession probabilities over the cycle are larger than the changes in separation probabilities, which suggests that workforce adjustments occur especially via worker inflow and not so much via worker outflow.

5 Conclusions

The current paper investigates how firms adjust their workforce over the cycle. Our empirical analysis is based on matched worker-firm data for the Netherlands, collected over the period 1993-2002. Our dataset allows us to study employment dynamics in great detail. We use information about workers accessions and separations in addition to standard measures for job creation and job destruction. We find that combining the different indicators leads to more insight into the nature of the employment adjustment at the firm level and the relationship between employment adjustment and worker flows.

Our analysis focuses on age-specific differences in job turnover and in worker mobility across the cycle. We find that age plays an important role in the employment adjustment over the business cycle. At the firm level we find much more dynamics in youth employment than in employment for prime-age workers. Moreover, cyclical adjustments of the workforce occur mainly through fluctuations in job creation for young and prime-age workers while for old workers they occur mainly through fluctuations in job destruction. This suggests that rejuvenation of the workforce occurs mainly via worker inflow. From an analysis of worker flows we find that young workers are more likely to separate and to find a new job than old workers. For accessions we find that young and prime-age workers in general are more likely to find a new job during business cycle upturns, whereas old workers accessions only occur in jobs related to their previous career. Therefore, separations for old workers are more likely to be a one-way

street out of the labor force into long-term unemployment.

In general, the results suggest that workforce adjustments occur via worker inflow and not so much via worker outflow. Employment of young workers is relatively more volatile over the cycle. However, for young workers the job loss in recessions is less harmful, since they recover more quickly after a recession.

References

Albaek, K. and B. Sørensen (1998), Worker Flows and Job Flows in Danish Manufacturing, 1980-91, *Economic Journal*, 108, 1750-1771.

Arbeidsinspectie (2003), *Arbeidsvoorwaardenontwikkelingen in 2002 - Een onderzoek naar de ontwikkelingen in de bruto-uurlonen en extra uitkeringen*, Ministerie van Sociale Zaken en Werkgelegenheid, Den Haag.

Becker, S.G. (1964), *Human Capital*, Columbia University Press, New York.

Blanchard, O. J. and P. Diamond (1990), The Cyclical Behavior of the Gross Flows of U.S. Workers, *Brookings Paper on Economic Activity*, 2, 85-143.

Blanchflower, D.G. and S.M. Burgess (1996), Job Creation and Job Destruction in Great Britain in the 1980s, *Industrial and Labor Relations Review*, 50, 1, 17-38.

Boeri, T. (1996), Is Job Turnover Countercyclical?, *Journal of Labor Economics*, 14, 4, 603-625.

Broersma, L. and P. Gautier (1997), Job Creation and Job Destruction by Small Firms: An Empirical Investigation for the Dutch Manufacturing Sector, *Small Business Economics*, 9, 211-224.

Burgess, S., J. Lane and D. Stevens (2000), Job Flows, Worker Flows, and Churning, *Journal of Labor Economics*, 18, 473-502.

Caballero, R. J. and M. L. Hammour (1991), The Cleansing Effect of Recessions, *NBER Working Paper* Series, no 3922.

Davis, S. J. and J. Haltiwanger (1990), Gross Job Creation and Destruction: Microeconomic Evidence and Macroeconomic Implications, *NBER Macroeconomics Annual*, 5, 123-168.

Davis, S. J. and J. Haltiwanger (1992), Gross Job Creation, Gross Job Destruction, and Employment Reallocation, *Quarterly Journal of Economics*, 107, 3, 819-863.

Davis, S.J. and J. Haltiwanger (1999), Gross Job Flows, in O. Ashenfelter and D. Card (eds.) *Handbook of Labor Economics*, North-Holland, Amsterdam, 2711-2805.

Davis, S.J. and J. Haltiwanger and S. Schuh (1996), *Job Creation and Destruction*, MA: MIT Press, Cambridge.

Dohmen, T.J. and G.A. Pfann (2004), Worker Separations in a Nonstationary Corporate Environment, *European Economic Review*, 48, 645-663.

Gomez-Salvador, R., J. Messina, and G. Vallanti (2004), Gross Job Flows and Institutions in Europe, *Labour Economics*, 11, 469-485.

Hamermesh, D.S., W.H.J. Hassink and J.C. van Ours (1996), Job Turnover and Labor Turnover: A taxonomy of Employment Dynamics, *Annales D'Economie et de Statistique*, 41/42, 21-40.

Lazear, E. P. (1979), Why is there Mandatory Retirement?, *Journal of Political Economy*, 87, 1261-1264.

Lazear, E. P. (1981), Agency, Earnings Profiles, Productivity, and Hours Restrictions, *The American Economic Review*, 74, 4, 606-620.

Lazear, E. P. (1995), *Personnel Economics*, MA: MIT Press, Cambridge.

Organization for Economic Cooperation and Development (1990 and other years), *Employment Outlook*, OECD, Paris.

Organization for Economic Cooperation and Development (1995a), The Transition From Work to Retirement, *Social Policy Studies*, No. 16, OECD, Paris.

Samorodov, A. (1999), Ageing and Labor Markets for Older Workers, *Employment and Training Papers*, 33, International Labour Office, Geneva.

Appendix A. Description of variables

Outflow: Workers who left a firm because of pension or early retirement, disability or illness, their temporary contract ended, layoff, they reported to have found a new job or they became self-employed, or they were initially hired from a temporary employment agency. We do not observe movements between jobs within firms.

Inflow: Workers who enter a new firm coming from school or college, re-enter, another job, unemployment, or coming from a temporary employment agency. Again, we do not observe within firm labor flows.

Tenure: Measured in years (difference between date of starting the job and sampling date).

Wage contract: Three types of wage contracts can be distinguished. Most workers have a collective wage agreement (CAO) which is bargained over at the sectoral level. The minister of social affairs has the right to force all firms within a sector to pay the same collectively bargained wage (AVV). Finally there are workers who have a bilateral bargained wage contract, but they work in general at higher positions.

Part-time / full-time: Part-time workers work less than 100% of the regular number of hours.

Occupation: We distinguish the following occupations: (1) simple technical activities, (2) administrative, (3) computer, (4) commercial, (5) service orientated, (6) creative, (7) management.

Sector: Since the AVO data contain information on the public sector for only some years, we restricted our analysis to the private sector. We distinguish 7 sectors. (1) agriculture and fishing, (2) industry, (3) construction, (4) trade and hotel and catering industry, (5) transport, storage and communication, (6) financial services, (7) health care and other services.

Firm size: We have defined the following size classes. (1) $1-9$, (2) $10-19$, (3) $20-49$ (4) $50-99$, (5) $100-199$, (6) $200-499$, (7) ≥ 500 workers.

Age: We have defined the following age groups. (1) young: 29 or below, (2) prime-age: 30-49 years old, (3) old: 50 or above.

Education level: We have defined seven education levels: (1) primary, (2) junior general, (3) pre-vocational, (4) senior general, (5) senior vocational, (6) vocational colleges, and (7) university.

Job complexity level: In the data six job complexity levels have been constructed: (f1) Very simple repetitive activities which do not change over time. No schooling and only limited experience is required. These activities are subject to direct supervision; (f2) Simple general repetitive activities. Some (lower) administrative or technical knowledge and experience is needed. These activities are subject to direct supervision; (f3) Less simple activities that are not repetitive. Some knowledge on administration or technical issues is needed. The activities are partly under direct supervision; (f4) More difficult activities for which an intermediate level of education is needed. In most cases there is no direct supervision; (f5) Activities within a certain field that require a higher level of knowledge and experience. These activities are not under direct supervision; (f6) Managers of intermediate and large firms and activities of an analytical, creative or contact nature, which are undertaken independently and require a university or comparable level.

Table 1: AVO means of variables (%)

	93	94	95	96	97	98	99	00	01	02
Male	61.6	60.3	59.2	58.3	58.7	57.2	59.0	57.3	55.7	54.8
Wage contract*	72.9	77.3	77.9	78.0	72.3	78.6	79.8	77.5	75.8	87.5
Inflow	11.1	10.8	14.5	15.1	16.4	16.2	17.6	18.4	19.3	16.3
Outflow	11.5	10.1	12.2	11.3	12.4	13.2	15.4	15.8	16.5	15.4
Tenure (years)	8.0	7.8	7.1	7.5	6.8	7.1	7.0	6.4	6.2	6.4
Firm size										
$1-9$	82.6	83.8	84.2	84.6	82.9	83.0	83.7	83.4	83.3	81.5
$10-19$	8.1	7.5	7.6	7.5	8.2	8.3	7.8	7.7	7.7	8.6
$20-49$	5.7	5.3	4.9	4.9	5.4	5.2	5.3	5.5	5.6	6.1
$50-99$	1.9	1.8	1.9	1.6	1.8	1.8	1.7	1.8	1.8	1.9
$100-199$	0.9	0.8	0.7	0.7	0.9	0.8	0.8	0.8	0.7	0.9
$200-499$	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6
≥ 500	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
$\Delta e < 0$	19.5	18.6	17.1	17.4	16.5	18.7	20.1	20.3	21.2	22.3
$\Delta e = 0$	58.9	59.6	54.6	53.9	51.3	49.7	51.3	48.2	48.9	53.2
$\Delta e > 0$	21.6	21.8	28.3	28.8	32.2	31.7	28.6	31.5	29.9	24.5
Total number										
Workers	29,043	36,685	31,332	42,686	43,471	46,786	48,230	48,714	60,419	49,087
Firms	1830	1870	1671	1832	1853	1847	1864	1870	2654	1846

Note: individual records are weighted by individual firm weights, firm records are weighted by firm weights.
*Wage contract implies either CAO or AVV.

Table 2: Job reallocation and labor mobility (%)

	Δe	Job Destruction	Job Creation	Job Reallocation	Separations	Accessions
Calendar year						
1993	−0.3	4.1	3.8	7.9	13.6	13.3
1994	0.3	3.9	4.2	8.1	11.4	11.7
1995	1.6	4.4	6.0	10.4	14.1	15.7
1996	3.2	3.4	6.6	10.0	12.8	16.0
1997	3.5	3.2	6.7	9.9	13.6	17.1
1998	2.7	3.0	5.7	8.7	14.0	16.7
1999	2.2	4.0	6.1	10.1	17.5	19.6
2000	2.6	4.0	6.6	10.6	18.0	20.6
2001	2.3	4.3	6.6	10.9	18.3	20.6
2002	0.6	4.3	4.9	9.2	17.3	17.9
Sector						
Agriculture and fishing	2.5	6.0	8.5	14.5	16.6	19.1
Manufacturing	0.0	3.5	3.5	7.0	10.0	10.0
Construction	1.8	4.6	6.4	11.0	13.1	14.9
Trade, catering and hotel	2.4	4.8	7.2	12.0	19.1	21.5
Transport, storage	2.3	4.1	6.4	10.5	15.0	17.3
Financial services	3.1	4.3	7.4	11.7	19.2	22.3
Health and other services	2.1	2.5	4.5	7.0	14.3	16.3
Firm size						
$1-9$	1.1	8.8	9.9	18.7	19.2	20.3
$10-19$	4.6	4.8	9.4	14.2	16.8	21.4
$20-49$	4.0	3.6	7.6	11.2	14.9	18.9
$50-99$	1.9	2.8	4.7	7.5	13.4	15.3
$100-199$	2.0	2.4	4.4	6.8	13.8	15.8
$200-499$	1.0	2.2	3.2	5.4	13.6	14.6
≥ 500	1.0	1.7	2.7	4.4	14.1	15.1

Note: Firm-specific and worker-specific weights are used to obtain representative results for the Netherlands.

Table 3: Parameter estimates baseline model

	Job destruction (1)	Job creation (2)	Job reallocation (3)	Separations (4)	Accessions (5)
a. Baseline estimates					
Δe_s	−0.156 (0.057)**	0.415 (0.099)**	0.259 (0.111)*	−0.051 (0.103)	0.540 (0.121)**
Calendar year					
1994	−0.009 (0.008)	−0.001 (0.004)	−0.009 (0.009)	−0.017 (0.010)*	−0.010 (0.008)
1995	−0.008 (0.007)	0.013 (0.006)**	0.005 (0.009)	−0.002 (0.010)	0.018 (0.008)**
1996	−0.011 (0.009)	0.009 (0.006)	0.002 (0.011)	−0.003 (0.011)	0.017 (0.010)*
1997	−0.011 (0.008)	0.016 (0.007)**	0.005 (0.010)	0.010 (0.010)	0.035 (0.010)**
1998	−0.009 (0.008)	0.009 (0.006)	−0.000 (0.010)	0.017 (0.010)	0.033 (0.009)**
1999	−0.009 (0.009)	0.012 (0.0075)**	0.003 (0.012)	0.042 (0.013)**	0.062 (0.011)**
2000	0.056 (0.010)**	−0.059 (0.006)**	−0.003 (0.011)	0.079 (0.011)**	−0.146 (0.009)**
2001	0.009 (0.018)	0.016 (0.005)**	0.024 (0.019)	0.067 (0.019)**	0.074 (0.010)**
2002	−0.005 (0.008)	0.008 (0.005)*	0.003 (0.009)	0.030 (0.011)**	0.043 (0.008)**
$\overline{R}^2$	0.336	0.647	0.481	0.419	0.746
b. Sensitivity analysis; No year dummies					
Δe_s	−0.141 (0.053)**	0.435 (0.077)**	0.294 (0.085)**	0.117 (0.094)	0.595 (0.106)**
$\overline{R}^2$	0.221	0.428	0.467	0.248	0.273
c. Sensitivity analysis; No year dummies, separate Δe for sector and aggregate					
Δe_s	−0.141 (0.059)**	0.368 (0.103)**	0.227 (0.110)*	−0.053 (0.105)	0.385 (0.140)**
Δe_n	0.002 (0.277)	0.406 (0.221)*	0.408 (0.345)	1.034 (0.367)**	1.277 (0.341)**
$\overline{R}^2$	0.221	0.432	0.469	0.259	0.286

Note: The estimates are based on 473 observations; robust standard errors in parentheses, a **/* indicates that the coefficient is different from zero at a 5%/10% level of significance; each column represents a separate estimate; all analyzes include fixed effects for sector (7) and firm size combinations (7). The reference group year is 1993.

Table 4: Parameter estimates age-specific analysis

	Job destruction (1)	Job creation (2)	Job reallocation (3)	Separations (4)	Accessions (5)
a. Main age effects					
Young	0.002 (0.003)	0.106 (0.004)**	0.108 (0.005)**	0.095 (0.005)**	0.205 (0.005)**
Old	0.038 (0.004)**	−0.020 (0.002)**	0.018 (0.004)**	−0.006 (0.005)	−0.069 (0.003)**
Δe_s	−0.158 (0.054)**	0.388 (0.079)**	0.230 (0.092)**	−0.152 (0.098)	0.397 (0.085)**
$\overline{R}^2$	0.240	0.618	0.491	0.404	0.795
b. Interaction effects Δe_s and age					
Young	0.004 (0.004)	0.097 (0.004)**	0.101 (0.006)**	0.091 (0.006)**	0.191 (0.005)**
Old	0.039 (0.005)**	−0.015 (0.003)**	0.025 (0.006)**	0.003 (0.006)	−0.057 (0.003)**
Young * Δe_s	−0.195 (0.070)**	0.777 (0.134)**	0.583 (0.134)**	0.100 (0.160)	1.052 (0.151)**
Prime-age * Δe_s	−0.099 (0.063)	0.326 (0.107)**	0.227 (0.125)*	−0.074 (0.097)	0.352 (0.109)**
Old * Δe_s	−0.182 (0.102)*	0.045 (0.077)	−0.136 (0.122)	−0.498 (0.148)**	−0.239 (0.104)**
$\overline{R}^2$	0.241	0.629	0.498	0.409	0.806
c. Interaction effects Δe_s and Δe_n with age; no year dummies					
Young	0.009 (0.005)	0.085 (0.005)**	0.094 (0.007)**	0.092 (0.008)**	0.177 (0.008)**
Old	0.045 (0.006)**	−0.020 (0.004)**	0.025 (0.007)**	0.017 (0.007)**	−0.056 (0.005)**
Young * Δe_s	−0.186 (0.071)**	0.709 (0.151)**	0.523 (0.150)**	0.026 (0.182)	0.916 (0.176)**
Prime-age * Δe_s	−0.159 (0.091)*	0.434 (0.117)**	0.275 (0.151)*	−0.167 (0.121)	0.430 (0.121)**
Old * Δe_s	−0.156 (0.105)	0.069 (0.079)	−0.087 (0.124)	−0.368 (0.144)**	−0.132 (0.104)
Young * Δe_n	−0.178 (0.292)	1.401 (0.426)**	1.223 (0.476)**	1.416 (0.519)**	2.902 (0.562)**
Prime-age * Δe_n	0.291 (0.398)	0.191 (0.258)	0.483 (0.467)	1.546 (0.459)**	1.427 (0.342)**
Old * Δe_n	−0.286 (0.319)	0.787 (0.217)**	0.501 (0.396)	0.053 (0.409)	1.274 (0.294)**
$\overline{R}^2$	0.238	0.619	0.484	0.358	0.768

Note: The estimates are based on 1418 observations; robust standard errors in parentheses, a **/* indicates that the coefficient is different from zero at a 5%/10% level of significance; each column represents a separate estimate; as in Table 3 included in each estimate fixed effects for sector (7) and firm size (7) combinations (not presented), as well as year dummies in panel a and b.

Table 5: Parameter estimates job separation and accession logit estimation

	Separations (1)	Accessions (2)
a. Including both Δe_i, Δe_s, and year dummies		
Young	0.526 (0.036)**	1.258 (0.034)**
Old	0.507 (0.040)**	−1.169 (0.063)**
Cyclical sensitivity		
Young * Δe_i	−1.624 (0.248)**	2.627 (0.286)**
Prime-age * Δe_i	−1.936 (0.263)**	4.474 (0.180)**
Old * Δe_i	−2.706 (0.256)**	6.455 (0.542)**
Young * Δe_s	4.725 (0.909)**	2.835 (0.835)**
Prime-age * Δe_s	2.726 (0.825)**	2.274 (0.779)**
Old * Δe_s	−5.710 (1.413)**	1.593 (1.706)
Year		
1994	−0.183 (0.072)**	−0.212 (0.080)**
1995	0.029 (0.077)	0.063 (0.084)
1996	−0.071 (0.073)	0.051 (0.083)
1997	0.159 (0.079)**	0.193 (0.087)**
1998	0.190 (0.075)**	0.417 (0.085)**
1999	0.363 (0.074)**	0.600 (0.085)**
2000	0.417 (0.072)**	0.588 (0.081)**
2001	0.387 (0.069)**	0.581 (0.080)**
2002	0.192 (0.071)**	0.349 (0.080)**
Contract type		
CAO	−0.183 (0.031)**	−0.236 (0.032)**
AVV	−0.046 (0.056)	−0.054 (0.050)
Education level		
Primary	0.149 (0.059)**	−0.160 (0.060)**
Junior general	0.042 (0.046)	−0.254 (0.048)**
Pre-vocational	−0.032 (0.038)	−0.264 (0.040)**
Senior general	0.028 (0.050)	−0.010 (0.044)
Vocational college	0.099 (0.045)**	0.434 (0.043)**
University	0.291 (0.070)**	0.649 (0.069)**
Job complexity level		
f2	−0.145 (0.062)**	−0.280 (0.065)**
f3	−0.286 (0.060)**	−0.484 (0.064)**
f4	−0.424 (0.068)**	−0.953 (0.071)**
f5	−0.455 (0.081)**	−1.133 (0.084)**
f6	−0.647 (0.103)**	−1.182 (0.105)**

Continued on next page

Table 5 – Continued from previous page

	Separations (1)	Accessions (2)
Tenure	−0.048 (0.002)**	
Female	−0.081 (0.032)**	−0.161 (0.031)**
Part-time	0.158 (0.034)**	0.596 (0.032)**
Occupation		
Technical	−0.088 (0.035)**	−0.090 (0.035)**
Administrative	−0.016 (0.041)	−0.001 (0.038)
Computer	−0.142 (0.073)*	0.015 (0.068)
Commercial	0.148 (0.048)**	0.208 (0.045)**
Creative	0.005 (0.089)	0.065 (0.070)
Management	−0.068 (0.056)	−0.168 (0.053)**
Constant	−1.617 (0.124)**	−2.036 (0.130)**
b. Including both Δe_i, Δe_s, and Δe_n		
Young	0.490 (0.054)**	1.160 (0.052)**
Old	0.563 (0.063)**	−1.044 (0.093)**
Cyclical sensitivity		
Young * Δe_i	−1.655 (0.250)**	2.594 (0.286)**
Prime-age * Δe_i	−1.939 (0.265)**	4.472 (0.179)**
Old * Δe_i	−2.707 (0.257)**	6.460 (0.522)**
Young * Δe_s	5.395 (0.997)**	3.579 (0.883)**
Prime-age * Δe_s	3.275 (0.844)**	3.317 (0.790)**
Old * Δe_s	−4.432 (1.516)**	3.593 (1.740)**
Young * Δe_n	7.321 (3.090)**	12.995 (2.609)**
Prime-age * Δe_n	5.830 (2.058)**	6.019 (2.322)**
Old * Δe_n	3.181 (4.086)	−2.023 (5.765)
Constant	−1.540 (0.116)**	−1.884 (0.117)**

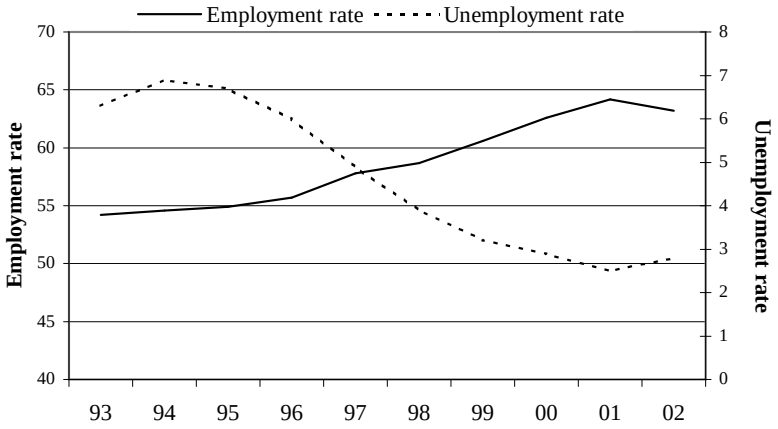
Note: The estimates are based on 270,771 observations; robust standard errors in parentheses, a **/* indicates that the coefficient is different from zero at a 5%/10% level of significance. Estimations include fixed effects for sector and firm size combinations. In panel a the reference group is prime-age, male, fulltime, no cao wage contract, senior vocational education level, job complexity level 1, occupation service oriented, year 1993. In panel b the reference group is the same; only estimates for the main age and interaction effects are presented.

Table 6: Predicted separation and accession probabilities

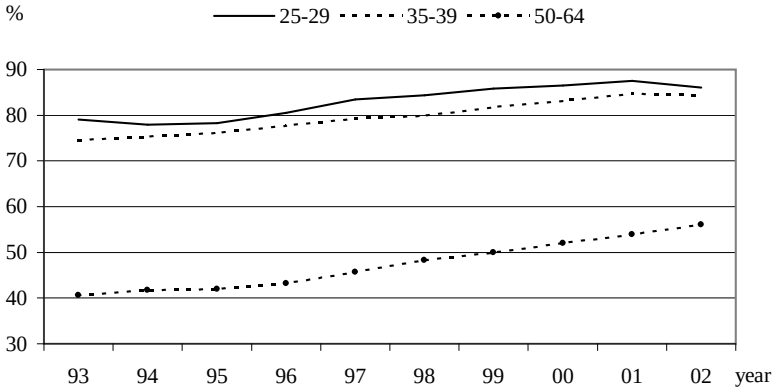
	Aggregate cyclical change			Sectoral cyclical change			Internal cyclical change		
	$\Delta e_n < 0$ (1)	$\Delta e_n > 0$ (2)	Diff. (3)	$\Delta e_s < 0$ (4)	$\Delta e_s > 0$ (5)	Diff. (6)	$\Delta e_i < 0$ (7)	$\Delta e_i > 0$ (8)	Diff. (9)
a. Separations									
Young	17.5	22.5	5.0	17.3	23.2	5.9	24.8	19.4	-5.4
Prime-age	9.1	11.0	1.9	9.2	11.4	2.2	12.3	9.6	-2.7
Old	11.8	11.1	-0.7	11.5	11.1	-0.4	13.0	9.5	-3.5
b. Accessions									
Young	23.1	32.1	9.0	23.7	32.9	9.2	22.3	35.1	12.8
Prime-age	8.5	11.7	3.2	8.5	12.3	3.8	6.5	14.7	8.2
Old	3.4	4.3	0.9	3.2	4.6	1.4	1.9	6.2	4.3

Note: Predictions represent average separation probabilities per group based on the parameters estimates presented in Table 5b.

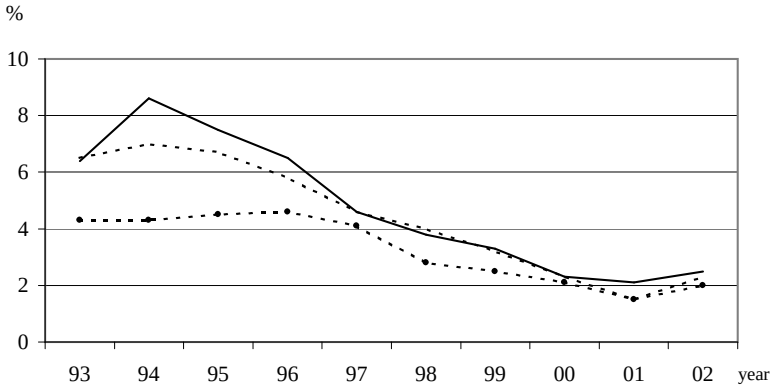
Figure 1: Employment rates and unemployment rates in the Netherlands; 1993 – 2002



(a) Aggregate employment and unemployment rates



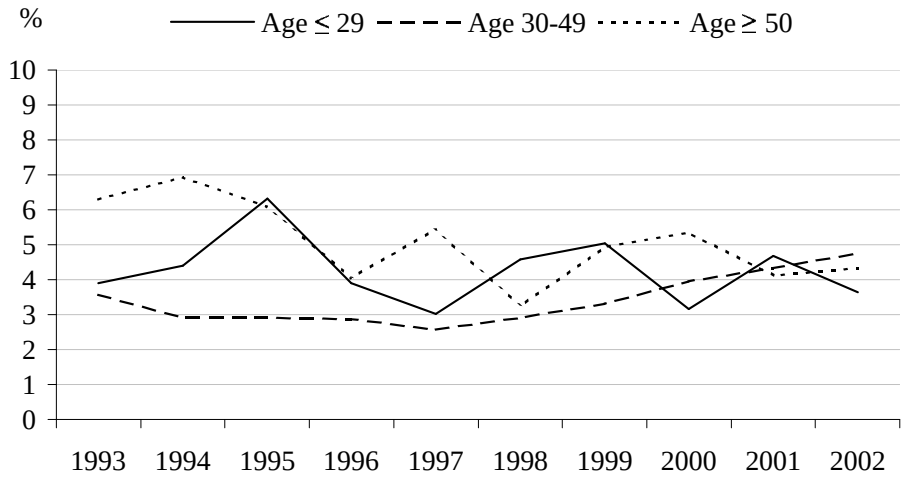
(b) Employment rates by age group



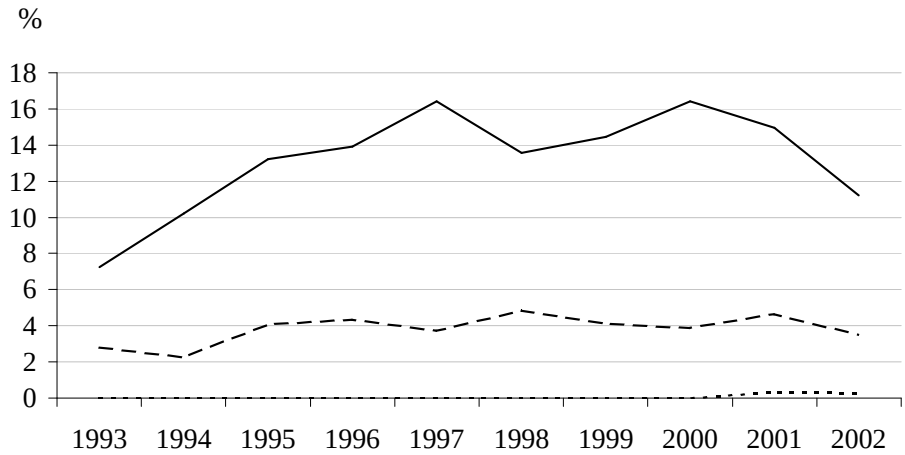
(c) Unemployment rates by age group

Figure 2: Mean age of worker flows; 1993 – 2002

Figure 3: Job reallocation rates by age group

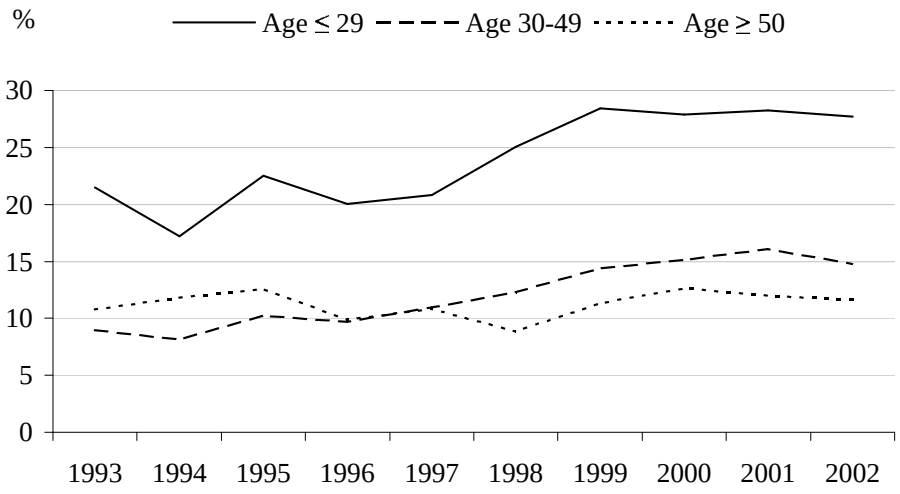


(a) Job destruction

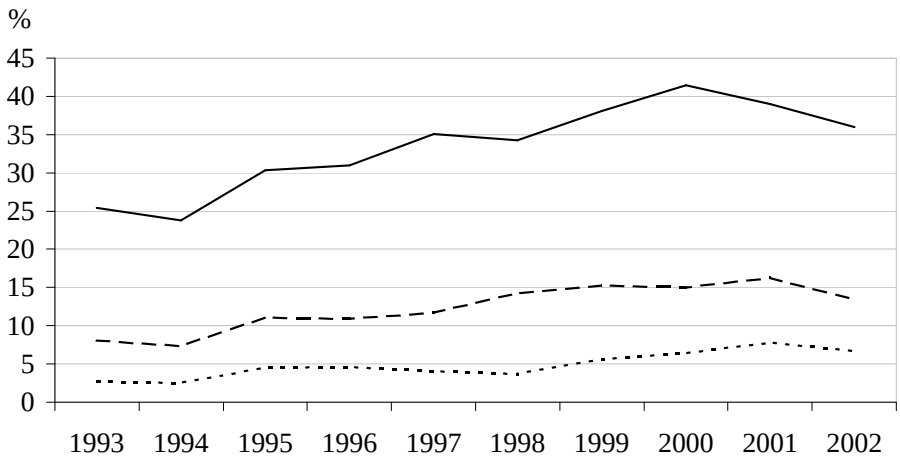


(b) Job creation

Figure 4: Labor mobility rates by age group



(a) Separations



(b) Accessions