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# WAGE EFFECTS OF UNEMPLOYMENT DURATION AND FREQUENCY*

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**ABSTRACT.** This paper analyzes the wage effects of unemployment duration and frequency for different regional labor market situations in The Netherlands using a simultaneous equations approach. The main finding is that unemployment duration has a significant negative effect and the frequency of unemployment a significant positive effect on wages in the core regions with relatively low unemployment rates. In the periphery with relatively high unemployment rates no significant effects of unemployment duration and frequency are found. It is argued that in the core regions unemployment duration is primarily viewed as a personal indicator of low productivity whereas in the periphery it is attributed to the situation in the regional labor market.

## 1. INTRODUCTION

Unemployment duration is an intensively studied issue in the labor economics literature. A central topic of research is optimal search theory. It states that the unemployed will continue searching (and hence prolong unemployment duration) until a job offer is received in which the corresponding wage exceeds the reservation wage (see, among others, Mortensen, 1986; Lippman and McCall, 1976). A related strand of research has focused on the effects of unemployment duration on (re)entry into employment. A basic result is that prolongation of the spell of unemployment leads to a deterioration of the (re)entry probability (see, among others, Nickell, 1979; Lancaster, 1979; Lancaster and Nickell, 1980).

In the present paper, we analyze the effect of an individual's unemployment history on the wage level taking into account differences in the situation at the regional labor market. The components of an individual's unemployment history that we consider are the duration of unemployment defined as the total number of months an individual has been unemployed during a given period and the

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frequency of unemployment, that is, the number of times an individual has become unemployed during a given interval.

Two opposing wage effects of duration are distinguished. On one hand, longer spells of unemployment may lead to higher future wages because of longer search periods and hence higher probabilities of receiving relatively high wage offers. On the other hand, unemployment duration could have a negative effect because employers may be inclined to perceive unemployment duration as a negative personal labor market characteristic and hence of lower productivity. Moreover, if the unemployed are aware of this association made by employers they will be stimulated to reduce the length of the spell of unemployment and, inter alia, lower their reservation wages.

In addition to the effect on job search, unemployment duration is likely to have a negative impact on wages for the following reasons. First, becoming unemployed means an interruption of the institutionally-based growth pattern of an individual wage and of the investment process in human capital, i.e., on-the-job-training. Second, being unemployed and living on unemployment benefits is often associated with a decrease in social status. Therefore, the unemployed are likely to lower their reservation wages at a rate positively related to the duration of unemployment which further strengthens the negative duration effect.[1]

Empirical studies show contradictory results with regard to the relation between unemployment duration and wage. Addison and Portugal (1989) showed that in the U.S. unemployment duration has a negative effect on the future wage. In a comparable study, Houle and Audenrode (1995) found no evidence of such a negative effect, and concluded that there is probably no relationship between unemployment duration and wages in Canada. They argued that because Canada and the U.S. are very similar with respect to the labor market, the differences found between both countries must be caused by small differences in the institutional setups.

The previous arguments with regard to the negative wage effects may also be valid for the frequency of unemployment. However, it is possible that a high unemployment frequency goes with intensive job search, which would imply a positive effect (see Devine and Kiefer, 1991, and the references therein). The nature of unemployment in these two cases is likely to fundamentally differ. In the latter quits or relatively short spells of unemployment will dominate whereas in the former layoffs and relatively long spells of unemployment will prevail.

When individuals are laid off and start searching, their reservation wage will initially be set approximately equal to the last wage. Moreover, the reservation wage will not be lowered during the first few months after the layoff because of the initial slight deterioration of reentry probabilities into employment.

[1]It should be observed that a lower bound of the reservation wage is likely to exist which is given by the prevailing unemployment benefits or social benefits.

However, when the spell of unemployment extends, negative "duration effects" may begin. Furthermore, being frequently unemployed may in itself have a depressing effect on the reservation wage. A high frequency of unemployment incidence may also be viewed by employers as an indicator of low productivity and, consequently, make them inclined to offer low paid jobs only. However only the positive effect is expected to hold in the case of voluntary quits. The reason is that voluntary quits are highly unlikely unless the individual is fairly certain to get a new job on favorable conditions. Hence, there is no ground to lower the reservation wage.[2]

In addition to an individual's unemployment history, the wage level may be affected by the regional unemployment rate as it reflects excess supply of labor. Moreover, the effect of an individual's unemployment history on the wage level may differ between regions with high and low unemployment levels.[3] In regions with low unemployment rates an individual's unemployment history (in particular its duration) may be viewed primarily as an unfavorable labor market characteristic whereas in regions with high unemployment rates it may be associated with unfavorable characteristics of the regional labor market instead of with lower productivity of an individual. Hence, in the former regions individual unemployment duration would have a negative wage effect, whereas in the latter it would be insignificant. The same is true for the frequency of unemployment provided that its general negative wage effect, as outlined above, holds. The foregoing is in line with Howland and Peterson (1988) who found that in expanding regional labor markets the wage losses for white collar workers who became unemployed were smaller than in contracting or stagnating labor markets.[4]

If the negative relationship between unemployment duration and frequency on the one hand and wages on the other holds, (re)employment policies, in particular the prevention of long spells of unemployment, may have welfare effects in prevention of loss of earnings. Another policy impact follows from the possible differences in effects of personal unemployment under high and low regional unemployment rates. In regions with high rates job-generating policies would be adequate whereas in regions with low unemployment rates employment policy should primarily consist of schooling, training and retraining, and retirement programs (see Folmer, 1986).[5]

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[2]In the Dutch context, voluntary employment interruptions should be viewed as vacation rather than speculative job search because such quits hardly occur in the Netherlands unless a new job has already been obtained (Van Dijk et al., 1989). The positive wage effect is even more likely to hold in this situation. In the survey underlying the case study, employment interruptions of the present kind are registered as spells of unemployment.

[3]In addition to the regional unemployment rate, many other regional characteristics may have influences on the wage level. For an overview of the literature on interregional wage differentials see Dickie and Gerking (1989).

[4]Note that wage losses for older, blue-collar, poorly education, high tenure workers are large regardless of the labor labor market situation.

[5]Job generating policies could undermine the equilibrating effects of migration. This is particularly relevant when certain regions face excess demand for labor and others face excess

From the discussion above it follows that the wage effects of unemployment duration and frequency are far from unambiguous. Therefore, empirical results are needed to provide further evidence. This is the main objective of this paper. The organization is as follows. In Section 2 we describe the wage equation and discuss some econometric problems in Section 3. We present a case study relating to the Netherlands in Section 4. Finally, we present our conclusion in Section 5.

## 2. THE WAGE EQUATION

Starting points for the derivation of the wage equation are the basic earnings function (Mincer, 1974) and the segmented earnings function (Mincer and Polachek, 1974; Borjas, 1981; Holmlund, 1984). The idea underlying these earnings functions is that, given job and personal characteristics, earnings capacity depends on the amount of and the returns to human capital accumulated within and outside the current job, as well as search activities. The basic earnings equation reads as

$$(1) \quad Y = f[(+)EDUC,(+)TEN,(-)TEN^2,(+)PEXP,(-)PEXP^2,(-)TEN\times PEXP,(+)\mathbf{SEAR}]$$

where $Y$ is the natural logarithm of the wage level $W$, *EDUC* denotes the level of formal education, *TEN* labor market experience on the current job, *PEXP* labor market experience prior to the current job, and **SEAR** stands for a vector of variables which determine job search.[6] The expected sign of each variable is given in parentheses. A brief description of the variables that need further explanation follows.

Wages are expected to increase with the level of education because individuals with a higher level of education have higher productivity rates and are better equipped for job search, ceteris paribus. The variable previous experience is usually defined as the difference between total number of years of work-experience and work-experience on the current job. The total number of years of work-experience is not known so previous experience is approximated using age minus tenure minus 15 (the age at which full-time compulsory education ends in the Netherlands) in the empirical application.

As indicated by the vector **SEAR**, job search is made up of several components. A first is formed by education and previous experience. This implies there is both a direct and an indirect effect (via job search) of these variables on the wage level. The indirect effects are expected to have the same signs as the direct effects. In particular, education and previous experience are likely to have positive effects because they make an individual more equipped and also more motivated for search. Moreover, the sign of $PEXP^2$ as an indicator of job search is assumed to hold because when certain age thresholds have been passed

supply within the same occupational group. Under such circumstances migration stimulating policies such as dissemination of information about job openings are more important.

[6]For operational definitions and further information about the variables used in the case study see Appendix 1.

motivation and equipment tend to decline. Motivation is also likely to decline with $TEN^2$.

A second set of variables that affects an individual's job search behavior is made up of the frequency (*FUNEM*) and duration (*DUNEM*) of unemployment. Two opposing effects of duration of unemployment can be expected. As argued in the introduction, the effects of these variables are ambiguous. The number of job changes (*JOBCH*) is another indicator of job search. A positive wage effect is even more likely to hold for this variable than for the frequency of unemployment because of the absence of possible discouragement and prevention strategies. However, job change may also take place on the basis of nonwage motives, for instance, to avoid possible future unemployment. Under such circumstances a non-positive effect may show.[7]

The last aspect of job search is inter-local search. Holmlund (1984) showed that returns to inter-local job search are higher than to local search. In contrast, Björklund and Holmlund (1989) concluded that there is no significant evidence that geographical mobility involves substantial wage gains in addition to those obtained by changing employer. Dickie and Gerking (1987) reported a negative effect on wages for those who moved in the U.S. However, in the U.S. a substantial proportion of migration is speculative (i.e., migration without a job at the new destination) whereas in most European countries, including the Netherlands, it is almost exclusively contracted (with a job at the new residence). The higher incidence of speculative migration may be the reason for the negative effect for the U.S.[8] Although this result implies that migration in the U.S. is not very profitable, a recent study by Van Dijk, Folmer, Herzog, and Schlottmann (1998) showed that for those who found a job after migration wages increase in both the U.S. and the Netherlands. The variable available in the data set is a dummy variable (*MIGR*) which represents whether migration was necessary to acquire the current job. The expected sign is positive but may be insignificant when combined with other job search variables.

Human capital theory (on which Equation (1) is based) begins with the assumption that various personal and job characteristics are given. This means that these characteristics have to be operationalized and included in the wage equation to avoid specification error (i.e., biased estimates due to the omission of relevant explanatory variables).

[7]Björklund and Holmlund (1989) included a job-change variable in a model similar to the one used here, they did not find a significant effect. However, when they took into account whether the job change was initiated by the employee (quit) or by the employer (layoff) they found a positive effect for those who quit and a negative impact for those who were laid off. They also estimated a model with wage growth as the dependent variable and found a positive wage effect for those who had changed jobs.

[8]The following studies are in line with these findings and provide some further support. Van Dijk et al. (1989) found a positive effect of migration on (re)entry into employment for the unemployed in the Netherlands whereas no significant effect could be discerned for the U.S. Bailey (1994) found for the U.S. that young adults who migrated while unemployed had longer durations of unemployment than those who did not migrate.

Important personal variables are sex and marital status. As argued by among others Mincer and Polachek (1974), women expect to spend less time in the labor force and consequently, have weaker incentives to engage in human capital investment. Therefore, the earnings profiles will be steeper for males than for females so that search effects and job opportunities will systematically differ by gender. Thus, pooling of males and females is inappropriate. The empirical model will be estimated for males only because of the small number of females in the sample (in particular unemployed females).

Employers value family membership as an indicator of stability and reliability which tends to lead to higher wages (Van Dijk and Folmer, 1985, and the references therein). Therefore, the dummy variable *SINGLE* is included in the model and takes on the value one for singles.

In addition to personal characteristics, job characteristics are relevant because wages for individuals with similar personal characteristics may vary according to the kind of job they have. First, occupation and position should be taken into account. In the case study the following occupational groups are distinguished: blue-collar workers (*BLUE*), white-collar workers (*WHCOL*), and professional workers (*PROF*). The former are expected to have the lowest wages, the latter the highest wages, and the white-collar workers are expected to take an intermediate position. Furthermore, supervisors will have higher wages because they have more responsibilities. It is also likely that a permanent job will pay better than a temporary one. To take into account the effects of supervision and a temporary job the data set allows for inclusion of the variables *SUPER* (number of people supervised) and *TEMP* (temporary jobs) into the model. The dummy variable TEMP takes the value one for individuals who have a temporary job.

Wages also differ substantially over sectors. First, working conditions usually vary by sector and are reflected in the wage level. Second, sectoral wage differences may be the result of bargaining between employers and employees (or their unions). Well-organized employees will probably obtain higher wages due to the 'insider effect' (see, among others, Summers and Blanchard, 1990, p. 240). The insider effect refers to the fact that wages are set by bargaining between employed workers ('insiders') and firms, with neither the employed population of other sectors nor the unemployed ('outsiders') playing a role in this bargaining process. Third, Lucifora (1990) showed that sectoral wage differentials are also due to variables such as employment composition by gender and skill, capital intensity, degree of competition in product markets, financial performance, and firm size. For instance, large firms with a high capital-labor ratio, making high profits, and showing a solid financial structure tend to pay relatively high wages. Finally, Arai (1990) provided additional evidence for sectoral wage differentials. Large firms having a relatively large share of employees with high education pay wages above the workers' opportunity costs to increase average worker effort and save on monitoring costs. For similar reasons high wages are paid to avoid the costs of hiring and training new

employees. The sectoral aspect is taken into account by distinguishing the public and banking sectors relative to all other sectors, consisting primarily of industry.[9] The dummy variables *PUBLIC* and *BANK* take the value one for individuals working in the public and banking sector, respectively.

The last characteristic to be taken into account is regional differences. In the literature two opposing viewpoints with respect to interregional wage differentials are evident.[10] One view states that genuine interregional differentials exist, which implies that the rates of return to, for instance, education and work-experience differ geographically. The explanation is that the supply of various categories of workers differs by region. The alternate view is that regional wage differentials exist only at an aggregate level, and disappear when a wage equation is specified that includes a proper set of personal and job characteristics and also corrects for differences in costs of living. This implies that interregional differences in average wage result primarily from aggregating heterogeneous types of labor.[11] As mentioned in the introduction, regional differences in the supply of labor may also lead to differences in the perception of an individual's personal unemployment history. From this discussion it follows that regional characteristics should be taken into account in the model. Regional differences will be handled by distinguishing between the core region with relatively low unemployment and the peripheral region with relatively high unemployment.[12]

## 3. ECONOMETRIC PROBLEMS

The existence of genuine regional effects will be tested by dividing the sample into subsamples for the core and the periphery and estimating a wage equation for each subsample. Comparison of the equations provides information about the existence of regional differences in wage effects for all variables. In particular, it allows for testing of the hypothesis that personal unemployment history has different wage effects in regions with high and low unemployment rates.

On the basis of the preceding and adding a disturbance term $\varepsilon$, we arrive at the following wage equation for the periphery and the core

[9]Initially, more sectors were distinguished. However, only the present distinction is significant.

[10]For an overview of the literature see Dickie and Gerking (1989).

[11]Dickie and Gerking (1989) stress the importance of including job characteristics and sectoral differences in a wage equation. They show that if these variables are taken into account no regional wage differentials can be found, whereas in a specification in which these variables are omitted significant regional wage differentials are evident.

[12]The core region consists of the provinces Noord-Holland, Zuid-Holland, and Utrecht located in the central part of the country with the four big cities. The remaining eight provinces are labeled the periphery. We also tried a more detailed regional subdivision consisting of the eleven provinces. However, this resulted in hardly significant coefficients because of the relatively small number of observations in each province. The signs and magnitudes of the coefficients clearly indicated the importance of distinguishing between core regions on the one hand and the peripheral regions on the other.

$$Y = f\,[(+)EDUC,(+)TEN,(-)TEN^2,(+)PEXP,(-)PEXP^2,(-)TEN{\times}PEXP,(-)SINGLE,$$
$$(+)MIGR,(+)SUPER,(-)TEMP,(+)WHCOL,(+)PROF,$$
$$(+)BANK,(+)PUBLIC,(+)JOBCH,(\pm)FUNEM,(\pm)DUNEM,\varepsilon]$$

Straightforward estimation of this equation is not possible for two econometric reasons. First, there is the problem of sample selection bias. This kind of bias is possible in the present study because the sample contains individuals who were unemployed at the date of the interview. The unemployed must be dropped from the sample on which the wage equation is estimated because they do not earn a wage. As shown by Heckman (1976, 1979), straightforward estimation of a relationship (i.e., the wage equation) without correcting for the deletion of observations confounds the parameters of interest with parameters of the function specifying the probability of being in the sample.

The problem of sample selection bias will be handled by application of the procedure advocated by Heckman (1979). In the present situation it comes down to probit estimation of an employment model for each of the two subsamples outlined above including both the employed and the unemployed. The probit model gives the probability of being employed (and hence of earning a wage) at the date of the interview. From this model the inverse of Mill's ratio ($\lambda$) is estimated. Finally, the estimated inverse of Mill's ratio is used as a regressor in the wage equation estimated on a subsample consisting of the individuals who were employed at the date of the interview and hence earn a wage.

The use of the estimated Mill's ratio introduces a stochastic regressor into the likelihood function. Therefore, because the usual procedure for estimating standard errors understates the true standard errors the standard errors must be corrected for the imprecision introduced. The correct asymptotic variance-covariance matrix is given by Heckman (1979). In the case where the null hypothesis of no selection bias holds the usual standard errors are appropriate. This hypothesis can be tested by means of the *t*-distribution (Heckman, 1979).

The second econometric problem is simultaneity bias with respect to the variables *FUNEM* and *DUNEM*. This follows from job search theory according to which search and voluntary unemployment terminate when a wage offer that exceeds the reservation wage is received. From previous discussion it follows that another variable for which endogeneity may be relevant is *JOBCH*. Therefore is also tested. The other explanatory variables are assumed to be exogenous.

Endogeneity is tested using the Hausman test (Hausman, 1978). This involves regressing *DUNEM*, *FUNEM*, and *JOBCH* on the exogenous variables in the system and obtaining the predicted variables $\widehat{DUNEM}$, $\widehat{FUNEM}$, and $\widehat{JOBCH}$. Next the expanded wage equation with the observed and predicted variables is estimated and the hypothesis that the coefficients of the predicted variables are zero is tested by standard methods. Rejection of the hypothesis of zero coefficients of the predicted variables implies rejection of the hypothesis of exogeneity. If the exogeneity of a subset of the above

mentioned variables is rejected on the basis of this test simultaneous-equations methods will be applied.

## 4. DUTCH CASE STUDY

### *The Data*

The data analyzed are from the OSA-Survey, 1985. This survey was conducted in April 1985 to provide insight into the characteristics of the (potential) labor force in The Netherlands. A total of 4,020 persons aged between 16 and 60, excluding students and military servants, were interviewed. The data set contains detailed information about personal labor market features, net wages, hours worked, and (un)employment history. Information about all changes from one job to another and to or from (un)employment during the period January 1980 to April 1985 was gathered using retrospective questioning.[13]

For the present study we selected the male individuals who were in the labor force (employed plus unemployed) during this period. The cases with incomplete information about the variables needed for the present study were deleted.[14] The resulting sample contains 1,310 cases (724 in the periphery and 586 in the core region). The subsample of individuals who were employed in April 1985 and hence earned a wage, consists of 1,204 cases (648 in the periphery and 556 in the core region). Additional information about the variables and summary statistics for the core and periphery is detailed in Appendix 1.

The dependent variable in the wage equation was taken to be the natural logarithm of the net hourly wage in April 1985, defined as the weekly earnings (excluding overtime payments, bonuses, etc.) after taxes divided by the number of hours worked per week.[15] An advantage of the net wage is that it adequately reflects the returns to work as perceived by the worker. A disadvantage is that

[13]For detailed information about the OSA-survey see Vissers, de Vries, and Schepens (1986). Of particular importance is that Vissers, de Vries, and Shepens (1986, p.5) reported that the unemployed in the sample are representative for the population of unemployed. It should be observed that ability of the people to recall information later has been questioned frequently. Blossfeld and Rohwer (1995, p. 17–18) reported that this is particularly problematic for retrospective, nonfactual questions concerning motivational, attitudinal, cognitive or affective states. Research on the accuracy of factual, retrospective data shows that, among others, an individual's employment history can be collected to a reasonable degree of accuracy. For the present data the period for which retrospective information was obtained was only five years ago. Therefore, the information about unemployment spells may be assumed to be remembered fairly accurately, although the number of very short spells of unemployed may be underestimated slightly (Vissers, 1986, p. 11).

[14]The total number of males in the sample who were employed or unemployed in January 1980 and April 1985 was 1432. A total of 122 cases were deleted from the sample, mainly because during 1980–1985 they were not in the labor force for a certain period of time because of full-time education, military service, or voluntarily withdrawal. A small number of cases were deleted because they reported incomplete information on the level of education, working hours, wage, or tenure.

[15]As in many other empirical studies (see Devine and Kiefer, 1991) the logarithm of the wage was used because this functional form was found to be superior to other specifications. It is also used in the basic earnings function (see Section 2).

the net wage not only reflects the returns to work, but also the tax regime. For instance, two persons earning the same gross wage may have a significantly different net wage if for example one of them owns a house with a mortgage on which the interest is tax deductible and the other has no tax deductions. Furthermore, taxes are higher when a partner also has income from labor. However, because the data set contains only net wage information no other wage variable could be used.

The dependent variable is the nominal wage because prices and taxes usually do not vary systematically over space in the Netherlands.[16] Therefore, there are few compensating differentials in real wages across the regions in which individuals reside.[17] An additional reason for the absence of compensating differentials in real wages is that 70 percent of the wages are the result of nationwide collective bargaining at the sectoral level (see Van Dijk, Folmer, Herzog, and Schlottmann, 1998, and the references therein).[18] Major exceptions are executive positions in the private sector.

As mentioned at the end of Section 2, regional differences will be handled by distinguishing between core and peripheral regions. The core regions are characterized by economic growth above the national average and relatively low unemployment rates. The reverse holds for the periphery. The unemployment rate in the peripheral regions is about 4 percentage-points higher than in the core regions. Approximately half of the respondents live in the peripheral areas. The fraction of workers ever unemployed is 9 percent of the total sample. As mentioned before (footnote 14) this sample is representative of the unemployed population in the Netherlands.

It is particularly important that the sample is appropriate with regard to the variation in unemployment duration. From Appendix 1 it follows that the duration of unemployment varies from 0 to 64 months and the frequency of unemployment between 0 and 4 times. The mean frequency and mean duration of unemployment are about twice as high in the periphery as in the core. This creates sufficient variation to make the data set appropriate for analyzing the wage effects of unemployment duration and frequency, for further detail see Vissers (1986, p.5).[19]

Only minor differences exist between the two regions for the remaining variables. The educational level, the average number of people supervised, the share of singles, and the proportion of individuals working in the banking sector

[16]There is some evidence that housing cost are slightly lower in the periphery.

[17]In situations of a very tight labor market for certain jobs employers may pay wages above the centrally negotiated level.

[18]This implies that migration in the Netherlands is induced by 'genuine' labor market characteristics such as job openings and promotions.

[19]Another possible problem is that *FUNEM* and *DUNEM* may be strongly correlated when measured over a relatively short period of time. However, this does not apply to the present study because the period under consideration is quite long: January 1980–April 1985. For those individuals with positive values for *FUNEM* and *DUNEM* the correlation coefficients are 0.30 and .24 for the periphery and core, respectively.

are somewhat higher in the core regions, whereas the proportions of temporary jobs and migrants are somewhat higher in the periphery. Thus, there exist no major differences between the core regions and the periphery with respect to the other explanatory variables with some minor exceptions. Hence, the risk that possible differences will show up between the core and periphery that are attributable to the unequal distribution of the other explanatory variables is minimal.

*Empirical Results*

The econometric results were obtained using the PC-version of the statistical package LIMDEP, Version 6.[20] The starting point of the analysis was the estimation of the employment probit models for the core and the periphery. The results are given and discussed in Appendix 2. Next the inverse Mill's ratios obtained from the probit models were included in the wage equations. Moreover, the wage equations were expanded by predicted values of *DUNEM*, *FUNEM*, and *JOBCH* (in addition to the observed values) to test for simultaneity bias.[21] The wage equations were estimated by OLS. The Hausman test indicated endogeneity for *DUNEM* and *FUNEM* in both cases. The hypothesis of exogeneity was not rejected for *JOBCH*. Next the wage equations with the predicted variables $\widehat{FUNEM}$ and $\widehat{DUNEM}$ instead of the observed variables were estimated. The results are given in Table 1.

The overall goodness-of-fit statistics (adjusted $R^2$ and log-likelihood) indicate a reasonable overall performance of the model.[22] In each case the variables *TEN*, $TEN^2$, *PEXP*, $PEXP^2$, and $TEN \times PEXP$ have the expected signs. Wages increase with years of tenure and experience. However, the effects of these two variables are nonlinear and not completely additive, as indicated by the negative signs of the coefficients for the quadratic terms and the interaction terms. The results are in line with numerous empirical studies (for example, Devine and Kiefer, 1991). For both the core and the periphery turning points for *TEN* vary with previous experience and are for all values *PEXP* are higher than the retirement age of 65. For *PEXP* the turning point for the periphery is 57 year and for the core 37. These results conform with the Dutch practice of rapidly increasing wages in the early stages of a career and continued increases until retirement-age, though at a lower rate.

[20]For details about LIMDEP see Greene (1992).

[21]The predicted values for *DUNEM*, *FUNEM*, and *JOBCH* were obtained using Tobit models. All the exogenous variables in the system were used as explanatory variables. The estimation results for the Tobit models are available upon request.

[22]Wage equations seldom have adjusted $R^2$s larger than 0.5 (cf. Devine and Kiefer, 1991). The adjusted $R^2$ would increase if a subset of explanatory variables with $t$-values less than 1 in absolute value was dropped. We present the equations in the present form, including variables with insignificant coefficients, because this shows explicitly which variables are not relevant in the present wage equations.

TABLE 1: Wage Equations for the Periphery and the Core

| Variable | Periphery Coefficient | Periphery t-ratio | Core Coefficient | Core t-ratio |
|---|---|---|---|---|
| *CONSTANT* | 1.72 | 19.92 | 2.10 | 26.22 |
| *TENU* | 0.04 | 5.52 | 0.01 | 1.65 |
| $TEN^2$ | –0.61 | –4.21 | –0.08 | –0.52 |
| *PEXP* | 0.04 | 5.24 | 0.01 | 2.23 |
| $PEXP^2$ | –0.55 | –3.99 | –0.19 | –1.50 |
| *TENPEXP* | –1.05 | –4.49 | –0.33 | –1.49 |
| *EDUC2* | 0.14 | 3.27 | 0.04 | 0.99 |
| *EDUC3* | 0.10 | 3.36 | 0.05 | 1.56 |
| *EDUC4* | 0.25 | 6.58 | 0.18 | 4.35 |
| *EDUC5* | 0.18 | 3.04 | 0.36 | 6.57 |
| *SINGLE* | –0.01 | –0.20 | –0.08 | –2.26 |
| *SUPER* | 0.04 | 5.54 | 0.04 | 5.58 |
| *TEMP* | –0.08 | –2.07 | –0.03 | –0.60 |
| *BANK* | 0.11 | 3.14 | 0.07 | 2.05 |
| *PUBLIC* | 0.05 | 2.20 | 0.02 | 0.83 |
| *WHCOL* | 0.11 | 4.55 | 0.09 | 3.48 |
| *PROF* | 0.13 | 4.87 | 0.19 | 7.47 |
| *MIGR* | 0.04 | 1.80 | 0.04 | 1.70 |
| *JOBCH* | 0.06 | 2.78 | 0.02 | 0.82 |
| $\widehat{FUNEM}$ | 0.03 | 0.34 | 0.40 | 2.64 |
| $\widehat{DUNEM}$ | 0.02 | 0.94 | –0.03 | –2.50 |
| *MILL* | –0.45 | –1.21 | 0.33 | 1.68 |
| Observations | 648 | | 556 | |
| $R^2$ | 0.44 | | 0.47 | |
| Adjusted $R^2$ | 0.42 | | 0.45 | |
| Log-likelihood | 52.42 | | 66.90 | |

The signs of the estimated coefficients for education are also in accordance with theoretical expectations and the results obtained in other empirical studies (e.g., Devine and Kiefer, 1991). The results for the occupational groups *WHCOL* and *PROF* and for the job characteristics *SUPER* and *TEMP* are also as expected. Professional workers obtain the highest wages and the wage level of white-collar workers is significantly higher than that of blue-collar workers. Individuals with supervisory responsibilities obtain higher wages than those with no such responsibility and a temporary job results in a lower wage than a permanent job. There is also evidence for the existence of sectoral wage differences. The salaries paid by the (semi)public sector are relatively high. The highest salaries are paid in the Banking, Insurance, and Commercial Services sector.

The coefficient of the variable *MIGR* indicates that individuals who had to move to obtain their current job receive higher wages. The positive effect, which is in line with the results of Holmlund (1984), implies that migrants receive compensation for the costs of moving and searching in other regions. The variable *JOBCH* is positive and significant in the periphery but not in the core.

The estimated coefficients of $\widehat{FUNEM}$ are positive in both cases. However, only in the core is it significant. Hence, there is support for the hypothesis that frequent unemployment incidence goes together with intensive job search activity and potential negative effects do not occur to such an extent that they outweigh the positive effects. The estimated coefficient of $\widehat{DUNEM}$ is insignificant for the periphery, and negative and significant in the core. Hence, in the latter case the negative connotation dominates the effect of longer search periods. An increase of one month in the duration of unemployment leads to a wage decrease of 3 percent. From the results for $\widehat{FUNEM}$ and $\widehat{DUNEM}$ in the core region it follows that the positive effect of one extra incidence of unemployment is offset by the negative duration effect if the unemployment spell exceeds 13 months. This finding is in line with results found in other studies that the probability of reemployment decreases sharply after one year of unemployment: employers use unemployment duration of one year or more as a negative screening device.

Not only do $\widehat{FUNEM}$ and $\widehat{DUNEM}$ differ between the core and the periphery but so do most other variables. With the exception of marital status and duration and frequency of unemployment all variables are significant.[23] In the core only the personal characteristics—tenure, previous experience, higher education, marital status, migration and duration and frequency of unemployment—are significant. This also holds for the job characteristics except for temporary jobs and jobs in the public sector. A possible explanation is that an individual's unemployment history is a substitute for the insignificant personal characteristics. This is in line with the finding that employers may use an individual's unemployment history as a screening device. Moreover, with the exception of the constant, *EDUC5*, *SINGLE*, and *PROF*, the coefficients for the periphery are substantially higher than for the core. However, the differences are negligible for *SUPER* and *MIGR*. A possible explanation is the difference in relative unemployment rates. In the periphery the unemployment rate is about 4 percentage-points higher than in the core region. The relative scarcity in the core leads to a higher constant and makes personal labor market characteristics less important. The reverse holds for the periphery where employers can be more selective with respect to wages. A possible reason that the coefficients of the highest level of education and, to a lesser extent, of professionals are higher in the core is the strong concentration of corresponding jobs where the vast majority of universities, research institutes, and corporate headquarters are located. This concentration induces contracted migration from the periphery to the core. A possible explanation for the fact that in the periphery the coefficient for *EDUC5* is somewhat lower than *EDUC4* is that the scarcity of commensurate job openings, means that some academics compete with individuals with polytechnic or lower education instead of migrating to the core.

[23]Two sided test: $\alpha = 10$ percent.

## 5. SUMMARY AND CONCLUSIONS

In this paper we analyze the wage effects of unemployment duration and frequency. As discussed in the introduction, no unambiguous wage effects of these variables can be derived from theoretical or empirical analyses. We also argue that the wage effects of unemployment duration and frequency may differ along with the regional unemployment rate. In regions with low rates, personal unemployment may be viewed primarily as a personal characteristic, whereas in regions with high unemployment rates it may be associated with characteristics of the regional labor market instead of with personal productivity. The empirical analysis of Dutch microdata for 1985 supports this hypothesis. For Dutch males unemployment duration has a significant negative effect on wages in the core regions with relatively low unemployment rates and an insignificant effect in the periphery. The frequency effect is only significant in the core, where it is positive.

In the introduction we mentioned that other empirical studies at the country level for Canada and the U.S. suggest that the ambiguous results regarding the relationship between unemployment duration and wages must be caused by small differences in the institutional setups, like unemployment benefits. This study brings new interesting information to the debate from the regional level. The results show that for regions within one country which have an identical institutional setup, the relation between unemployment duration and wages are not uniform. The variations are caused by differences in recruiting and search behavior which are related to the situation at the regional labor market rather than to institutional differences. However, more work is needed in this area to unravel the origins of the differences in wages related to previous unemployment.

An important policy conclusion that follows from this analysis is that preventing long spells of unemployment in regions with relatively low unemployment rates will prevent loss of earnings. (Re)training and early retirement programs would be appropriate policy measures in such regions. In fact this has been common practice in the Netherlands since the late 1980s.

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## APPENDIX 1: THE DATA SET

The data set analyzed in this study is based upon the OSA-Survey 1985. It consists of a total of 4,020 cases. Individual cases that meet one or several of the following criteria during the period January 1980–April 1985 were deleted from the original sample:

out of the labor force;
in the military service;
attending a daily education;
unknown age;
self-employed;
female.

The size of the sample analyzed is 1,310. A total of 106 individuals were unemployed in April 1985, these cases were used only in the employment models. For the wage equation 1,204 observations were used.

### A1. DEFINITION OF THE VARIABLES

*Dependent variables in the wage equation and the employment model*

| | |
|---|---|
| ln (*INCHR*) | Net income per hour in Dutch guilders |
| *EM* | 0: unemployed in April 1985<br>1: employed in April 1985 |

*Independent variables*

| | |
|---|---|
| *TEN* | Tenure; defined as number of years with the same employer |
| $TEN^2$ | Square of *TEN*/1000 |
| *PEXP* | Previous experience; defined as *AGE-TEN*-15 |
| $PEXP^2$ | Square of *PEXP*/1000 |
| *TEN*×*PEXP* | Interaction of tenure and previous experience defined as (*TEN* × *PEXP*)/1000 |
| *EDUC* | Educational levels,<br>*EDUC1*: Basic education, reference category<br>*EDUC2*: Lower medium education<br>*EDUC3*: Higher medium education<br>*EDUC4*: Higher education (polytechnic)<br>*EDUC5*: Higher education (university) |
| *MIGR* | 0: Did not migrate to obtain current job<br>1: Migrated to obtain current job |
| *SINGLE* | 1: Single<br>0: Family member |
| *SUPER* | Supervision<br>0: No supervision |

| | |
|---|---|
| | 1 - 5: Supervising groups of persons |
| *TEMP* | 0: Permanent job<br>1: Temporary job |
| *OCCUPATION*: | Occupational group<br>*BLUE*: Blue-collar workers<br>*WHCOL*: White-collar workers<br>*PROF*: Professional workers |
| *SECTORS* | Sector classification based on SBI (Standaard Bedrijfsindeling, Standard Firm Classification) used by the Dutch Central Bureau of Statistics. (Note that these are not exactly comparable with the Standard Industrial Classifications (SIC).<br>*BANK*: Banking, insurance, commercial services (SBI 8)<br>*PUBLIC*: Other services, mainly (semi-)public (SBI 9) all other sectors; reference category |
| *JOBCH* | Number of job-to-job changes between January 1980 and April 1985 |
| *AGE* | Age at April 1985 |
| $AGE^2$ | Square of AGE/1000 |
| *DUNEM* | Total duration of unemployment in months between January 1980 and April 1985 |
| *FUNEM* | Number of times unemployed between January 1980 and April 1985 |

## APPENDIX 2: THE EMPLOYMENT MODEL

The employment equation estimated in this paper describes the probability of being employed at the date of the interview. The sample is made up of individuals who have been unemployed and of individuals who have continuously been employed. The explanatory variables usually included in models of this type are as follows (cf. Van Dijk and Folmer, 1985, and the references therein). First, unemployment benefits and maximum duration of benefits. For the present study these variables are not available. Instead, the variable duration of unemployment (*DUNEM*) is used as a proxy. This can be justified because the involuntary unemployed are entitled to benefits that are a fraction of their former wage. The benefits remain at almost the same level during the first two-and-half years of unemployment. After that the unemployed are permanently entitled to minimum subsistence benefits. Unemployed individuals who have not previously been employed and those who quit voluntarily are also entitled to minimum subsistence benefits. Furthermore, unemployment duration is an important labor market characteristic that influences the probability of being in the labor force. Second, education, age, sex, marital status, and situation at the regional labor market are standard explanatory variables in an employment model. The probability of obtaining a job has been found to increase with the level of education. Regarding age, it has been shown that young individuals have better chances to find a job because they have the most

up-to-date formal schooling, are more flexible, and have a relatively long payback period on investment in on-the-job-training for the employer. However, employers may be less inclined to hire very young people, because of their rather uncertain productivity level and the risk that they may leave after only a short period (job hopping). Empirical results for the Netherlands are ambiguous. Van Dijk and Folmer (1985) found that age had a negative effect on the probability of obtaining a job, whereas in another case Boin and Van Dijk (1992) found no significant effect. In order to take account of possible nonlinearity the variables *AGE* and $AGE^2$ are included in the model. Marital status is an important explanatory variable because singles often have lower probabilities of getting a job because employers value family membership as an indicator of reliability and stability. The regional labor market situation is taken into account by estimating separate models for the core and the periphery. In summary, the employment model by region reads as follows

$$EM = \mathrm{h}\,[(+)EDUC, (-)SINGLE, (+)AGE, (-)AGE^2, (-)DUNEM, \varepsilon_2]$$

where *EM* denotes the probability of being employed in April 1985. The other variables are defined in Appendix 1.

The estimation results are given in Table B1. The fraction correctly predicted that is used as a goodness-of-fit statistic is high for both the periphery and the core. For both regions marital status and duration of unemployment are the only significant variables. Omission of the insignificant variables changed the goodness-of-fit statistic and the Mill's ratio only marginally and had hardly any effect on the coefficients of the wage equation.

TABLE A1: Summary Statistics Periphery and Core

| | Periphery (724 cases) | | | | Core (586 cases) | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | Mean | Std.Dev. | Min | Max | Mean | Std.Dev. | Min | Max |
| *TENU* | 11.75 | 9.79 | 0 | 59 | 11.87 | 8.97 | 0 | 57 |
| $TEN^2$ | 0.23 | 0.35 | 0 | 3 | 0.22 | 0.33 | 0 | 3 |
| *PEXP* | 12.46 | 9.51 | 0 | 45 | 12.80 | 9.31 | 0 | 44 |
| $PEXP^2$ | 0.24 | 0.33 | 0 | 2 | 0.25 | 0.32 | 0 | 2 |
| *TENPEXP* | 0.10 | 0.12 | 0 | 1 | 0.11 | 0.13 | 0 | 1 |
| *EDUC2* | 0.22 | 0.41 | 0 | 1 | 0.18 | 0.38 | 0 | 1 |
| *EDUC3* | 0.42 | 0.49 | 0 | 1 | 0.41 | 0.49 | 0 | 1 |
| *EDUC4* | 0.17 | 0.38 | 0 | 1 | 0.22 | 0.41 | 0 | 1 |
| *EDUC5* | 0.03 | 0.18 | 0 | 1 | 0.05 | 0.23 | 0 | 1 |
| *SINGLE* | 0.11 | 0.32 | 0 | 1 | 0.12 | 0.32 | 0 | 1 |
| *SUPER* | 0.76 | 1.30 | 0 | 5 | 0.92 | 1.38 | 0 | 5 |
| *TEMP* | 0.17 | 0.37 | 0 | 1 | 0.09 | 0.29 | 0 | 1 |
| *BANK* | 0.06 | 0.25 | 0 | 1 | 0.09 | 0.29 | 0 | 1 |
| *PUBLIC* | 0.35 | 0.47 | 0 | 1 | 0.35 | 0.47 | 0 | 1 |
| *WHCOL* | 0.20 | 0.40 | 0 | 1 | 0.23 | 0.42 | 0 | 1 |
| *PROF* | 0.24 | 0.42 | 0 | 1 | 0.29 | 0.45 | 0 | 1 |
| *MIGR* | 0.21 | 0.41 | 0 | 1 | 0.20 | 0.40 | 0 | 1 |
| *JOBCH* | 0.22 | 0.52 | 0 | 5 | 0.22 | 0.51 | 0 | 4 |
| *AGE* | 39.21 | 9.89 | 18 | 63 | 39.67 | 9.69 | 18 | 63 |
| $AGE^2$ | 1.64 | 0.81 | 0 | 4 | 1.66 | 0.81 | 0 | 4 |
| *FUNEM* | 0.23 | 0.59 | 0 | 4 | 0.10 | 0.35 | 0 | 3 |
| *DUNEM* | 4.48 | 12.88 | 0 | 63 | 1.95 | 8.45 | 0 | 63 |
| *EM* | 0.89 | 0.30 | 0 | 1 | 0.94 | 0.22 | 0 | 1 |
| *INCHR* | 13.34 | 4.26 | 2 | 41 | 13.80 | 4.50 | 4 | 41 |

TABLE B1: Employment Model for Males in the Periphery and the Core

| | Periphery | | Core | |
|---|---|---|---|---|
| Variable | Coefficient | t-ratio | Coefficient | t-ratio |
| *CONSTANT* | 4.38 | 2.74 | 8.07 | 2.76 |
| *EDUC2* | –0.48 | –1.59 | –0.46 | –1.16 |
| *EDUC3* | –0.08 | –0.28 | 0.01 | 0.04 |
| *EDUC4* | –0.06 | –0.11 | 4.55 | 0.11 |
| *EDUC5* | 2.74 | 0.07 | 0.55 | 0.69 |
| *AGE* | –0.01 | –1.17 | –0.25 | –1.83 |
| $AGE^2$ | 0.94 | 0.97 | 2.48 | 1.61 |
| *SINGLE* | –0.78 | –3.28 | –1.04 | –3.12 |
| *DUNEM* | –0.07 | –11.46 | –0.01 | 7.15 |
| Observations | 724 | | 586 | |
| Log-likelihood | –110 | | –51 | |
| Fraction Correctly Predicted | 94.3% | | 96.8% | |