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Education, Allocation and Earnings in the Netherlands: Overschooling?

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Abstract — This paper documents the increased participation in higher education in the Netherlands and its consequences for the relation between levels of education and job levels. Undereducation has been reduced, overeducation has been increased. This does not imply private or social inefficiency, as even years of "overeducation" earn a positive rate of return. A general specification of the earnings function is derived from allocation models of the labor market. It contains the human capital specification and the job competition specification as special cases, and proves superior to both.

INTRODUCTION

IN THE recent decade, the role of education as an instrument in promoting many desirable goals has increasingly been criticized. Once education was seen as the almost self-evident vehicle in promoting national economic growth, individual development and a more equitable distribution of income. These beliefs have led to an impressive expansion of participation in higher education. Individuals who undertook the education on the basis of favorable expectations on the returns to schooling and governments have stimulated the expansion by supplying the opportunities at a heavily subsidized cost to individuals.

The growing enrolments have been accompanied by a number of disappointments. Rewards to education have declined, the success of schooling for minority groups and persons with a weak labor market position has been modest and the motivation of students has become problematic, in particular in the ages of compulsory education. Doubts have mounted on the value of an education, in particular on the social value of it. Perhaps the educational expansion has gone too far? The experiences have had a marked impact on the theories analyzing the role of education with respect to the labor market. The once dominant human capital theory has been contested by theories of labor market segmentation and of education as a screening and signalling device. Analyses of the effect of education on earnings have increasingly paid attention to the intermediating role of the process of labor market allocation. The present paper fits in with that emphasis.

The purpose of this contribution is to provide a picture of the developments in the Netherlands. It will document changes in educational participation, in the relation between individuals' education and the quality of the job they hold and it will stress the impact of labor market allocation on earnings. The empirical approach is very similar to that of Duncan and Hoffman (1981). Theoretically, it fits in with the assignment literature as developed by Tinbergen (1956), Sattinger (1975, 1980) and Hartog (1981, 1985b).

EDUCATION AND ALLOCATION

In 1961, 10% of the Dutch males leaving full-time schooling did so with only 6 years of basic education; this was reduced to less than 1% in 1981. The share of those leaving with a higher vocational education increased from under 6 to over 16%, of those with a

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university training from 3 to 11%. The figures for females show a reduction from almost 7 to 1% for basic education, an increase from 4 to 14% for higher vocational and from under 1 to 5% for a university education.[1]

The changing composition of the outflux of the educational system has obviously affected the composition of the labor force. The development towards increased levels of schooling has even been strengthened by the composition of labor force withdrawals at higher ages. Withdrawals on account of early retirement and disability have fallen disproportionately on the lower educated. To illustrate with the same schooling categories as above: in 1961 57% of the male labor force only had basic education, 2% had attended a higher vocational education and 1½% had at least some university education. In 1975, these figures had changed into 34% basic, 7% higher vocational and almost 4% university education. For females the corresponding figures changed from 54%, ½%, and ½% in 1961 to 32%, 8% and 1½% in 1975.[2] The general result is clear: as in all developed countries, the level of education of the labor force in the Netherlands has risen strongly during the last two decades.

In order to investigate the effects of these supply shifts on the allocation in the labor market, it would be quite attractive to characterize jobs by one or a few variables and use these for a summary description of positions obtained with a given education. Two methods are in use to obtain such variables. The first method is based on an evaluation of jobs by job analysts. It aims at specifying job requirements needed for successful performance, based on the complexity and difficulty of the tasks to be accomplished. Job requirements may relate to many traits and characteristics of individuals (compare the US *Dictionary of Occupational Titles*), but often requirements are compressed to a single variable. The second method, further discussed below, extracts information from the individual worker, by asking to specify the education required for adequate performance in the job.

The first method, using the grading of work by job analysts, has been applied in the Netherlands by Conen and Huygen (1980) and by Huygen *et al.* (1983). The grading, developed by the Dutch Department of Social Affairs and known as the ARBI-code, involves a distinction in 7 levels. It focuses on the degree of complexity of jobs, taking into account the job content and the worker's knowledge and ability needed to develop the required level of proficiency. Grading is from level 1, very simple work with a training time of a few days to level 7, work on a scientific basis. According to the authors' analysis, the job level structure exhibits a clear polarization in the period 1960–1971: the share of higher job levels (5, 6, 7) and of lower job levels (1, 2, 3) increased, while the share of middle job levels (4) strongly decreased. Job level 4 refers to skilled blue-collar work and middle administrative jobs. The period 1971–1977 exhibits a modest expansion of this polarization tendency.[3]

The joint effect of the changes in job structure and educational composition of the labor force can be studied from calculated utilization of education. This is a notoriously hazardous undertaking, since it requires a definition of a proper match between level of education and job level. It involves a rather simplistic notion of the link between worker quality and nature of the job (cf. Rumberger, 1983). It compresses a multidimensional allocation problem to a singular dimension and is inevitably based on an imperfect definition of the "proper match". Still, such an exercise is almost suggested by the nature of the scales used in grading the jobs: often the description of the grades refers to educational qualifications. This also applies to the present case: the instructions for applying the ARBI code explicitly refer to types of schooling. Using these instructions for defining a proper match between education and job level, the extent of utilization of education can be calculated;[4] results are given in Table 1.

The table indicates an unequivocal development: overutilization of education is strongly reduced, underutilization is equally strongly increased and the frequency of the proper match is virtually unchanged. It is reassuring to note that both datasets in 1971, based on different educational groupings to allow for comparability within a subperiod, generate almost identical results.

The second method to classify the demand side of the labor market in correspondence to the supply side involves asking individuals to evaluate the job they hold in terms of the education they think is desirable to perform adequately. This has the advantage of obtaining information from the source closest to the actual job situation, taking account of all specific circumstances. Compared to grading by job analysts, it lacks uniform instructions and measurements and may produce biased results on

Table 1. The utilization of education (percentages of workers)* — ARBI-code

	1960†	1971†	1971‡	1977‡
Job level below level of education	7.0	13.6	15.4	25.7
Job level matching level of education	57.5	59.3	55.2	53.6
Job level above level of education	35.6	27.1	29.5	20.6

*Proper match between job level and education based on the instruction for the ARBI-code, as in Hartog (1980).
†Labor force by education and job level based on Conen and Huygen (1980).
‡Labor force by education and job level based on Huygen *et al.* (1983).

several accounts. The actual practice of hiring and selection may be given more weight than the correspondence between the job content and the actual nature of training in school. Also, respondents may be inclined to picture a desired situation (like holding a job requiring much education) rather than the true situation. Hence, required education may be biased upwards, although this is by no means certain.

Evidence on the utilization of education derived from the second method is only available for one year, in a sample on quality of work in 1974. The results are remarkably close to those for 1971 presented in Table 1. Of the 1500 respondents 53% (in a representative national survey) indicate equality between desired and actual education, 17% indicate that a lower education would be sufficient while 30% indicate a higher level of education as desirable. Distinguished by level of education attained, it appears that underutilization increases monotonically with level of education, while overutilization diminishes almost monotonically.[5]

The results discussed above support the following conclusions. First, it is clear that at any point in time there is an important dispersion of job levels held by individuals with a given level of education. The job levels differ substantially in the demands they put on the worker, in complexity and difficulty of the tasks performed. This suggests that the rewards to education, both pecuniary and non-pecuniary, may vary widely among individuals and warrant further attention for the allocation process in the labor market. Second, there is clear evidence that the strong increase in educational levels of the labor force after 1960 has led to important changes in allocation. The assessment of these changes should be cautious. Job levels are measured on ordinal scales only and the evaluation of a proper match between education and job level cannot avoid elements of arbitrariness. Yet, qualitatively the available evidence points in one direction. The strong increase of participation in higher education has made it much more difficult to reach high job levels for the lower educated and has pushed higher educated workers to lower job levels. In that sense, "overutilization" of education has diminished and "underutilization" has increased. It is now time to turn to some consequences.

ALLOCATION AND EARNINGS

Analysis of the matching between job level and level of education based on the notion of an adequate match as a one-to-one relation is vulnerable to the criticism that this involves a very rigid view of optimal allocation. It suggests the existence, for each level of education, of an optimum job level and the implication that allocation to any other job level is necessarily suboptimal. Suboptimality is implied particularly with respect to underutilization: the individual is simply supposed to have been at school longer than necessary for his job.

Evaluating the nature of allocation would seem to require more information than that based on comparison with the "proper match", however defined: an "improper" matching need not be inefficient, as an overeducated individual may still be more productive than a properly educated individual working at the same job level and hence may still recover his investment. Therefore, it is needed to take a closer look at the consequences of allocation. In the absence of data on individual productivities this will be done by looking at earnings. Investigation of the earnings impact of allocation in the labor market will be guided by the theoretical literature and will attempt to test their implied specifications.

The first theoretical model is the human capital model. Concentrating on the variables discussed above and ignoring other variables (like experience etc.) for the time being, the standard human capital earnings equation runs:

$$\ln Y = \alpha_0 + \alpha_1 s \qquad (1)$$

where Y = individual earnings,
s = years of education actually attained.

Human capital theory is fundamentally a supply-side theory and earnings are not supposed to be affected by the requirements of the job.[6] In fact, job level and related variables are usually supposed to be subsumed in the age-earnings profile. Note that, under certain conditions, α_1 can be interpreted as the rate of return to education (Mincer, 1974).

A quite opposite specification can be derived from Thurow's (1975) job competition model. In that approach, marginal productivity is taken as a fixed characteristic of the job, independent of the worker. Individual earnings are also supposed to be related to the job rather than to the worker. There is no claim of equality between earnings and marginal productivity, and in fact, it is not at all clear how exactly earnings are determined. Yet, it would be in the spirit of the theory to relate earnings to job characteristics and this is just what Thurow and Lucas (1972) did. In the present application this yields

$$\ln Y = \beta_0 + \beta_1 r \qquad (2)$$

where r = years of education required for the job.

A third specification can be derived from the allocation theory, developed by Tinbergen (1956), Sattinger (1980), Hartog (1981) and others. Essentially, these theories stress that wages are instrumental in allocating heterogeneous workers to heterogeneous jobs. The earnings function is a hedonic price equation, in which both supply and demand side parameters appear, in much the same way as in Lucas (1977). The specification used here will be similar to that estimated by Duncan and Hoffman (1981), to facilitate interpretation in line with the observations made in section 2:

$$\ln Y = \gamma_0 + \gamma_1 r + \gamma_2 s^o + \gamma_3 s^u \qquad (3)$$

where $s^o = s - r$ if $s > r$
$= 0$ otherwise
$s^u = r - s$ if $r > s$
$= 0$ otherwise.

Hence, s^o measures the years of overeducation, while s^u measures the years of undereducation. The rewards to education are then separated into rewards in case of a "proper matching" and corrections for under- and overeducation. Note however, that in the present application the notion of a proper matching is not a far reaching concept: it simply serves as a benchmark for earnings effects, without *a priori* implying an optimal allocation. Also, the interpretation of required years of education need not be very strict: one may simply take it to indicate a ranking of jobs.[7]

Now, note that Equation (3) encompasses (1) and (2) as special cases. The human capital specification emerges if $\gamma_1 = \gamma_2 = -\gamma_3$ and the job-competition specification emerges if $\gamma_2 = \gamma_3 = 0$. Hence, estimation can proceed with Equation (3), testing for human capital and job competition theory as nested hypotheses.

The data used for estimating the earnings function are taken from a 1982 representative survey, in which 2677 persons were interviewed about labor force mobility, earnings and education.[8] Here, only observations on wage earners are utilized (n = 1132), as the rewards to independent work may be subject to different rules. Individuals have been asked to state their after-tax earnings in guilders per period (week or month), where earnings are described in the survey as net salary per week, 4 weeks or month. They are turned into hourly wages by dividing by hours worked per period. Hours are stated as the number of hours per week a person usually works in gainful employment. After-tax earnings tend to be more reliable than gross earnings as individuals are better informed about it; moreover, using net earnings allows interpretation of coefficients as private rates of return. Education was recorded according to the Standard Classification of Education used by the official statistical office. This code classifies school types in 5 levels, based on the standard duration and working out to multiples of 3 years (the lowest level takes 6 years; the highest 18). Individuals have been asked what schooling they consider the best preparation for their job, through the following question: "Which education, according to you, is the best preparation

for the work you are doing?". Although there are no further instructions to this question one may assume individuals to indicate formal education prior to entering this kind of work, as they see it now, and possibly followed by additional on-the-job training. But admittedly, the lack of instructions leaves some ambiguity. This "best-preparation education", henceforth called required education, has been coded in the same way as actually attained education.

The data can be used to depict the sample in terms of over- and undereducation, by a cross-tabulation of actually attained education s and required education r. Both are measured in years, but as indicated, only multiples of 3 occur. Table 2 gives the results.

Considering the difference in the way the variables have been measured, the correspondence with the results given in Table 1 is fairly close. Over 60% of the workers indicate a job level to match their education, as compared to the 54% measured in 1977 on the basis of job analysts' grading. The higher frequency of a proper match corresponds to a decreased proportion of underutilization, from 26 to 16%; the proportions of overutilization are about equal. As in the large data sets discussed above, the proportion of overutilization decreases monotonically with the level of education attained. However, the proportion of underutilization is now close to constant rather than monotonically increasing. In view of the differences in measurement and sampling, it would not be easy to decide to what extent the differences reflect real changes between 1977 and 1982. It is more important to note that the sample is in line with the earlier findings and seems sufficiently reliable to estimate the earnings functions derived above.

Estimation results for earnings functions conforming to specifications (1), (2) and (3) are given in Table 3. All the regression equations include years of experience and experience squared, but these results are not reported.[9] Concentrating first on the results for specification (3), it is found that they exhibit a very regular structure. The rate of return to education in the total population is about 7% if individuals are allocated to a job where required and attained levels of education are equal. The return for females is about 30% lower than that for males. If the individual ends up in a job that requires less schooling than the individual has available, there is a loss of return for each year of overeducation of 20% (i.e. the return falls from 7.1 to 5.7%). The loss is considerably larger for females than for males. If one manages to get a job requiring more education than available, the return, for each year of overutilization, drops by 2.5 percentage points, from 7.1 to 4.6%. Again, the earnings loss is larger for females than for males. Under- and overeducation have asymmetric effects on male earnings. A t-test on the difference of the coefficients[10] establishes a statistically significant difference at 1%. The difference is not significant for women (at 50%). Adding the square of years over- and undereducated did not produce significant coefficients. Hence, the impact of "mallocation" is log linear.

The hypotheses of earnings equations restricted either to specification (1) or to specification (2) can be tested with an F-test on the residual sum of squares. These tests are summarized below.

The results show that both for the total population

Table 2. The utilization of education (percentage of workers) — worker assessment

	r = education required, in years (multiples of 3)			
s = education attained, in years (multiples of 3)	$r < s$ Underutilized	$r = s$ Properly matched	$r > s$ Overutilized	n
6	15.7	5.9	78.5	51
9	9.5	52.2	38.4	232
12	19.5	69.2	11.2	383
15	17.6	73.9	8.5	153
18	16.1	83.9	—*	31
All educations	16.0	62.2	21.8	850†

*This case cannot occur.

†282 observations are incomplete on attained and/or required education.

Table 3. Three different earnings functions, for log net hourly wages

	Total	Males	Females
Equation (1)			
Schooling attained (s)	0.061***	0.065***	0.047***
	(13.94)	(12.31)	(5.97)
$\bar{R}^2$	0.385	0.327	0.322
Equation (2)			
Schooling required (r)	0.043***	0.046***	0.030***
	(12.10)	(11.02)	(4.30)
$\bar{R}^2$	0.342	0.287	0.260
Equation (3)			
Schooling required (r)	0.071***	0.076***	0.052***
	(15.40)	(13.93)	(5.86)
Years overeducated (s^o)	0.057***	0.065***	0.037***
	(8.13)	(7.43)	(3.15)
Years undereducated (s^u)	−0.025***	−0.019*	−0.040**
	(2.98)	(1.90)	(2.48)
$\bar{R}^2$	0.424	0.381	0.331
Number of observations	540	394	140

t-values are in parentheses; *, **, ***, indicate significance at 10%, 5%, 1%.
All regression equations also contain experience and experience squared; the equation for total included a dummy for sex.

Table 4. F-statistics of Equation (3) against the alternatives

	Total	Males	Females
(1) Human capital: $\gamma_1 = \gamma_2 = -\gamma_3$	19.29*	18.13*	1.94
(2) Job competition: $\gamma_2 = \gamma_3 = 0$	39.57*	30.70*	8.24*

* = significant at 0.1%.

and for the male subpopulation, specification (3), containing both supply and demand side parameters, is superior to both the human capital specification and to the job competition specification. Note that if one uses either of these specifications [i.e. (1) or (2)], one would underestimate the rate of return in comparison to properly allocated individuals: the coefficient on r in specification (3), applying when $s^o = s^u = 0$, is higher than the coefficient in (1) and (2).

For females, specification (3) is only superior to the job competition specification but not to the one derived from human capital theory. While the difference in the level of returns between males and females comes as no surprise, the difference in the nature of the function is remarkable. There may be a relation with differences in supply behavior. Both for participation and for hours worked, female labor supply has substantially higher wage elasticities than male supply (cf. Hartog and Theeuwes, 1985). This may explain why females have to be paid the returns to their actual education even in jobs for which they are overeducated. But apparently these high supply elasticities cannot prevent the full wage correction in jobs where females are undereducated. An *ad hoc* explanation might be that the supply elasticity is much lower at low levels of education (where most undereducation is found). If anything, the scanty evidence goes in the other direction.[11] The results can only be explained from further empirical work.

The claim that specification (3) is superior to either (1) and (2) (with the exception for females discussed above) may not be immediately shared by adherents to the theories they are to represent. They

might argue that these specifications are not correct representations. Consider first the way human capital has been treated. It may then be pointed out the standard human capital specification is included: the log of wages explained by years educated, experience and experience squared. Within that theory, required education has no place and the statistical significance of its coefficient is taken as evidence against human capital theory. However, one may attempt to rationalize the findings from effects of on-the-job training. Suppose that the variable "required schooling" is in fact an indication of required human capital for the job. It is acknowledged that human capital may be created by formal schooling as well as by on-the-job training, but it is measured in terms of equivalent formal schooling only. Hence, assume that earnings relate to an individual's actual human capital HC^A, which is created from actual schooling S^A and actual training T^A, in a technology with linear isoquants:

$$HC^A = \delta_s S^A + \delta_T T^A. \tag{4}$$

Suppose, further, that in a given job there is a minimum requirement of human capital HC^R. If $HC^A \geq HC^R$, there is obviously no problem. If $HC^A < HC^R$, training is given to make up for the gap. Fig. 1 gives an illustration.

If the individual's schooling is sufficient to produce the minimum human capital requirements, i.e. $S^A > HC^R/\delta_s$, the individual is employed without further training. If not, additional training is given:

$$T(S_A) = \frac{1}{\delta T}(HC^R - \delta_s S^A). \tag{5}$$

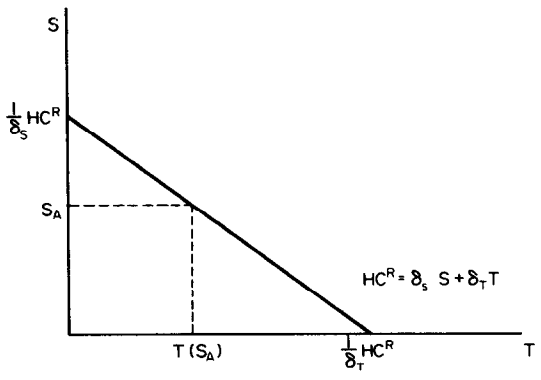

Figure 1. Training and required human capital.

In this case, the individual's human capital is equal to the minimum requirement HC^R.

Now, consider the implications for the earnings function. If schooling is sufficiently high, $S^A > HC^R/\delta_s$, training $T = 0$, and actual human capital, $HC^A = \delta_s S^A$. In this case, required schooling is absent from the earnings function, and specification (1) re-appears, with slight reinterpretation of the coefficient (now equal to $\alpha_1 \delta_s$). If schooling is insufficient, there is additional training in order to reach HC^R. But by assumption, HC^R is indexed by required schooling, and the earnings function will only include required schooling, and not actual schooling: specification (2). Hence, the reinterpretation of "required schooling" as an index of required human capital, while at the same time allowing for substitution between schooling and on-the-job training, does not seem to save the human capital interpretation. Perhaps a better argument can be made, but a neat formal presentation of such an argument has not been found in the literature.

The job competition theory also appears adequately represented. Thurow (1975) is explicit enough: "Wages are paid based on the characteristics of the job in question" (p. 76), and: "The individual's earnings depend upon the job he acquires and not directly upon his own personal characteristics" (p. 77). The representation in earnings function (2), admittedly simple by compressing all characteristics into a single variable, seems to do full justice to this hypothesis. One might seek an escape by denying any systematic simple relation between wages and job characteristics as given here, as the necessary "sociology of wage determination is in a rudimentary form" (*ibid.* p. 112) but that is not very helpful. Moreover, the specification seems adequate to test the claim from segmented labor market theories that education is not relevant for wages within (the lower) segments of the labor market: required education is an attractive operationalization of segments. One may of course argue that individual statements on required education do not have much value; however, empirical tests based on job analysts' evaluation produce very similar results (Hartog, 1985b).

COMPARISON WITH RESULT FOR THE U.S.

The general approach in this paper and the specification of the earnings function allow a direct comparison of allocation and earnings effects as

Table 5. Comparison of results for the U.S. and the Netherlands

	Incidence		Wage effect	
	U.S. 1976	NL 1982	U.S. 1976	NL 1982
Proper match: $r = s$	46.1	62.2	0.063	0.071
Overeducation: $r < s$	42.0	16.0	0.029	0.057
Undereducation: $r > s$	11.9	21.8	−0.042	−0.025

presented for the U.S. in Duncan and Hoffman (1981). To facilitate the comparison, Table 5 was constructed.

The results suggest that in Holland, in 1982, the distributions of available and required education were much closer to each other than in the U.S. in 1976. In the Netherlands, there was markedly less overeducation than there was in the U.S. The lower tension between the demanded and the supplied distribution manifests itself in the earnings function. In the Netherlands, required and excessive education are rewarded higher, and the penalty on overeducation is lower.

The lower incidence of overeducation in the Netherlands is not due to a lower growth rate of participation in education. Using data from Rumberger (1981), the share of individuals with 11 or more years of schooling grew from 53.6 to 76.5 between 1960 and 1976, i.e. by some 23 points. Combining some data sources for the Netherlands, the share of individuals with 12 or more years of education grew from 10.4 to 66.6 between 1960 and 1982, i.e. by 56 points. Even though one should be very cautious with these data for the Netherlands, due to problems of comparability arising from changes in the school system, it seems much more likely, that the cause of the difference is to be found at the demand side. Using the same data sources, it appears that in the U.S. in 1976, 21.9% of the jobs required virtually no schooling (0–5 years), whereas this held for only 3.8% in the Netherlands in 1982. Since the supply of this education level was 1.5% in the U.S. and 0% in the Netherlands, this bottom level already yields 20.4% overeducation in the U.S., but only 3.8% in the Netherlands. Thus, 16.6% of the 26% difference in overeducation is located at the bottom level. It is tempting to speculate about the cause of this effect. For example, it is quite conceivable that the relatively high level of the minimum wage in Holland has eliminated many jobs at the lowest end of the distribution. But this is mere speculation, as good studies on this issue are lacking. It would certainly be worthwhile, however, to investigate this further, using a structural model of the labor market.

CONCLUDING REMARKS

It has been demonstrated that the large changes in the educational composition of the labor force in the last two decades in the Netherlands have led to marked changes in the distribution of individuals by level of education across job levels. Using a standard for an adequate match between job level and level of education derived from job analysts' grading of work, it appears that underutilization of education has increased, overutilization has decreased and the frequency of the adequate match has almost been stable. The cross-section evidence of a dispersion of individuals with given education across job levels cannot be taken as convincing proof of a general inefficiency, and neither can the time series development of this dispersion. This requires more information on the effects of allocation. A social evaluation would need information on productivity. The feasibility of such work, given the necessary data, has been demonstrated by Tsang (1987), who establishes negative effects of overeducation on productivity by using job satisfaction as an intermediary variable. The present study was limited to the effect on earnings. It demonstrated that allocation has a significant effect: it does matter where an individual of given education ends up. In the process, an extended earnings equation, containing both supply and demand side parameters has been proven to be superior to both the human capital and the job competition specification. At present, one can certainly not conclude to a general inefficiency on account of individual "overeducation", since even years of overeducation earn a positive rate of return.

Obviously, more work is needed. The hourly wage rate measured as the ratio of earnings and hours worked may not be the proper "price" variable if hours worked come in tied packages with other elements in the labor contract and cannot be freely varied. The distinction between net wages relevant to workers and gross wages relevant to firms should be done justice. It would be better to use direct measures of productivity rather than wages. The differential incidence of unemployment should be given attention. The results reported here at least suggest that further attention for the effects of allocation in the labor market might be quite rewarding.

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NOTES

1. Data from Hartog (1980, Chap. 4) and CBS *Statistisch Zakboek* 1983 (Table F 24). The figures include both graduates and drop-outs.
2. Data from Hartog (1980, Chap. 4).
3. The research required additional grading of newly emerged jobs (not graded before in the ARBI-code) and an aggregation procedure from graded job titles into Census job titles, based on very limited information on the frequency of graded job titles. The aggregation procedure is perhaps the main weakness of the work. The ARBI-code may be briefly described as follows: (1) very simple work, requiring a few days of experience; (2) simple work, requiring a few weeks of experience; (3) somewhat complex work, requiring a few months of experience; (4) fairly complex work, requiring substantial experience and some theoretical knowledge; (5) complex work, requiring large experience and theoretical knowledge; (6) very complex work, requiring intermediate education and experience; (7) scientific work. The subperiods, 1960–1971 and 1971–1977, have been distinguished on the basis of availability of observations (only in the 3 years indicated) and some comparability problems: the Dutch secondary education system was divided up differently in the second period. The observations for 1960 and 1971 are from censuses, the 1977 observations are from a very large labor force survey.
4. For similar exercises, see Blaug *et al.* (1967), Rawlins and Ulman (1974), Berg (1970), Rumberger (1981) and for a critical evaluation, Miller (1980).
5. Details are given (in Dutch) in Hartog (1985a).
6. The job may have impact through the amount of on-the-job training it can provide (see the discussion in the text below), but human capital theory has never indicated the relation between education, job level and age (experience). Specifying such a relation as, e.g. a link between education, earnings profiles, job level profiles and experience is conceivable, but certainly not straightforward.
7. Certain interpretations of the coefficients in the earnings function, however, do require a strict interpretation of "required" education — see below.
8. The survey is known as the NPAO-Mobility Survey. The empirical results in this section are taken from the second author's graduate thesis, written under the supervision of the first author.
9. The number of observations is lower than in Table 2, due to missing observations on experience, earnings and/or hours worked. The non-reported results for experience conform to the usual parabolic earnings profiles. Other things equal, females earn significantly less than males. Alternative specifications employing age rather than experience have been run. With experience, rates of return are slightly higher; also, significance levels are higher. Years of experience is measured as the number of years one has worked in gainful employment.
10. This test is described in Johnston (1972), section 5.6
11. In an unpublished graduate thesis at Erasmus University (July 1984), Nicolette van der Hammen found own wage elasticities of participation for married females to fall with level of education, in a two-level distinction.

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