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Education, training and employability

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Two hypotheses are tested: (1) education and training increase the employability of workers at other tasks within the firm and reduce the need for help from supervisors when workers encounter small problems, and (2) greater employability and problem solving capability increase wages. The empirical results show that greater employability and problem solving capability are independent from each other. Formal work-related training increases employability. Workers in jobs requiring no induction training are less employable at other jobs or departments. Both general and specific human capital increase the ability of workers to solve problems on their own. Greater employability does not increase wages. Male workers who solve problems on their own earn more than men who need help from others. The effects of human capital variables on employability and problem solving capability do not differ between and men and women. However, it is found that the ability to solve problems on one's own has a pay off for men but not for women.

I. INTRODUCTION

Current socioeconomic policy debates, especially those in Europe, are to a large extent dominated by the belief that labour market should become more flexible. Investments in human capital – such as education and on-the-job training – are seen by many as a tool to improve labour market flexibility (see, for example, OECD, 1995). Two types of labour market flexibility can be distinguished: internal flexibility and external flexibility. Internal flexibility refers to the employability of workers (i.e. the number of tasks a worker can be assigned to, or the amount of assistance needed in the job) and to promotion from one job to another within the firm. External mobility can be distinguished into job to job mobility (change of employers) and exit routes from the labour market (into early retirement, disability, unemployment, nonparticipation, etc.).

The human capital theory leads one to expect that investments in education and training increase internal mobility but reduce external mobility. Human capital makes workers more employable and therefore increases internal mobility. This holds both for investments in general and firm-specific human capital. Investments in specific human capital also increase the opportunity costs of job to job mobility and transition out of the labour market, which lower external mobility: if the costs and benefits are shared, investments in firm specific human capital strengthen the employment relation.

Mincer (1991) argues that workers with more years of schooling are better at finding their most suitable employment and therefore have lower job to job mobility rates. Investments in general human capital are thus expected to decrease external mobility. The empirical evidence on the effects of general human capital on external mobility is mixed: some studies (e.g. Börsch-Supan, 1990) find that higher educated workers have lower job turnover, while others find that education has no effect (Lindeboom and Theeuwes, 1991; Mekkelholt, 1993; Groot, 1996a; Groot and Verberne, 1995).

There is less ambiguity about the empirical evidence on whether higher educated workers are more likely to parti-

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cipate in the labour market (see for example, OECD, 1996). The empirical evidence on the effects of education on retirement from the labour market is, on the other hand, less clear (see Hebbink *et al.* 1996a).

If the worker contributes to the costs of it, investments in firm specific human capital are supposed to reduce the workers' quit rate (Oi, 1962). In empirical studies it is generally found that on-the-job training reduces job to job mobility (Lynch, 1991; OECD 1993; Groot, 1996a).

With respect to the relation between education and internal flexibility the available empirical evidence is again somewhat mixed: some studies find that more education is associated with higher promotion rates (see, McCue, 1996), while others find that the effects are not significant (Lewis 1986; Groot, 1996b; Groot and Maassen van den Brink 1996). It is also found that on-the-job training increases the probability that one has a job that offers promotion opportunities, but conditional on being in a job offering promotion – i.e. jobs in an internal labour market – trained workers are not significantly more likely to receive promotion (Groot and Maassen van den Brink, 1996).

Education and training are expected to make workers more employable within the firm. Greater employability increases internal flexibility. In particular if training takes the form of 'multi skilling': skills that enable workers to perform multiple tasks. Higher educated and trained workers are supposed to be more employable, i.e. they can be employed into more jobs within the firm and they need less supervising in their work. Empirical evidence for these hypotheses, however, is lacking.

This paper fills a gap in the literature on the relation between human capital and labour market flexibility. In this paper we look at the effects of education and training on employability of workers within the firm. Further, the wage effects of greater employability are calculated. Workers who are more employable or need less supervising are expected to be more productive. If wages reflect marginal productivity rates, greater employability can be expected to increase workers' wages as well. It is further tested whether the effects of human capital and other variables on employability and wages differ between men and women and between older and younger workers.

Employability is operationalized in two ways in this paper. First by the extent to which the worker can be assigned to other jobs or departments within the firm. This we refer to as 'employability' in the strict sense. Secondly employability is measured by the way small problems at work are solved. This latter variable can also be seen as an indicator for productivity: the costs of production are less if workers do not need others to help them with small problems compared to a situation where they need colleagues or supervisors to assist them.

II. THE DATA

The data for the empirical analysis are taken from the 1994 wave of the Dutch OSA–Labour Market Survey. This data set is in part a longitudinal survey of individuals who participated in one of the five previous waves, which were conducted between 1985 and 1992. Because of sample attrition, the longitudinal part of the survey is supplemented by observations from a cross-section of the population aged 15–65 years. The total sample size is 4538 observations. From this survey we selected individuals who are in paid employment at the time of interview. This reduces the sample size to 2765 observations (1666 males and 1099 females).

Employability is measured by the response to two separate survey questions. The first measures the number of tasks the worker is able to perform, while the second is an indicator of the quality of the tasks performed. The first employability variable is:

If it is convenient for the firm, are you then employable for tasks that actually belong to another job or department of the firm?

There are five response categories: No; Yes, but this has never happened; Yes, but it happens only once in a while; Yes, but it happens not very frequently; Yes, this happens frequently.

Table 1 contains the frequency distribution of the employability variable. Women are employed at other jobs in the firm less frequently than men. Of the female workers 36% report that they are not employable for tasks in other jobs or at other departments. Of the male workers this is 25%. A little over 10% of both the male and the female workers report that they can be employed elsewhere at the firm but that this has never happened. About a third of the male workers and 26% of the female workers report that this happens only once in a while, while for 15% of the female workers and 18% of the male workers this does not happen very frequently. A little less than 14% of the male workers and 12% of the female workers are frequently employed at other jobs or departments.

The second indicator of the employability of workers is the response to the survey question:

If you encounter small problems in your work, how are these usually solved?

This question has six answering categories: By myself; By myself together with colleagues; By instruction of the supervisor or manager; By a maintenance service; By another service or department; Otherwise. This employability variable measures how well the tasks the worker is assigned to can be handled by the worker on his/her own. The variable can also be interpreted as a proxy for produc-

Table 1. *Cross tabulation of 'employability in tasks in other jobs or departments' ('employability') and 'how do you solve small problems?' ('problem solving') by gender (column percentages over row percentages)*

Employability: Problem solving:	No	Yes, but this has never happened	Yes, but it happens only once in a while	Yes, but it happens not very frequently	Yes, it happens frequently	Total
All workers ($N = 2765$)						
By myself	29.6%	10.0%	29.7%	17.3%	13.4%	
	46.0%	43.9%	43.6%	46.7%	45.5%	45.1%
By myself together with colleagues	26.3%	32.0%	32.0%	17.4%	14.2%	
	35.9%	41.3%	41.3%	41.0%	42.2%	39.5%
By instruction of supervisor	34.5%	11.1%	31.0%	13.5%	9.8%	
	16.2%	14.7%	13.8%	11.0%	10.1%	13.6%
Otherwise	31.3%	16.7%	22.9%	12.5%	16.7%	
	1.9%	2.8%	1.3%	1.3%	2.2%	1.7%
Total	29.0%	10.3%	30.7%	16.7%	13.3%	100.0%
Male workers ($N = 1666$)						
By myself	23.9%	10.1%	32.8%	18.5%	14.7%	
	47.3%	47.4%	47.5%	49.5%	50.9%	48.3%
By myself together with colleagues	23.4%	9.8%	34.1%	18.4%	14.4%	
	36.0%	35.7%	38.3%	38.2%	38.8%	37.5%
By instruction of supervisor	29.5%	10.6%	33.8%	15.9%	10.1%	
	15.0%	12.9%	12.6%	11.0%	9.1%	12.4%
Otherwise	23.3%	23.3%	30.0%	13.3%	10.0%	
	1.7%	4.1%	1.6%	1.3%	1.3%	1.8%
Total	24.4%	10.3%	33.4%	18.1%	13.9%	100.0%
Female workers ($N = 1099$)						
By myself	40.0%	9.9%	23.9%	15.1%	11.1%	
	44.7%	38.6%	36.3%	41.4%	36.3%	40.3%
By myself together with colleagues	30.3%	10.5%	29.3%	16.0%	13.9%	
	35.9%	43.0%	46.9%	46.3%	48.1%	42.6%
By instruction of supervisor	40.6%	11.8%	27.6%	10.6%	9.4%	
	17.4%	17.5%	16.1%	11.1%	11.9%	15.5%
Otherwise	44.4%	5.6%	11.1%	11.1%	27.5%	
	2.0%	0.9%	0.7%	1.2%	3.7%	1.6%
Total	36.0%	10.4%	26.6%	14.7%	12.3%	100.0%

tivity of workers. Workers who do need help in solving problems are more productive than workers who do.

As shown by Table 1, male workers report slightly more frequently that they solve problems on their own than female workers. About 48% of the male workers and 40% of the female workers say that they solve small problems on their own. A little over 37% of the male workers and a little less than 43% of the female workers say they do it with the help of colleagues. One in eight (12.5%) of the male workers and 15% of the female workers need instructions by their supervisor. The other response categories are not frequently mentioned: 1.7% of both the male and the female workers say they solve small problems by calling a maintenance service or another service or department, or otherwise. To avoid sample sizes becoming too small, these other response categories – problems are solved by a maintenance service, service department or otherwise – are omitted from the analysis, reported in the next section.

The cross tabulation of employability and problem solving capability in Table 1 suggests that the correspondence between the two is low. For example, 46% of the workers who are employed in other jobs at the firm frequently report that they solve problems on their own. This is equal to the share of workers who say that they are not employable at other jobs. Further, of the workers who are not employable elsewhere, 30% solve problems on their own while 34.5% need instruction from a supervisor for this. All in all the two variables seem independent from each other and the correlation between the two is low. This is confirmed by the values of the partial correlation coefficients between the employability and problem solving items which are all less than 0.1 in absolute values.

Employability in other jobs or departments in the firm is an ordered variable, while problem solving capability is an unordered variable. To determine the impact of education and training on employability we have estimated some ordered probit equations on whether workers can be

employed in other jobs or departments in the firm and some multinomial logit equations on how workers solve small problems. In all equations we include a large number of human capital variables. These are classified into four groups: formal schooling, formal on-the-job training, informal training, and induction time. Formal schooling is captured by years of education. The formal on-the-job training variables include: a dummy whether the firm the employee works at organized work-related training courses, a dummy whether the worker has participated in formal work-related training, and a variable indicating how many training courses the worker has received. Informal training is captured by tenure at the current firm and years of work experience. Further, we include four dummy variables for job level, seven dummy variables indicating how much time it takes for a new worker in the job to become fully productive. These variables can be seen as indicators of the complexity of the job and the amount of induction time and training required to become fully qualified for the job.

A number of other control variables are included in the equations as well (see the footnote Table 2). Sample statistics of the human capital variables can be found in Table 2.

As is well known, the coefficients of both the ordered probit equation and the multinomial logit equations are not directly interpretable. To improve the interpretation of the findings we have calculated the marginal effects of the education and training variables. A description of the calculation of the marginal effects in the multinomial logit model can be found in Maddala (1983). For the calculation of the marginal effects in the ordered probit model, let $\Pr(Y_{ij} = 1)$ be the probability that the response of individual i to the question whether he/she is employable for tasks that actually belong to another job or department of the firm is equal to $j (j = 1, \ldots, 5)$. Let X be a vector of explanatory variables with associated coefficients β. The probability that individual i is in category j can be written as:

$$\Pr(Y_{ij} = 1) = \Phi(\alpha_{k+1} - X\beta) - \Phi(\alpha_k - X\beta) \qquad (1)$$

where Φ is the standardized normal distribution function and the α's are location parameters $(k = 0, \ldots, 5)$, with $\alpha_0 = -\infty$, $\alpha_1 = 0$, and $\alpha_5 = \infty$. The marginal effect of the nth variable on the probability that the individual is in category j is then:

$$\frac{\partial \Pr(Y_{ij})}{\partial X_n} = (\phi(\alpha_{k+1} - X\beta) - \phi(\alpha_k - X\beta)) - \beta_n \qquad (2)$$

where ϕ is the standard normal density function. Based on the coefficients we have calculated the marginal effects for each individual in the sample separately. In the table we present the sample means of the calculated marginal effects.[1]

III. THE DETERMINANTS OF EMPLOYABILITY

The parameter estimates of the ordered probit and multinominal logit equations are found in Table 2. The average marginal effects of the education, training and job related variables are in Table 3. We have tested whether the coefficients differ between male and female workers. A likelihood ratio test reveals that the hypotheses that the coefficients for male and female workers are equal cannot be rejected at any reasonable statistical level. This holds both for whether workers can be made employable elsewhere at the firm and how they solve small problems. We therefore present the parameter estimates for the combined sample of male and female workers.

We also tested for cohort effects in employability and problem solving capability. It is possible that younger workers are broader educated and therefore more employable. To test for cohort effects we have re-estimated the models for three different age groups: workers aged younger than 35, workers between 35 and 50 years, and workers who are 50 years or older. The likelihood ratio tests show that the parameter estimates between the three cohorts are not significantly different from each other.

The other likelihood ratio tests indicate that all restrictions on the human capital variables are rejected, except those for years of education and for the informal on-the-job training variables (tenure and experience) in the equation on employability in other jobs or departments in the firm. Education, tenure and experience do not significantly attribute to the explanation of whether workers can be employed at jobs elsewhere at the firm.

Employability at other tasks

The parameter estimates show that years of education do not have a significant effect on being employable in other jobs or departments.

Of the on-the-job training variables the number of training courses taken has a significant effect on the extent to which workers can be employed elsewhere. An additional course taken increases the probability that the worker has taken up tasks somewhere else in the firm by 0.8%. Workers in firms that organize training are also more likely to be employable at other tasks.

The effect of tenure on the probability that the worker can be employed in other jobs or department borders sig-

[1] Strictly speaking, the marginal effects can only be calculated for continuous variables. However, to facilitate the interpretability and readability of the results, we have calculated the marginal effects for the discrete variables as well.

Table 2. *Parameter estimates ordered probit on 'employable in tasks in other jobs or departments' (reference category: no) and multinominal logit on 'how do you solve small problems' (reference category: by myself) for male and female workers* (t-*values in brackets*)

	Sample mean	Employable in tasks in other job or departments	How do you solve small problems: with colleagues	How do you solve small problems: instruction by supervisor
intercept		0.211 (1.178)	0.693 (1.849)	0.895 (1.723)
α_2		0.295** (17.841)		
α_3		1.108** (39.915)		
α_4		1.713** (49.215)		
Education				
Years of eduction	11.43	−0.002 (0.183)	−0.018 (1.004)	−0.079** (3.009)
Formal work-related training				
Firm organizes work-related training	0.66	0.105* (2.245)	0.355** (3.572)	0.058 (0.424)
Worker has participated in work-related training	0.66	0.004 (0.081)	−0.049 (0.447)	−0.182 (1.150)
Number of training courses received	2.00	0.024* (2.395)	−0.011 (0.594)	−0.004 (0.108)
Informal on-the-job training				
Years of tenure at the firm/10	9.24	−0.057 (1.828)	0.171** (2.565)	−0.016 (0.157)
Years of work experience/10	16.92	−0.023 (0.848)	−0.217** (3.693)	−0.159 (1.899)
Job level (reference category: intermediate level jobs)				
Elementary jobs	0.07	0.226* (2.501)	0.137 (0.713)	0.123 (0.505)
Lower level jobs	0.32	0.035 (0.640)	0.101 (0.897)	0.302* (1.975)
Higher level jobs	0.17	−0.067 (1.007)	−0.211 (1.610)	−1.168** (3.933)
Scientific jobs	0.06	0.028 (0.274)	−0.186 (0.916)	−0.303 (0.774)
Job complexity: How much time does it take to become fully productive? (reference category: more than a year)				
None	0.04	−0.710** (5.809)	−1.063** (3.951)	−0.178 (0.557)
Less than 2 days	0.06	−0.152 (1.499)	0.077 (0.346)	0.564* (1.976)
Between 3 days and 2 weeks	0.09	0.001 (0.009)	0.023 (0.128)	0.666** (2.717)
2–6 weeks	0.14	−0.102 (1.407)	0.057 (0.376)	0.304 (1.455)
Between 6 weeks and 3 months	0.14	−0.067 (0.920)	0.272 (1.819)	0.573** (2.560)
3–6 months	0.14	−0.071 (0.987)	−0.003 (0.228)	0.186 (0.798)
Between 6 months and a year	0.17	−0.071 (0.997)	0.010 (0.076)	−0.006 (0.026)
Number of observations		2787	2730	
Loglikelihood		−4150.98	−2557.86	
Pseudo-R^2		0.061	0.121	
Likelihood Ratio Tests‡				
Male coefficients equal female coefficients		46.28	84.76	
Coefficients for age groups < 35, 35–50, and > 50 years are equal		88.12	144.50	
All coefficients except intercept = 0		179.68***	337.72***	
Highest education level = 0		0.04	9.10***	
Formal work-related training = 0		17.04***	15.80***	
Informal on-the-job training = 0		8.32	17.48***	
Job level and job complexity = 0		45.24***	71.54***	

Note: * significant at 5% level; ** significant at 1% level; *** restrictions rejected at 1% level. ‡ this tests whether the joint restriction that the variables included under the different human capital headings are equal to zero can be rejected. Other control variables include three dummy variables for the number of workers supervised by the individual, dummy variables for marital status and gender, firm size, and six dummy variables for industry.

nificance. The sign of the coefficient is negative: workers with more tenure are less likely to be employable elsewhere at the firm. These effects suggest the presence of 'experience concentration'. Workers with more experience build up more specific human capital. This makes them more productive at their current job, but less employable at other jobs. Their expertise is concentrated at the specific job they are doing.

Only workers in elementary jobs are significantly more likely to be employable at multiple tasks and departments at the firm. Working in an elementary job increases the probability of being employable elsewhere by 7.5%. There are no significant differences in the probability of being employable between the other four job levels.

Of the job complexity variables only the one for jobs which take no time to become fully productive has a significant effect on the probability that the worker can be employed elsewhere at the firm. However, the likelihood

Table 3. *Marginal effects of education and training variables on 'employable in tasks in other jobs or departments' and 'how do you solve small problems'*

	Employable in tasks in other jobs or departments					How do you solve small problems		
	No	Yes, but this has never happened	Yes, but it happens only once in a while	Yes, but it happens not very frequently	Yes, this happens frequently	By myself	By myself together with colleagues	By instruction of the supervisor or or manager
Education								
Years of education	0.001	−0.000	−0.000	−0.000	−0.000	0.007	0.000	−0.008
Formal work-related								
Firm organizes work-related training	−0.035	−0.004	0.004	0.013	0.022	−0.066	0.079	−0.013
Worker has participated in work-related training	−0.001	−0.000	0.000	0.000	−0.001	0.019	−0.001	−0.017
Number of training courses received	−0.008	−0.001	0.001	0.003	0.005	0.002	−0.002	0.000
Informal on-the-job training								
Years of tenure at the firm/10	0.109	0.002	−0.002	−0.007	−0.012	−0.029	0.041	−0.011
Years of work experience/10	0.008	0.000	−0.000	−0.003	−0.005	0.047	−0.042	−0.005
Job level (reference category: intermediate level jobs)								
Elementary jobs	−0.075	−0.009	0.009	0.029	0.047	−0.031	0.025	0.006
Lower level jobs	−0.011	−0.001	0.001	0.004	0.007	−0.034	0.007	0.028
Higher level jobs	0.022	0.003	−0.003	−0.009	−0.014	0.101	0.017	−0.118
Scientific jobs	−0.009	−0.001	0.001	0.003	0.006	0.049	−0.026	−0.023
Job complexity: How much time does it take to become fully productive? (reference category: more than a year)								
None	0.236	0.028	−0.027	−0.091	−0.147	0.197	−0.237	0.040
Less than 2 days	0.050	0.006	−0.006	−0.019	−0.031	−0.044	−0.014	0.058
Between 3 days and 2 weeks	−0.000	−0.000	0.000	0.000	0.000	−0.041	−0.032	0.073
2–6 weeks	0.034	0.004	−0.004	−0.013	−0.021	−0.027	−0.004	0.031
Between 6 weeks and 3 months	0.022	0.003	−0.003	−0.009	−0.014	−0.079	0.031	0.048
3–6 months	0.024	0.003	−0.003	−0.009	−0.015	−0.004	−0.018	0.023
Between 6 months and a year	−0.012	−0.001	0.001	0.005	0.007	−0.001	0.003	−0.001

ratio test indicates that on the whole the job complexity variables contribute significantly to the explanation of employability of workers in other jobs. Relative to workers in jobs which take more than a year to become fully qualified, workers in jobs that take no time to become fully productive are less likely to be employed elsewhere at the firm. The marginal effect of this variable is large: workers in jobs that do not involve induction training are 24% more likely to be in jobs in which you cannot be made employable in other jobs or departments at the firm. So, workers in more complex jobs are more frequently employed at other jobs or departments at the firm.

Problem solving

A higher education decreases the probability that workers have to ask instruction from managers or supervisors to solve small problems and increase the probability that workers solve these problems by themselves. A year of education increases the probability of solving problems on your own by 0.8%.

If the firm organizes training for its workers, it becomes more likely that problems at work are solved in co-operation with other colleagues. The marginal effect of organizing training at the firm on the probability solving problems with colleagues is 8%.

Years of tenure at the firm increase the probability that problem solving is done with colleagues, while years of work experience in general decrease this probability. The net effect of tenure and experience is positive: years at the firm increase the likelihood that problems are solved with colleagues. Workers with more general work experience are more likely to solve problems on their own and less likely to do so with colleagues or with the help of a supervisor. The marginal effect of a year of tenure on the probability that problems are solved with the help of colleagues is 0.4%. The marginal effect of experience on the probability of solving problems on your own is 0.5% (−0.42% on the probability that problems are solved with colleagues and −0.6% on the probability that help of a supervisor is needed).

Relative to workers in intermediate level jobs, workers in lower level jobs are significantly more likely to need instruction from a supervisor to solve problems at work. Workers in higher level jobs are significantly less likely to require instructions from a supervisor. Working in a lower level job decreases the probability of being able to solve problems on your own by 3%, while working in higher level jobs increases this probability by 10% (relative to working in an intermediate level job).

Compared to workers in jobs that take more than a year to become qualified, workers who are fully productive immediately and need no induction time are less likely to solve problems with colleagues and more likely to solve problems on their own. Probably the problems encountered in these jobs are such that they can be solved by workers on their own. The marginal effect of being in a job that does not take induction time on the probability of solving problems by yourself is 20%. Workers in jobs that take less than two weeks to become fully qualified for the job are more likely to need assistance by a supervisor to solve problems at work. Relative to workers in jobs that take more than a year to become fully productive, these workers are 4–7% more likely to need instructions from their supervisor.

By comparing the effects of human capital on employability at other tasks in the firm with those on problem solving capability it can be assessed whether the value of human capital lies in broadening the skills of workers and making them employable at multiple tasks in the firm, or rather in making them more productive in the specific tasks they are doing. Education has an effect on problem solving but not so much on employability in other tasks. So, education makes you better at the specific tasks you perform, but not in the number of other tasks you do. The main function of on-the-job training courses appears to be multi-skilling of workers: on-the-job training increases employability in other tasks but does not improve workers' performance at the specific tasks they perform. Experience appears to affect the way the worker performs his/her tasks and not the number of other tasks the worker is assigned to. Tenure at the current firm contributes negatively to productivity as measured by problem solving capability. This supports the view that high tenured workers stay with the firm because their performance is overestimated relative to what they are able to earn elsewhere. Finally, induction training contributes to the way the worker performs his/her tasks but not to how many other tasks the worker performs.

IV. THE WAGE EFFECTS OF EMPLOYABILITY

Greater employability and problem solving capability can be expected to increase productivity. If wages reflect marginal productivity, greater employability and problem solving capability will increase wages as well. To test this we estimated some OLS wage equations with dummies for employability and problem solving capability. The dependent variable in the equations is the log of the net wage rate, calculated by dividing standard monthly wages by contractual hours of work. A summary of the coefficients of the wage equations and some likelihood ratio tests are found in Table 4. A likelihood ratio test reveals that the coefficients of the male wage equation are significantly different from those of the female wage equation. For this reason we present separate estimates for men and women.

The likelihood ratio tests further show that employability in other jobs or department does not significantly affect

Table 4. *Parameter estimates human capital and employability variables in OLS wage equations by gender (dependent variable: net wage rate; t-values in brackets)*

	All workers	Male workers	Female workers
Intercept	2.021** (47.445)	2.078** (43.060)	1.992** (22.866)
Education			
Years of education	0.022** (10.080)	0.027** (10.035)	0.017** (4.183)
Formal work-related training			
Firm organizes work-related training	−0.010 (0.792)	−0.012 (0.809)	0.007 (0.324)
Worker has participated in work-related training	0.036** (2.650)	0.024 (1.430)	0.062** (2.808)
Number of training courses received	0.001 (0.320)	−0.002 (0.677)	−0.029 (0.586)
Informal on-the-job training			
Years of tenure at the firm/10	0.097** (4.543)	0.070** (2.844)	0.165** (3.565)
Years of tenure^2/100	−0.024** (3.578)	−0.020** (2.706)	−0.036 (1.910)
Years of experience/10	0.261** (12.260)	0.268** (10.317)	0.266** (6.669)
Years of work experience^2/100	−0.043** (8.739)	−0.041** (7.259)	−0.055** (5.131)
Job level (reference category: intermediate level jobs)			
Elementary jobs	−0.083** (3.573)	−0.100** (3.240)	−0.031 (0.834)
Lower level jobs	−0.055** (3.965)	−0.097** (5.761)	0.007 (0.304)
Higher level jobs	0.167** (9.864)	0.145** (7.293)	0.193** (6.272)
Scientific jobs	0.309** (11.897)	0.267** (9.198)	0.412** (7.579)
Job complexity: How much time does it take to become fully productive? (reference category: more than a year)			
None	−0.064* (2.023)	−0.043 (0.980)	−0.029 (0.586)
Less than 2 days	−0.043 (1.598)	−0.019 (0.514)	−0.022 (0.480)
Between 3 days and 2 weeks	−0.059** (2.651)	−0.129** (4.323)	0.029 (0.747)
2–6 weeks	−0.052** (2.745)	−0.059* (2.526)	0.009 (0.257)
Between 6 weeks and 3 months	−0.059** (3.154)	−0.073** (3.308)	0.009 (0.243)
3–6 months	−0.044* (2.476)	−0.049* (2.471)	−0.007 (0.179)
Between 6 months and a year	−0.017 (1.003)	−0.025 (1.384)	0.039 (1.028)
Employable in tasks in other jobs or departments (reference category: no)			
Yes, but this has never happened	0.050*** (2.586)	0.056* (2.353)	0.034 (1.051)
Yes, but it happens only once in a while	0.003 (0.189)	0.006 (0.373)	−0.014 (0.598)
Yes, but it happens not very frequently	0.027 (1.646)	0.016 (0.814)	0.051 (1.618)
Yes, this happens frequently	−0.021 (1.185)	−0.022 (1.044)	−0.024 (0.801)
How do you solve small problems (reference category: by myself)			
By myself together with colleagues	−0.022 (1.863)	−0.042** (3.017)	0.007 (0.330)
By instruction of the supervisor or manager	−0.072** (4.300)	−0.074** (3.546)	−0.054 (1.950)
Otherwise	−0.012 (0.82)	−0.028 (0.579)	−0.014 (0.171)
Number of observations	2448	1506	942
Loglikelihood	−140.09	9.847	−97.32
Adj-R^2	0.524	0.570	0.386
Likelihood Ratio Tests‡			
Highest education level = 0	99.12***	99.92***	18.06***
Formal work-related training = 0	10.12***	2.46	9.94
Informal on-the-job training = 0	418.78***	263.74**	162.40***
Job level and job complexity = 0	253.44***	199.26***	85.74***
Employable in other tasks = 0	13.86	9.92	7.94
How do you solve problems = 0	18.52***	16.32***	5.36

Note: * significant at 5% level; ** significant at 1% level; *** restrictions rejected at 1% level; ‡ this tests whether the joint restriction that the variables included under the different human capital headings are equal to zero can be rejected. Other control variables include three dummy variables for the number of workers supervised by the individual, dummy variables for marital status and gender, firm size, and six dummy variables for industry.

wages. Apparently, greater employability does not increase wages. Problem solving capability only has a significant effect on male wages but not on female wages. The coefficients indicate that relative to workers who solve problems on their own, men who have to ask help from colleagues earn 4.2% less and male workers who have to get instructions from a supervisor earn 7.4% less.

The likelihood ratio tests further indicate that formal work-related training – i.e. apprenticeship training, whether the firm organizes training, participation in on-

the-job training and the number of training courses – do not have a significant effect on wages. Of the formal work-related training variables, only participation in on-the-job training increases female wages significantly by 6%.

The complexity of the job has a significant effect on male wages. Surprisingly, neither problem solving capability nor induction time has significant pay-off for women. For women there are also no significant wages differentials between elementary work, lower level jobs and intermediate level jobs. Among male workers, a job that requires less than six months to become fully productive pays 5–13% less than a job that takes more than a year to become fully qualified.

V. CONCLUSION

In this paper we have formulated and tested two hypotheses. The first is that education and training increases employability of workers within the firm and reduces the need for help from supervisors when workers encounter small problems. The second hypothesis is that greater employability and problem solving capability increases productivity and, subsequently, wages.

With respect to the first hypothesis it is found that formal work-related training – such as apprenticeship training and the number of on-the-job training courses taken – increase the probability that one is employed in other jobs or departments at the firm. Relative to workers in jobs that require more than a year to become fully qualified, workers in simple jobs that require no induction time are less likely to be employed at other jobs or departments at the firm. On the other hand, individuals doing elementary work are more likely to be employable elsewhere. Employability seems to be more common for simple jobs requiring few skills. Formal education and informal training through tenure and experience do not significantly increase employability.

All forms of human capital investments appear to increase problem solving capability of workers significantly. Especially more educated workers, workers with more experience and workers in more complex jobs that require more induction time are more likely to be able to solve problems themselves and need less supervision.

Employability in other jobs in the firm and problem solving capability appear to be independent from each other. The cross-tabulation of the two shows that the correspondence between the two is low.

Regarding the second hypothesis, it is found that both for male and female workers, employability in other jobs or departments at the firm does not have a significant effect on wages. A possible explanation for these insignificant findings is that there are opposing effects at work. On the one hand, workers who are more employable may be more productive and earn more. On the other hand, workers who do not perform adequately in their job may be more likely to be employed at a different job in the firm. This would create a negative ability selection effect: less than average performers are more likely to be employable in other jobs at the firm. So the insignificant effect of employability of wages may be due to positive productivity effects and negative ability selection effects.

Problem solving capability has a significant effect on male wages but not on female wages. Male workers who have to ask for help from colleagues to solve problems earn 4% less, while workers who need instructions from a supervisor earn 7% less than workers who are able to solve problems on their own.

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REFERENCES

Börsch-Supan, A. (1990) Education and its double-edged impact on mobility, *Economics of Education Review*, **9**, 39–53.

Groot, W. (1996a) On-the-job training, job mobility and wages, *Discussion Paper* TI 96-30/3, Tinbergen Institute, Amsterdam/Rotterdam.

Groot, W. (1996b) On-the-job training and promotion in Britain, *mimeo*, Department of Economics, Leiden University.

Groot, W. and Maassen van den Brink, H. (1996) Glass ceilings or dead ends: job promotion of men and women compared, *Economics Letters*, **53**, 221–6.

Groot, W. and Verberne, M. (1997) Aging, job mobility and compensation, *Oxford Economic Papers*, **49**, 380–403.

Hebbink, G. (1996) Human capital, labor demand and wages, PhD thesis, Tinbergen Institute Research Series 35, Amsterdam.

Lewis, G. (1986) Gender and promotions, *Journal of Human Resources*, **21**, 406–19.

Lindeboom, M. and Theeuwes, J. (1991) Job duration in the Netherlands: the co-existence of high job turnover and permanent job attachment, *Oxford Bulletin of Economics and Statistics*, **53**, 243–64.

Lynch, L. (1991) The role of off-the-job vs. on-the-job training for the mobility of women workers, *American Economic Review*, **81**, 151–6.

Maddala, G. (1983) *Limited-Dependent and Qualitative Variables in Econometrics*, Cambridge University Press, Cambridge.

McCue, K. (1996) Promotions and wage growth, *Journal of Labor Economics*, **14**, 175–209.

Mekkeholt, E. (1993) Een sequentiële analyse vande baanmobiliteit in Nederland, PhD thesis, University of Amsterdam, Amsterdam.

Mincer, J. (1991) Education and unemployment, *Working Paper 3838*, National Bureau of Economic Research, Cambridge, Massachusetts.

OECD (1993) Enterprise tenure, labor turnover and skill training, *Employment Outlook 1993*, pp. 119–55, Organization for Economic Cooperation and Development, Paris.

OECD (1995) *Jobs Study*, Organization for Economic Cooperation and Development, Paris.

OECD (1996) *Lifelong Learning for All*, Organization for Economic Cooperation and Development, Paris.

Oi, W. Y. (1962) Labor as a quasi-fixed factor, *Journal of Political Economy*, **70**, 538–55.