

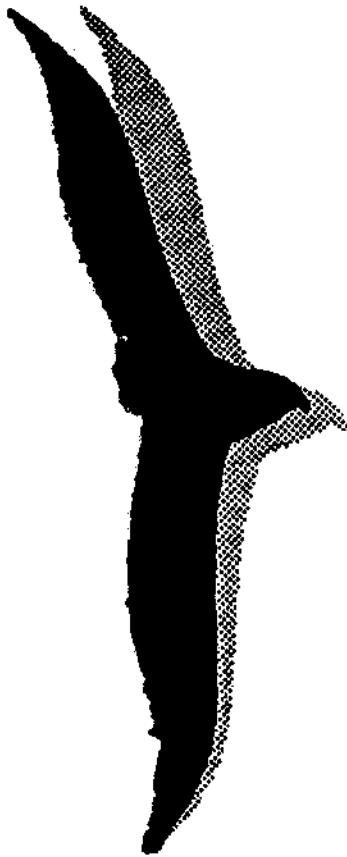
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Job Competition by Educational Level

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JOB COMPETITION
BY EDUCATIONAL LEVEL

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ABSTRACT

During the cyclical downturn of the 1980's unemployment in the Netherlands increased substantially, with unemployment rates of lower educated worker increasing more than those of higher educated workers. A possible explanation of this phenomenon is job competition between workers with different levels of education. Another explanation of the diverging unemployment rates, is that employers dismiss replaceable lower educated workers before irreplaceable higher educated workers. In this paper we scrutinize the job competition explanation. Our results show that there only is job competition between unemployed workers with an academic and a higher vocational education. There is no job competition at lower levels of education.



Keywords: Job competition, matching function, unemployment, vacancies
JEL classifications: J63, J64, C13

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1. INTRODUCTION

During the cyclical downturn of the 1980's unemployment in the Netherlands increased substantially, with unemployment rates of lower educated worker increasing more than those of higher educated workers (see figure 1). A possible explanation of this phenomenon is job competition between workers with different levels of education. If employment decreases lower educated workers compete for scarce jobs with higher educated workers. This competition may be caused by employers, who raise their hiring standards in periods of high unemployment (Okun (1981)), but even if hiring standards are constant over the cycle higher educated workers may be in the front of the job queues for scarce jobs (Thurow (1975)). In both cases, higher educated workers will take the jobs previously occupied by lower educated workers.

In this paper we scrutinize the crowding out explanation of the negative relationship between unemployment and the level of education. We estimate the degree of job competition by analyzing matching by educational level for the Dutch labour market of the 1980's. We estimate matching functions to investigate whether workers with a higher level of education competed successfully for jobs at a lower level of education. Our results show that there is only job competition between workers with an academic and a higher vocational education, while there is no job competition at lower levels of education.

This does not answer the question why unemployment rates diverge during a cyclical downturn (and as figure 1 shows, converge again during an upturn). Although this question can not be answered satisfactorily in the present article, we shall point at some evidence that during a downturn employers dismiss workers by educational level. If workers with a higher level of education perform specialized tasks, that require specific skills, then employers will hang on to such irreplaceable workers during a downturn. On the other hand, lower educated workers may be easier to replace, so that the burden of adjustment is shifted to them.

The policy implications of the job competition versus the differential dismissal explanation of the relation between unemployment and level of education are rather different. If job competition is important, then schooling is ineffective and only leads to a redistribution of unemployment. If employers hang on to better educated workers, then schooling may reduce the difference in the unemployment rates, and thereby decrease the total unemployment rate.

The paper is organized as follows. In section 2 we discuss the phenomenon of job competition. Section 3 presents a model of job competition by educational level. We hypothesize that the choice of a worker to search for a job at a lower educational level depends on the wage and the expected duration of unemployment at both educational levels. Section 4 discusses the data that we use in the analysis and gives the estimation results. Section 5 concludes.

2. JOB COMPETITION

As has been noted many times before, lower educated workers have higher unemployment rates than higher educated workers, and the difference increases in periods of high unemployment.

One explanation of this phenomenon is job competition between unemployed workers with different levels of education. Job competition occurs if employers prefer higher educated over lower educated workers for jobs that were previously occupied by lower educated workers. A necessary condition for this is, that employers can choose between workers, i.e. that there is a pool of applicants for a job. In Van Ours and Ridder (1992) we show that employers select a suitable candidate from such a pool of applicants. Although this is the normal search strategy used by employers in filling vacancies, efficiency wage arguments (e.g. Yellen (1984)) that imply that employers pay wages above the market clearing level, have been used to argue that job queues exist and do not lead to a downward adjustment of wages.

If unemployment increases and, as a consequence job queues lengthen, employers may react by increasing the hiring standards, i.e. the required level of education. As argued by Okun (1981), this may be an attractive strategy for employers who find it difficult to lower wages in times of high unemployment. Using the data that are discussed in section 4, we have computed the average required level of education of new job vacancies during the 1980's. The results in figure 2 show that for the 4 occupational categories there is no evidence that the required educational level (measured in years of schooling) has increased with the level of unemployment. A simple regression of the average required educational level in occupation category j in year t , $E_{j,t}$, on the unemployment rate, $U_{j,t}$, a set of occupational dummy's (technical is the reference group), and a time trend confirms this (t-values):

$$E_{j,t} = 11.6 - 0.47 U_{j,t} + 1.57 d_{\text{medical}} + 0.89 d_{\text{clerical}} - 0.49 d_{\text{soc-cult}} + 0.03 t$$

(26.2) (1.5) (3.3) (2.5) (1.6) (0.8)

in which: E = average educational level of new vacancies
 U = unemployment
 d = dummy for occupational category
 j = occupational category
 t = time

If there has been job competition, it was not caused by education requirements that increased with the level of unemployment.

Even if the required level of education does not change over the cycle, longer job queues for scarce jobs may put lower educated workers at a disadvantage. This viewpoint has been strongly argued by Thurow (1975). According to Thurow the traditional wage competition labour market model is incorrect. In this model wages are flexible and therefore competition between workers eventually clears the labour market. In Thurow's view wages are fixed by collective bargaining. Productivity is a characteristic of jobs, not of individual workers. Education per se does not raise productivity but it is a sign of trainability. Potential workers are ranked in a queue according to their relative trainability for the available jobs. If, in times of recession, unemployment increases and the job queue lengthens, the workers at the back of the queue are not hired. Thus lower educated

workers are hit the hardest by a recession.

For an explanation of the relative increase of the unemployment rate of lower educated workers during a cyclical downturn we do not need an appeal to some form of job competition. A competing explanation starts from the well-documented difference in adjustment costs, when employing skilled or unskilled workers (see e.g. Nickell (1986), section 2; in a recent study Pfann and Palm (1990) find that the adjustment costs are 50% larger for white-collar workers). Because skill and the required level of education are highly correlated, we expect that the direct and indirect, i.e. due to lost investment in the employee, adjustment costs increase sharply with the educational level. As a consequence, the adjustment of the employment of higher educated workers will be much slower than that of lower educated workers. Hence, during a cyclical downturn lower educated workers will be dismissed before higher educated workers, and this order will result in a relatively high unemployment rate of lower educated workers.

Note that differential adjustment costs and job competition both explain the relatively high unemployment rate of lower educated workers. However in the job competition theory the cause is a decline in the share of lower educated workers in the flow of new hires, while in the differential adjustment cost explanation the cause is an increase in the share of lower educated workers in the layoffs. To distinguish empirically between both explanations we require information on the composition of the flows of new hires and layoffs.

In a recent study Teulings and Koopmanschap (1989) have related the change in the distribution of employment over educational levels for a number of labour markets distinguished by occupation and region to the change in the unemployment rate at the various levels of education in regional labour markets. As the change in the employment share of a particular level of education in a particular submarket is approximately proportional to the change in the relative unemployment rate at the relevant level in that submarket, the positive association that is found by Teulings and Koopmanschap is a confirmation of the divergence of the unemployment rates by educational level as documented in figure 1. Teulings and Koopmanschap consider this positive correlation as evidence for job competition. We have argued that the same correlation can be explained by differential adjustment costs, and information on gross flows into and out of employment (from and to unemployment, respectively) is needed to distinguish between the hypotheses. In section 4 we estimate the effect of an increase in unemployment at a particular level of education on the flow of new hires at a lower level of education. This gives a direct estimate of the degree of job competition.

3. MATCHING UNEMPLOYMENT AND VACANCIES AND JOB COMPETITION

Job competition between workers of different educational levels may occur if it is profitable for an unemployed worker to search for a job at a lower level of education.

Let us consider an unemployed worker with educational level i , who has to decide to search for a job of either educational level i or educational level $i-1$. We assume that if he searches for a job at level i he is part of the pool of unemployed workers who search for a job at level i . The wage for a job at educational level i is W_i and the search duration is T_i . If he searches for a job at level $i-1$ he is part of the pool of unemployed workers searching for jobs at level $i-1$, with wage W_{i-1} ($W_{i-1} < W_i$) and a search duration of T_{i-1} . The unemployed worker receives unemployment benefits at rate B . Furthermore we assume that accepted jobs last forever. Note that this assumption implies that there are no employed job seekers. The discounted value of search for a job at level i given is equal to:

$$\int_0^{T_i} B e^{-rt} dt + T_i \int_0^{\infty} W_i e^{-rt} dt \quad [1]$$

which we can write as

$$B/r + [(W_i - B)/r] e^{-rT_i} \quad [2]$$

Assuming that the duration of search is exponentially distributed with hazard rate θ_i , the value of search at level i is

$$VS_i = B/r + (W_i - B) \cdot \theta_i / [r \cdot (r + \theta_i)] \quad [3]$$

In the same way we can derive the value of search at level $i-1$

$$VS_{i-1} = B/r + (W_{i-1} - B) \cdot \theta_{i-1} / [r \cdot (r + \theta_{i-1})] \quad [4]$$

An unemployed worker at level i is indifferent between searching at level i or searching at level $i-1$ if $VS_i = VS_{i-1}$. Using [3] and [4] this means that this worker is indifferent if

$$\theta_i / \theta_{i-1} = (W_{i-1} - B) / [(W_i - B) + (W_i - W_{i-1}) \cdot \theta_{i-1} / r] \quad [5]$$

In [5] the ratio of the search hazards is equal to the ratio of the return from employment at level $i-1$ and the sum of the return from employment at level i and the capitalized expected yield of searching at level i rather than at level $i-1$.

Note that since $W_{i-1} < W_i$, equation [5] states that in an equilibrium with search at level $i-1$ $\theta_i < \theta_{i-1}$. So an equilibrium situation with search at level $i-1$ by unemployed workers at level i requires the search duration at level i to be longer than the search duration at level $i-1$. Furthermore it follows that the larger the wage differential between the educational levels, the larger the difference between the search durations must be.

The search duration at the different educational levels is influenced by the decision to search at a lower level. The search duration of an individual worker at level i will depend on both the number of unemployed workers that search at that level and on the number of vacancies at that level: the more unemployed workers search at level i , the longer the expected search duration for an individual worker, and the more vacancies at level i the shorter the expected search duration for an individual worker.

The search durations of unemployed workers depend on the matching technology and the supply-demand conditions. To formalize this relationship we use a matching function, which specifies the flow of filled job vacancies as a function of the number of unemployed and the number of vacancies. We specify the matching function as a constant returns to scale Cobb-Douglas function

$$F = k \cdot U^\alpha \cdot V^{1-\alpha} \quad [6]$$

in which: F = flow of filled job vacancies

U = unemployment

V = vacancies

k = efficiency parameter

α = scale parameter

Matching functions as in [6] have been estimated using time series data for different countries. Blanchard and Diamond (1989) use American data, Jackman, Layard and Pissarides (1989) use British data and Van Ours (1991) uses Dutch data.

In this study we specify a matching function for each educational level. If we assume that a fraction λ_i of the unemployed workers at level i searches at level $i-1$, we may specify [6] for both educational levels as

$$F_i = k \cdot [(1-\lambda_i) \cdot U_i]^\alpha \cdot [V_i]^{1-\alpha}$$

$$F_{i-1} = k \cdot [U_{i-1} + \lambda_i \cdot U_i]^\alpha \cdot [V_{i-1}]^{1-\alpha} \quad [7]$$

The hazard rate θ_i for the duration of search of the unemployed workers at level i is equal to the ratio of the flow F_i and the stock of unemployed workers who search at level i .

Therefore

$$\theta_i = k \cdot [((1-\lambda_i) \cdot U_i) / V_i]^{\alpha-1}$$

$$\theta_{i-1} = k \cdot [(U_{i-1} + \lambda_i \cdot U_i) / V_{i-1}]^{\alpha-1} \quad [8]$$

We define

$$\Phi = \{(W_{i-1} - B) / [(W_i - B) + (W_i - W_{i-1}) \cdot \theta_{i-1} / r]\}^{1/(1-\alpha)} \quad [9]$$

Note that since $W_{i-1} < W_i$ it follows that $0 < \Phi < 1$

Using [5] and [8]-[9] we find that λ_i satisfies

$$(U_{i-1} + \lambda_i \cdot U_i) / V_{i-1} = \Phi \cdot (1-\lambda_i) \cdot U_i / V_i \quad [10]$$

from which we derive

$$\lambda_i = [\Phi \cdot U_i \cdot V_{i-1} - U_{i-1} \cdot V_i] / [\Phi \cdot U_i \cdot V_{i-1} + U_i \cdot V_i] \quad [11]$$

In equilibrium there is job competition at level $i-1$ if $\lambda_i > 0$, so if

$$U_i/V_i > (1/\Phi) \cdot U_{i-1}/V_{i-1} \quad [12]$$

If the wages at levels i and $i-1$ are the same, the condition for workers of level i to search at level $i-1$ is that the UV ratio at level i is larger than the UV ratio at level $i-1$. In other words: if wages at both levels are equal workers of level i search at level $i-1$ until the UV ratio's at both levels are equal. If $W_{i-1} < W_i$ a necessary but not sufficient condition for an unemployed worker at level i to search below his educational level is that the UV-ratio is lower at the lower level of education.

Table 1 gives the differences in UV ratio's between educational level for 4 occupational categories. For unemployed workers with an academic education the expected search duration at their own educational level is higher than that at the higher vocational level. For all other workers the expected search duration at a lower educational level is higher than at their own level, so there is no incentive to search at a lower level of education. Therefore we conclude from table 1 that the necessary condition for job competition is only fulfilled at the higher vocational level.

Relation [12] suggests a simple rule that can be used to detect educational levels at which job competition may occur. In Thurow's labour queue model it is taken for granted, that unemployed workers look for a job below their level of education. The analysis in this section shows, that this is not true if higher educated workers, who search at the lower level, have the same search duration as the lower educated workers. Insofar this is not true job competition may occur, even if [12] does not hold. In the next section we estimate the degree of job competition at various levels of education, and we shall compare the results with the predictions of table 1.

4. DATA AND ESTIMATION RESULTS

The data used in the analysis are from eight vacancy surveys conducted by the Dutch Central Bureau of Statistics (CBS). These surveys were held in the months October 1980-1983, September 1984 and January 1986-1988. The vacancy survey is a stratified random sample in which data are collected of some 20,000 employers. The stratification is by size of establishment and by industry. Government agencies (central and local), education institutions and temporary employment agencies are excluded from the survey. The employers in the surveyed population account for 80-85% of total employment.

From the surveys we obtained the number and the incomplete duration of job vacancies distinguished by level of education and occupational category. We distinguish between 4 levels of education (average years of schooling is given between parenthesis): primary (9), secondary (12), higher vocational (15) and academic (18) and 4 occupational categories: clerical, technical, medical and (socio)

cultural¹. The incomplete duration was recorded in intervals: 0-1, 1-3, 3-6 and 6+ months. We used the grouped duration data to calculate completed durations by estimating Proportional Hazard Models for job vacancies distinguished by level of education and occupational category, using dummy variables for the years of the survey as regressors (See for details of the method used: Van Ours and Ridder (1991)). Next we calculated flow data by dividing the number of vacancies by the average completed vacancy durations. These data give the flow of filled job vacancies². The numbers of unemployed workers distinguished by level of education and occupational category were obtained from the Dutch Central Planning Bureau (CPB)³.

In our empirical analysis we specify the matching function at two levels i and $i-1$ in year t as:

$$F_{i,t} = \exp(\beta_0 + \sum_j \beta_j d_j + \varepsilon_{i,t}) \cdot ((1-\lambda_i) \cdot U_{i,t})^\alpha \cdot V_{i,t}^{1-\alpha}$$

$$F_{i-1,t} = \exp(\beta_0 + \sum_j \beta_j d_j + \varepsilon_{i-1,t}) \cdot (U_{i-1,t} + \lambda_i \cdot U_{i,t})^\alpha \cdot V_{i-1,t}^{1-\alpha} \quad [13]$$

In [13] the d_j are dummy variables for the occupational categories (technical = reference category). The error terms $\varepsilon_{i,t}$ and $\varepsilon_{i-1,t}$ are interpreted as random shocks to the matching efficiency and are assumed to be uncorrelated over time. Because $F_{i,t}$ is obtained by dividing $V_{i,t}$ by the average vacancy duration at level i in year t , we may question the exogeneity of $V_{i,t}$ (and $V_{i-1,t}$ in the equation for $F_{i-1,t}$).

After taking logarithms we estimate the equation in [13] by Non-Linear Least Squares⁴. We must estimate two equations at a time in

¹ To clarify the nature of the classification we give some examples: Technical (CBS classification: 3): Architect, engineer, plumber, painter, welder. Medical (5): Physician, medical receptionist, mid-wife, physio-therapist, pharmacist. Clerical (6): Economist, secretary, typist, salesman. (Socio-) Cultural (7 and 8): Social worker, personnel officer, waiter/waitress, artist, barber.

² Of course, these computed flows are only correct if the number of vacancies is approximately constant over time, which is obviously not true. However, because the inflow and outflow rates are large relatively to the stock of vacancies, equilibrium is quickly re-established after shocks to either the inflow or the outflow rate. Direct estimates of the in- or outflow rates are difficult to obtain.

³ The unemployment data of the CPB are quarterly data. We used the data from the third quarters of 1980-1984 and the fourth quarters of 1985-1987.

⁴ To account for possible endogeneity of $V_{i,t}$ we also computed Instrumental-Variable estimates. As an instrument for the number of vacancies at the survey date we used the vacancy inflow prior to the survey date. The estimation results were obtained with the TSP routine that computes Non-Linear 2SLS, using a method developed by Amemiya (1974). The estimation results in Appendix 1 show there is not much

order to identify λ_1 . We assume that the efficiency of the labour market does not depend on the educational level. The equation allows for differences in efficiency between occupational categories. The estimation results are shown in table 2⁵.

The first column presents the estimation results for primary and secondary education, the second column those for secondary and higher vocational education and the third column those for higher vocational and academic education. These three estimates are in many respects similar. First, there are differences in labour market efficiency between types of education. The market for technical workers has the lowest efficiency, that for medical workers the highest. The efficiency of the market for clerical and socio-cultural workers is about the same in all estimates. Also, the parameter α of the matching function does not differ much and is about 0.3.

The main difference between the estimates are the results with respect to the job competition parameter. This parameter is not significant at levels 2 and 3, the level of primary and secondary education. The parameter of level 4, the level of higher vocational education is significant, indicating job competition between workers with a higher vocational education and academic workers.

In the fourth column we specify the job competition parameter λ_4 as a function of the difference in UV-ratio at the academic and higher vocational educational level. As hypothesized in section 3 λ_4 also depends on differences in wages at both levels, but we have no data on this. We specified λ_4 as:

$$\lambda_4 = \exp(\phi_0 + \phi_1 \cdot (U_4/V_4 - U_3/V_3)) / (1 + \exp(\phi_0 + \phi_1 \cdot (U_4/V_4 - U_3/V_3))) \quad [14]$$

The coefficient ϕ_1 is not significant, although it has the correct sign.

All in all the estimation results in table 2 indicate that, except for the higher vocational level, there is no evidence of job competition. More precisely, only at the higher vocational level the flow of filled vacancies is affected by the level of unemployment at the next higher level of education. This result is consistent with the prediction of table 1. However, an inspection of figure 1 does not lead to this conclusion: the unemployment rates of workers with a higher vocational and academic training do not diverge dramatically. The unemployment rates of workers with an education at the primary and secondary level do diverge dramatically and those for workers with a secondary and higher vocational training do so to a lesser extent. Therefore, it is no surprise that 'direct' estimates, as those obtained by Teulings and Koopmanschap, lead to the conclusion that there is job competition at these levels. As argued before, the interpretation of these 'direct' estimates is ambiguous, and our

difference with the results obtained with NLS.

⁵ Because the observation refer to time intervals at different lengths, testing for serial correlation is not straightforward. Inspection of the residuals did not point at serial correlation.

results, that provide a direct test of the presence of higher educated workers in queues for jobs that require only a lower level of education show that they are misleading: there is no evidence of job competition at the primary and secondary level, despite diverging unemployment rates.

5. CONCLUSION

With our results we can unequivocally reject the existence of job competition at lower, i.e. primary and secondary, levels of education. Moreover, we can explain why previous authors have concluded that job competition is important. The observation that unemployment rates diverge during a cyclical downturn is by itself not sufficient to prove the existence of job competition. A direct test of the crowding-out hypothesis must be based on a study of the composition of new hires over the cycle, and this is what our test does.

A possible explanation of the diverging unemployment rates during a cyclical downturn, is that employers dismiss replaceable lower educated workers before irreplaceable higher educated workers. For a test of this hypothesis we need data on the composition of the inflow into unemployment (from employment) over the cycle. In the Netherlands inflow data classified by level of education are not available, and even estimates based on unemployment durations by education category can not be obtained. Related evidence for the UK and the USA is given by Layard, Nickell and Jackman ((1991), table 3, p 45), and this evidence shows that in 1984 and 1987 respectively the difference in unemployment rates between skill groups is due to differences in the inflow rate and not in the duration of unemployment. Of course, this evidence is not conclusive.

More insight into the reason why unemployment rates diverge is important, because the job competition and the differential adjustment cost hypotheses have radically different implications for the effectiveness of schooling. Schooling is ineffective and only leads to a redistribution of unemployment, if job competition is important. If however, because of high adjustment costs, employers hang on to better educated workers then schooling may reduce the difference in the unemployment rates, thereby decreasing the total unemployment rate.

Literature

Anemiyā, T. (1974) The Nonlinear Two-Stage Least-Squares Estimator, Journal of Econometrics, 2, pp. 105-110.

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

Jackman, R., R. Layard and C. Pissarides (1989) On Vacancies, Oxford Bulletin of Economics and Statistics, 51, 4, pp. 377-394.

Layard, R., S. Nickell, R. Jackman (1991) Unemployment, Oxford, Oxford University Press.

Nickell, S. (1986) Dynamic Models of Labour Demand, in: O.C. Ashenfelter and R. Layard, Handbook of Labor Economics, Amsterdam, North-Holland, pp. 473-522.

Okun, A.M. (1981) Prices and Quantities: A Macroeconomic Analysis, Washington, The Brookings Institution.

Ours, J.C. van, and G. Ridder (1991) Cyclical Variation in Vacancy Duration and Vacancy Flows: An Empirical Analysis, European Economic Review, 35, pp. 1143-1155.

Ours, J.C. van (1991) The Efficiency of the Dutch Labour Market in Matching Unemployment and Vacancies, De Economist, 139, pp. 359-378.

Ours, J.C. van, and G. Ridder (1992) Vacancies and the Recruitment of New Employees, Journal of Labor Economics, forthcoming.

Pfann, G.A., and F.C. Palm (1990) Asymmetric Adjustment Costs in Non-Linear Labour Demand Models with Empirical Evidence for the Dutch and the U.K. Manufacturing Sectors, Discussion paper, University of Oxford.

Teulings, C., and M. Koopmanschap (1989) An Econometric Model of Crowding Out of Lower Educational Levels, European Economic Review, 33, pp. 1653-1664.

Thurow, L.C. (1975) Generating Inequality, New York, Basic books.

Yellen, J.L. (1984) Efficiency Wage Models of Unemployment, American Economic Review, Proceedings, 74, pp. 200-205.

Figure 1 Unemployment by educational level (% of the labour force at the relevant level)

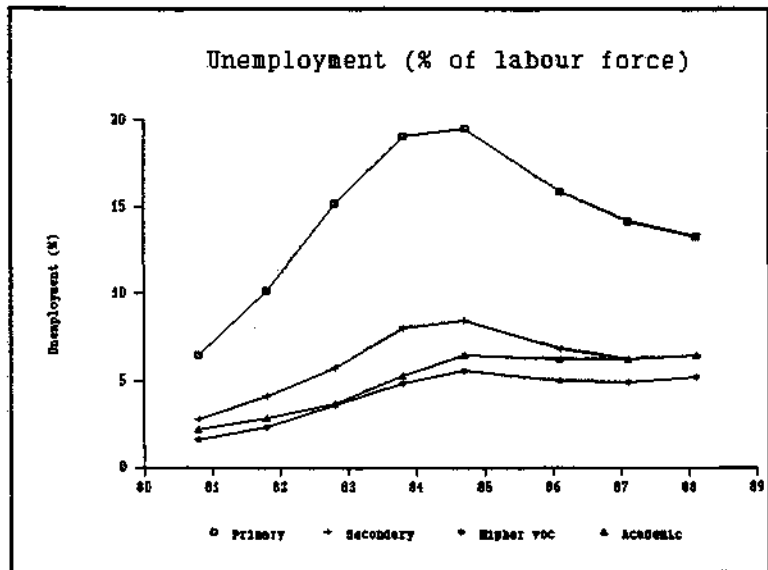
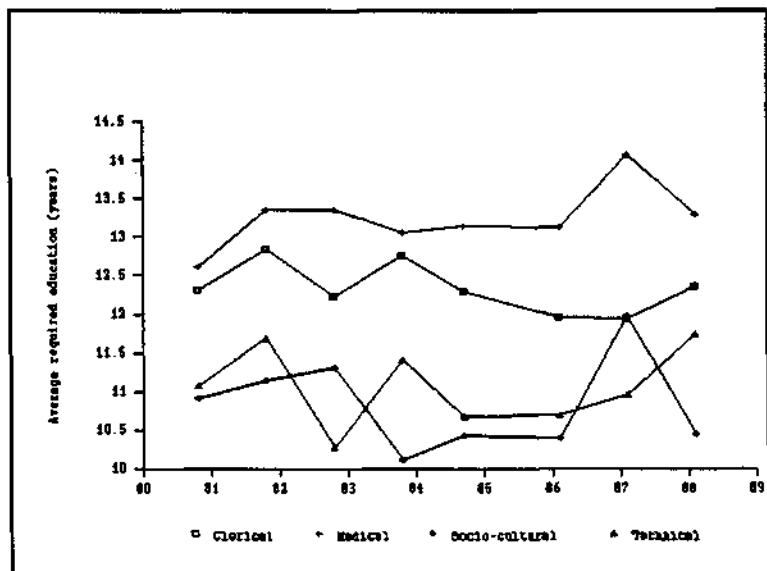


Figure 2 Average required educational level for new job vacancies: 1980-1988



a) Calculations of the average level based on the assumption that primary education = 9 years, secondary = 12 years, higher vocational = 15 years, academic = 18 years

Table 1 Average difference in unemployment-vacancy ratio between educational levels: 1980-1988^{a)}

Occupational category	$U_i/V_i - U_{i-1}/V_{i-1}$		
	i=2	i=3	i=4
Technical	-16.0	-10.8	1.6
Medical	-	-1.8	4.0
Socio-cultural	-16.7	-1.8	19.9
Clerical	-8.2	-8.2	1.0

^{a)} i = level of education; 1 = primary, 2 = secondary, 3 = higher vocational, 4 = academic

Table 2 Estimation results: job competition by educational level

	1.	2.	3.	4.
Constant	-1.06 (3.1)	-1.15 (8.1)	-1.06 (8.8)	-1.08 (9.0)
β medical	0.88 (6.8)	0.88 (7.0)	0.89 (7.4)	0.90 (7.5)
β clerical	0.56 (4.6)	0.58 (4.9)	0.60 (5.1)	0.57 (5.1)
β soc-cult	0.45 (3.5)	0.43 (3.4)	0.43 (3.5)	0.47 (3.7)
α	0.30 (6.5)	0.32 (6.8)	0.32 (7.2)	0.32 (7.4)
λ_2	0.06 (0.3)			
λ_3		-0.41 (1.3)		
λ_4			0.60 (5.1)	
ϕ_0				-0.02 (0.0)
ϕ_1				0.07 (1.4)
\bar{R}^2	0.872	0.874	0.887	0.857

t-values between parenthesis

Appendix 1 ESTIMATION RESULTS INSTRUMENTAL VARIABLE ESTIMATION

	1.	2.	3.	4.
Constant	-1.03 (6.7)	-1.22 (6.2)	-1.02 (6.7)	-1.01 (6.0)
β medical	0.87 (6.8)	0.90 (6.9)	0.89 (7.3)	0.88 (7.1)
β clerical	0.55 (4.5)	0.59 (4.9)	0.56 (4.9)	0.55 (4.8)
β soc-cult	0.47 (3.4)	0.40 (2.7)	0.45 (3.3)	0.45 (3.0)
α	0.28 (4.4)	0.36 (4.4)	0.30 (4.8)	0.29 (4.3)
λ_2	0.10 (0.4)			
λ_3		-0.49 (1.5)		
λ_4			0.62 (4.7)	
ϕ_0				1.05 (1.7)
ϕ_1				0.06 (0.8)
\bar{R}^2	0.895	0.898	0.890	0.887

t-values between parenthesis