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The training of school-leavers Complementarity or substitution?

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Abstract

In theoretical discussions about the relation between education and training, the question of complementarity or substitutability between these two different forms of human capital is raised. If initial education and industrial training are substitutes, overeducated workers will participate less in additional training than workers who are adequately educated. It could explain the persistence of overeducation and implies that the social wastage of overeducation will be less. On the other hand, if initial education and industrial training are complements, existing differences in human capital will only increase by industrial training, implying the risk for some workers of 'missing the boat'. Supplementary to Groot we not only look at the impact of over- and undereducation (level) but also at non-matching fields of studies and the 'narrowness' of types of education. A sample of labour market entrants was used, so we did not have to cope with the disturbing influence of other forms of human capital: life and labour market experience. The paper gives evidence in support of both substitutability and complementarity between initial education and firm training.

JEL classification: I21; J24

Keywords: Overeducation; Training

1. Introduction

People spend a quarter of their lives at school, but learning does not stop when they leave. For both organisations and individuals, 'permanent education' is gradually becoming the normal state of affairs. In some cases work itself offers plenty of opportunities to learn, and in other cases training is given outside the immediate working environment. This training can have various functions, ranging from complete retraining (e.g. as a result of occupational mobility), through further training because skills have become obsolete, to training to help an employee master a new function. The last of these is particularly important for newcomers to the labour market. An analysis of the training which accompanies the entry of school-leavers to the labour market will highlight the match between the skills which are demanded in the labour market and the skills which are acquired during initial education. This will have implications for the question of what skills should be, or should not be, incorporated in initial education.

This article focuses first of all on the determinants of training participation of labour market entrants: what determines the probability that a school-leaver will receive training after leaving initial education? Are initial differences in human capital investments reduced or actually increased by further training? And is the main function of training to compensate for deficiencies in initial education (substitution), or does it in fact build on the skills acquired in the education system (complements)?

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This article examines the determinants of training for Dutch school-leavers from Short Senior Secondary Vocational Education (KMBO), Senior Secondary Vocational Education (MBO) and Higher Vocational Education (HBO), corresponding to three levels of educational attainment.[1] We look at one particular form of training, e.g. firm training, including both *external courses* and *in-company training*, but excluding informal on-the-job training and also excluding apprenticeship training.

2. Theoretical framework

When analysing the determinants of training, it is important to distinguish between two important functions of training. First, training can be considered as an investment in human capital, sometimes building on the skills which have already been acquired during initial education. Second, training can have a function in bridging any gaps which may exist between the skills which are demanded and those which employees possess. In theoretical terms, these functions correspond to two theoretical approaches, which overlap to some extent: the *human capital theory* and the *matching theory*. The theories can be said to overlap because training to supplement skills may also have the character of an investment. Nevertheless, the two theories model two different ways of looking at training.

The central principle of the *human capital theory* is that the skills which are acquired in training represent human capital, which is valued by employers because it leads to higher productivity. This higher productivity will be manifest in higher wages (Becker, 1975). This also shows that education and training are investments. Relevant short-term expenditure can generate a 'cash flow' in the long term. As with other investment plans, it is possible to carry out cost–benefit analyses, for example the internal rate of return (Psacharopoulos, 1987).

Employers will train their workers if the expected rate of return from the investment in training is higher than the alternative rate of return for investments with a similar risk (for example, the market interest). Of course, the expected rate of return on training is dependent on the training costs, but also on the investment horizon, the increase in productivity and the increase in wage costs. *Employees* can also decide to invest in training, and according to the human capital theory they will do so if the expected rate of return on the investment is higher than the alternative rate of return with an equal risk. The balance of the benefits (in higher wages) and training costs over the whole investment period produces an internal rate of return which is compared with an alternative rate of return.

One significant factor in determining the costs of training, for both individuals and employers, is the time needed to acquire new skills. Therefore the costs of training will be lower for individuals with a greater learning ability, as indicated by the educational level they have attained. Reversely, when there are fixed training costs higher educated people can learn more and therefore can raise more benefits. The ratio between the costs and benefits of training is thus more favourable for those with higher education than for those with lower-level education, so that a higher educational level will increase the probability of firm training. Formal education and firm training can then be considered as complements. Another important factor in determining the costs of training is the organisation size. Extensive empirical research has shown that large organisations train their personnel much more intensively than small organisations (CBS, 1995; Fracis, Hertz & Horrigan, 1995; Green, 1993). This may be partly due to economies of scale when purchasing, or providing training. In the case of in-company training, the fixed costs of training (for example the management and the premises for a training department) can be spread over a large number of employees, and in the case of out-company training it will be possible to obtain a discount for quantity. In addition, the 'pooling' of the training risks in larger organisations will produce a lower risk on the total investment.[2] Therefore, larger organisations will have a higher probability of employees participating in firm training.

The investment horizon is particularly important in determining the expected returns on the investment. For a given level of training costs, and given training benefits per period (change in productivity minus change in wages), the shorter the (expected) investment horizon is, the lower the net present value and internal rate of return on the investment will be. An employer will therefore be less likely to train part-time employees, since the training will be utilised and made to pay over fewer future working hours, and will also be less likely to train employees with a temporary contract, because of the higher risk that such employees will leave. Not the actual investment horizon, but rather the subjectively *expected* investment horizon determines the training investments. Employers who expect women to withdraw from the labour market will calculate a lower expected internal rate of return for women (see also Groot, Schippers & Siegers, 1988). This expectation is based on the average lab-

[1] See Appendix A for a description of the Dutch educational system.

[2] Ritzen (1991) makes a similar point, by suggesting that the inability of individuals to 'pool' their training risk leads to under-investment in general training.

our market behaviour of women (Green, 1993). This can lead an employer to be less ready to invest in training for women, so their probability of getting trained will be reduced.

In the analysis above, training has been considered mainly as a form of investment in human capital. But training can also, and simultaneously, serve the function of bridging differences between an individual's skills and the skills which are required. This aspect of training is most explicitly discussed in the *matching theory* and clearly refers to substitution between initial education and firm training. According to this theory, a mismatch between the required skills and the skills a worker actually possesses has important consequences for productivity, wages, the probability of an employee leaving, and so forth. Variations in the quality of the match (by level and field of study) will therefore lead to differences in the need for additional training (Barron, Black & Loewenstein, 1989). If the educational *level* which is required for a particular job is lower than the educational level of the person holding that job, this is known as overeducation, and if the educational level required for the job is higher than the educational level of the worker concerned this is termed undereducation. According to matching theory, undereducation will lead to a greater need for further training, while overeducation means that there is less need for training.

In addition to the effect of the educational level of a worker, the match between the employee's *field of education* and the field of education which is required for the job is also relevant. According to matching theory, if the field of the employee's education corresponds to the field which is required, the need for further training in the form of firm training will be less, and vice versa.

Types of education also vary in the scope of the occupational field for which they prepare (De Grip & Heijke, 1989). Some types of education prepare students for a narrow occupational domain (for example, Senior Secondary Vocational Education for pharmacy assistants), while others prepare for a broad occupational field (for example, Senior Secondary Vocational Education in mechanical engineering). If school-leavers from a 'narrow' type of education find work in their own field, the need for supplementary training will presumably be less than for people with a 'broad' education working in their own field. However, if school-leavers from a 'narrow' type of education find employment outside the field in which they studied, the need for training (i.e. retraining) will be even higher.

3. Data

The data which have been used to answer the research questions come from the STOA (Schoolverlaters tussen onderwijs en arbeidsmarkt) survey which records the flows of school-leavers and their destinations in the labour market. The STOA survey gives a representative nation-wide picture of young people leaving General Secondary Education, Junior Secondary Vocational Education, Short Senior Secondary Vocational Education, Senior Secondary Vocational Education, or Higher Vocational Education. The survey is held approximately $1\frac{1}{2}$ years after leaving school.[3]

The data used for this analysis come from the 1996 survey which records the 1994/95 school-leavers cohort. The present analysis is based on a sub-sample consisting of school-leavers who completed Short Senior Secondary Vocational Education (KMBO), Senior Secondary Vocational Education (MBO) or Higher Vocational Education (HBO). They had paid work in the Netherlands for at least 12 hours per week at the time of the survey, were not self-employed and were also not participating in full-time education or apprenticeship. Those who did not satisfy these conditions or who had missing values on the variables which were used for the analysis were excluded. This resulted in a sub-sample of 11,901 cases who had studied in 129 different fields of study.

The indicator of participation in firm training is the question whether the school-leavers had participated in a course or in-company training since the time of the survey (i.e. about $1\frac{1}{2}$ years). It excludes hobby courses, informal on-the-job training and apprenticeship training.

The following variables have been selected as determinants of the probability of training: gender, ethnic background, educational level, width of initial education, size of the organisation, branch,[4] part-time work,[5] overeducation or undereducation,[6] the length of service (in months), and the field of study required for the job.[7]

[3] STOA is a combination of two former surveys — RUBS and HBO-Monitor. For a more detailed description of the STOA survey, see ROA (1997a,b).

[4] Classified using standard industrial classification (SBI) employed by Statistics Netherlands.

[5] Defined as contractual employment for 32 hours or less per week.

[6] The school-leavers were asked what educational level was required for their job. This required educational level is compared with the level of education they have completed. The various types of education are divided into the following levels: (1) Primary Education; (2) Junior Secondary Vocational Education/Junior General Secondary Education; (3) Short Senior Secondary Vocational Education; (4) Senior Secondary Vocational Education/Senior General Secondary Education/Pre-University Education; (5) Higher Vocational Education or higher. If the required educational level is below the employee's actual educational level, this is called overeducation and if the required educational level is higher than employee's actual educational level this is called undereducation.

[7] This match is determined directly, by asking the respondents whether the required type of education for their job is their own field, a related field, another field, or no particular field.

The width of the respondent's initial education has been operationalised as follows (see also Appendix B). For each of the 129 different fields of study, a Gini–Hirschman coefficient (Sheldon, 1985) was calculated for the dispersion of people with that type of education across the occupational groups. This coefficient is a continuous variable ranging from 0 (if every school-leaver finds employment in the same occupational group) to 1 (if school-leavers are evenly dispersed over all occupational groups). The occupational dispersion of workers with a certain type of education represents the *width* of that type of education.

4. Results

What are the most important determinants of training? To answer this question, a logistic regression equation has been estimated, for the probability of participation in firm training. The results are shown in Table 1. For the averages and standard deviations of all the variables used, see Appendix C.

Some of the variables which are included in the estimation model have already been discussed in the theoretical section, like gender, educational level, the width of initial education and the size of the organisation. The model also incorporates a number of other personal, educational and organisational characteristics (such as ethnic background and branch) which have not been explicitly considered in the theoretical framework.

Table 1 contains estimation results of the basic model, which encompasses almost 12,000 cases. To detect any interaction effects between the field of study which is required for the job and the type of education which has been followed, additionally four separate equations have been estimated (see also Table 1). Moreover, to explore interaction effects[8] of the level of educational attainment and the *width* variable, Table 2 was included (in combination with Appendix D).

The hypothesis that a higher educational level increases the probability of training, is clearly confirmed by our model. School-leavers of the reference category HBO have a significantly higher probability of training participation than school-leavers of MBO, who in turn have a significantly higher probability of training participation than school-leavers at the lowest KMBO-level (respectively t=3.3 and t=2.8). The result is also robust for the separate equations in Table 1. This finding is in line with other empirical studies, which also point to a positive relationship between the educational level of employees and participation in training (see for example OECD, 1991; Allaart, Kunnen, Praat, van Stiphout & Vosse, 1991).

The positive relation between organisation size and participation in firm training is also clearly confirmed in this analysis. In very large firms (500 employees or more) or large firms (50–499 employees), school-leavers participate in firm training significantly more often than in organisations with 10–50 employees (the reference group), while in very small organisations (1–10 employees) there is a significantly lower probability of participation in firm training.

The impact of the benefit-side of the investment in firm training is also confirmed by our data of school-leavers. Derived from the human capital theory we formulated the hypothesis that employees working under part-time contracts are less likely to participate in firm training, since the 'life-time' benefits of the new qualifications will be less for such employees. The hypothesis that employees with a permanent contract are more likely to participate in firm training was also confirmed by the analysis. The effect is quite strong; with an average chance of training since leaving school of 0.37, the predicted chance of school-leavers with a permanent contract is 0.52. Contrary to our expectations the probability of training participation of women is the same as for men.

In outlining the theoretical framework, a number of hypotheses relating to the function of training in bridging differences between an individual's skills and the skills which are required were formulated. Someone who has completed a course at a higher educational level than is required for the job (overeducation) will be less likely to participate in firm training, while undereducation will result in a higher probability. The results in Table 1 show that overeducation indeed has the expected effect on the participation rate of firm training. Overeducation results in a significantly lower probability of this kind of training. In models (2), (3), (4) and (5), the effect of overeducation is also negative, but in (2) and (4) it is not significant. The expected positive effect of undereducation on training participation is not confirmed in the analysis. The standard error of this parameter is high, because only 2% of school-leavers found a job above their educational attainment.

The lower probability of firm training for overeducated school-leavers is not necessarily due to a surplus of skills. There are two other possible reasons: a non-random quit rate and/or a non-random learning ability. Hersch (1991) gives evidence in support of the intuitive notion that overeducated workers are less satisfied with their jobs and are more likely to quit. The lower training probability of overeducated school-leavers — compared with school-leavers with the same educational attainment but with a job at a matching level — could therefore be due to a higher quit intention. A higher quit intention

[8] The addition of an interaction parameter HBO×width in the basic model is significant at a 99% confidence level (coefficient is −1.24; standard error is 0.48). The complete results are available on request.

Table 1
Estimation results for the probability of participation in firm training (logit)[a]

	Baseline model (1)		Own field (2)		Related field (3)		Another field (4)		No particular field (5)	
	b	SE	*b*	SE	*b*	SE	*b*	SE	*b*	SE
Female	−0.01	0.04	−0.06	0.11	0.01	0.06	−0.11	0.19	−0.06	0.10
Ethnic minority	−0.22	0.16	0.03	0.33	−0.24	0.21	−1.34	0.72	−0.31	0.43
KMBO	−0.87**	0.14	−2.10**	0.62	−0.73**	0.23	−0.83	0.45	−0.68**	0.23
MBO	−0.45**	0.05	−0.47**	0.12	−0.43**	0.07	−0.31	0.23	−0.48**	0.11
HBO	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Width of initial education	−0.28*	0.11	−0.85**	0.23	−0.24	0.17	0.53	0.66	0.16	0.36
1–9 employees	−0.14*	0.07	0.08	0.14	−0.37**	0.10	0.60	0.32	−0.21	0.16
10–49 employees	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
50–499 employees	0.27**	0.05	0.23	0.12	0.24**	0.07	0.67**	0.25	0.30**	0.12
500 or more employees	0.53**	0.05	0.50**	0.13	0.52**	0.07	0.29	0.26	0.60**	0.12
Agriculture and fisheries	−0.03	0.17	−0.10	0.39	−0.02	0.24	−0.60	0.90	0.30	0.32
Industry and mining	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Construction	0.32**	0.11	0.36	0.22	0.31*	0.15	−0.75	0.53	0.51	0.32
Commerce, hotel and catering	0.16*	0.07	0.60**	0.19	0.10	0.10	0.02	0.32	0.28	0.17
Transport and communication	0.39**	0.10	0.59*	0.30	0.44**	0.14	0.09	0.43	0.44*	0.21
Commercial services	0.77**	0.06	0.51**	0.16	0.70**	0.08	0.71*	0.29	1.20**	0.16
Other services	0.13	0.08	−0.24	0.18	0.14	0.11	−0.07	0.33	0.64**	0.20
Health care	−0.37**	0.08	−0.48**	0.19	−0.46**	0.11	−0.55	0.43	0.00	0.27
Overeducation	−0.25**	0.05	−0.07	0.16	−0.17**	0.07	−0.10	0.19	−0.37**	0.10
Matching level	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Undereducation	−0.07	0.17	−0.76	0.50	−0.09	0.24	0.93	0.53	0.23	0.45
Own field of study	ref	ref	.	.	.	.	.	.	.	.
Related field of study	0.20**	0.05	.	.	.	.	.	.	.	.
Another field of study	0.44**	0.10	.	.	.	.	.	.	.	.
No field of study	0.17*	0.07	.	.	.	.	.	.	.	.
Permanent contract	0.61**	0.05	0.59**	0.12	0.61**	0.07	0.68**	0.22	0.64**	0.12
Part-time job	−0.25**	0.06	−0.02	0.12	−0.27**	0.09	−0.51	0.29	−0.27*	0.14
Length of service	0.02**	0.00	0.01	0.01	0.02**	0.00	0.03	0.02	0.01	0.01
Constant	−1.06**	0.12	−0.58**	0.24	−0.90**	0.17	−1.46*	0.62	−1.32**	0.35
Number of cases	11901		2439		6602		564		2296	
−2 log likelihood	14872		3041		8326		698		2689	

[a] Asterisks indicate significance: *$p<5\%$; **$p<1\%$. Not included in the model.

Table 2
Estimation results of the probability of participation in industrial training (logit) in the baseline model, and separately for school-leavers working in a job for which training in their own field, a related field, another field, or no particular field, is required[a]

	Total		Own field		Related field		Another field		No particular field	
	b	SE	*b*	SE	*b*	SE	*b*	SE	*b*	SE
MBO	(6a)		(7a)		(8a)		(9a)		(10a)	
Width of initial education	1.20*	0.52	−0.08	1.07	1.82**	0.74	3.51	3.43	1.90	1.19
Overeducation	−0.27**	0.10	−0.10	0.27	−0.24	0.15	−0.07	0.39	−0.41*	0.18
Matching level	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Undereducation	0.32	0.29	−0.33	0.89	−0.05	0.40	2.15	1.16	1.21	0.75
Own field of study	ref	ref	.	.	.	.	.	.	.	.
Related field of study	0.02	0.10	.	.	.	.	.	.	.	.
Another field of study	0.28	0.20	.	.	.	.	.	.	.	.
No field of study	−0.23	0.13	.	.	.	.	.	.	.	.
HBO	(6b)		(7b)		(8b)		(9b)		(10b)	
Width of initial education	−0.36**	0.12	−0.73**	0.25	−0.28	0.18	0.69	0.70	−0.07	0.39
Overeducation	−0.23**	0.06	−0.04	0.20	−0.16*	0.08	−0.17	0.24	−0.33*	0.13
Matching level	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Undereducation	0.46	0.29	−2.58*	1.06	0.27	0.41	1.26	0.87	0.10	1.18
Own field of study	ref	ref	.	.	.	.	.	.	.	.
Related field of study	0.21**	0.07	.	.	.	.	.	.	.	.
Another field of study	0.44**	0.13	.	.	.	.	.	.	.	.
No field of study	0.27**	0.09	.	.	.	.	.	.	.	.

[a] Asterisks indicate level of significance: *$p<5\%$; **$p<1\%$. Not included in the model.

leads to a shorter investment horizon, so it will be less attractive to invest in firm training. Therefore, we also estimated a model in which we controlled for the quit intention of school-leavers.[9] The regression coefficient of the variable *quit intention* is only −0.07 — with a standard error of 0.05 — so it is not statistically significant. Moreover, adding this extra variable has no impact on the regression coefficients of over- or undereducation. So, overeducated school-leavers do not have a lower chance of being trained *because* they are bound to leave the company earlier.

Secondly, suppose that there is an unobserved variable *learning ability* which both influences the probability of firm training and the probability of being overeducated. School-leavers who have to step aside to a job under their educational attainment might have less learning ability than school-leavers with the same educational attainment who find a job at a matching level. This would result in the human capital argument that school-leavers with less learning ability will need more time to acquire new skills, so the training costs will be higher and the probability of training will be lower. In that case the explanation for a negative effect of overeducation on the likelihood of firm training is not the lesser need for training because of the surplus of skills, but the lesser ability of overeducated school-leavers. To test the validity of this alternative explanation a logit model of being overeducated was estimated. The residual ε_1 will capture the influence of unobserved variables on the chance of being overeducated, while residual ε_2 captures the influence of unobserved variables on the chance of being trained. A correlation between ε_1 and ε_2 is an indication of the existence of an unobserved variable that both influences the probability of overeducation and the probability of firm training. However, the result of this analysis shows that the correlation between ε_1 and ε_2 is almost zero (0.0032). The explanation that overeducated school-leavers have a lower likelihood of firm training because of their surplus of skills is therefore not falsified by the data.

The hypothesis that school-leavers who are working within the field in which they studied would have less need for further training than school-leavers who find work in a field other than that in which they studied, was also confirmed (Table 1). Both school-leavers who have found a job in which a related field of study was required and school-leavers who have found a job in which another field of study was required, have a significantly

[9] They were asked if they had been searching for another job in the previous 4 weeks.

higher likelihood of training participation. Furthermore, the difference between the latter two coefficients — related and another field — is also significant (t=2.0). Thus, the more deviant the field of study the more often training is required. This is in line with the assumption that school-leavers who work within the field in which they have studied would have less need for additional training compared with people who are working outside the field in which they studied.

When formal education and additional training can be considered as substitutes, an interaction effect for the width of that formal education is expected. School-leavers from a 'narrow' type of education who find work in their own field will need less supplementary training. However, if school-leavers from a 'narrow' type of education find employment outside the field in which they studied, the need for training (i.e. retraining) will be even higher. This substitution hypothesis is not confirmed by the estimation results of Table 1. On the contrary, school-leavers who find a job in their own field of study have a significantly lower chance of training participation the broader the formal education is. Narrow types of education lead to more training, especially for school-leavers who find a job in their own field. This is a confirmation of the complementarity hypothesis, e.g. the more one has the more one gets.

Breaking the five models down by level of education — MBO and HBO (see Table 2 and Appendix D) — shows different effects of the width of education. The above finding, that narrow types of education lead to more training, especially for school-leavers who find a job in their own field, is only valid for HBO. For MBO, broader types of education lead to more training, especially for school-leavers who find a job in a related field of study. This latter result is puzzling because it confirms neither the complementarity hypothesis nor the substitution hypothesis.

5. Summary and conclusions

Several hypotheses were formulated on the basis of the human capital theory and the matching theory. The most important findings can be summarised as follows.

1. As expected, a higher educational level results in a higher probability of participation in firm training. Also, the probability of participation in firm training being higher in large organisations is confirmed.
2. Part-timers as well as school-leavers with a temporary contract are significantly less likely to participate in firm training than full-timers and school-leavers with a permanent contract, respectively. Male school-leavers did not have a significantly higher probability of participation in firm training.
3. As expected, overeducation results in a lower probability of participation in firm training. Undereducation did not, however, lead to a higher participation rate.
4. School-leavers working outside the field in which they studied are more likely to participate in firm training than school-leavers working within the field in which they were initially educated.
5. School-leavers from a 'narrow' type of education (i.e. a type of education focused on one or only a few occupational groups) who work in their own field are more likely to participate in firm training than school-leavers from broader types of education who are working in their own fields. However, this is only valid for school-leavers of HBO.

As regards the determinants of firm training of labour market entrants, we have to conclude that these confirm the expectations related to the rate of return of firm training. For example, the effects of educational level, the size of the organisation, part-time work and temporary work all confirm the hypotheses of the human capital theory.

According to the matching theory, initial education and firm training can be seen as substitutes. The results of this study indicate that training not only has a function of investment in human capital, but also serves a function in bridging discrepancies between the skills possessed by the school-leavers and the skills demanded on the labour market. In the first place, it appears that school-leavers who are working in jobs which are below their educational level are trained less. This is an important finding, because as many as one in three of all working school-leavers are over-educated for the jobs they have. Secondly, school-leavers who work in the field in which they were educated are less likely to be trained than school-leavers who find work in a related or another field of study. The need for additional training is stronger for school-leavers who have to step aside to a completely different field of study than for school-leavers who switch to a related field of study than that in which they were educated. These findings indicate that firm training has a clear function to bridge skills gaps between the skills attained and the skills required.

The effect of the width of the type of education on training participation is ambiguous. At HBO-level, a narrower type of education leads to more training, which is a confirmation of the idea that formal education and training are complementary. However, at MBO-level there is no evidence of complementarity or substitution.

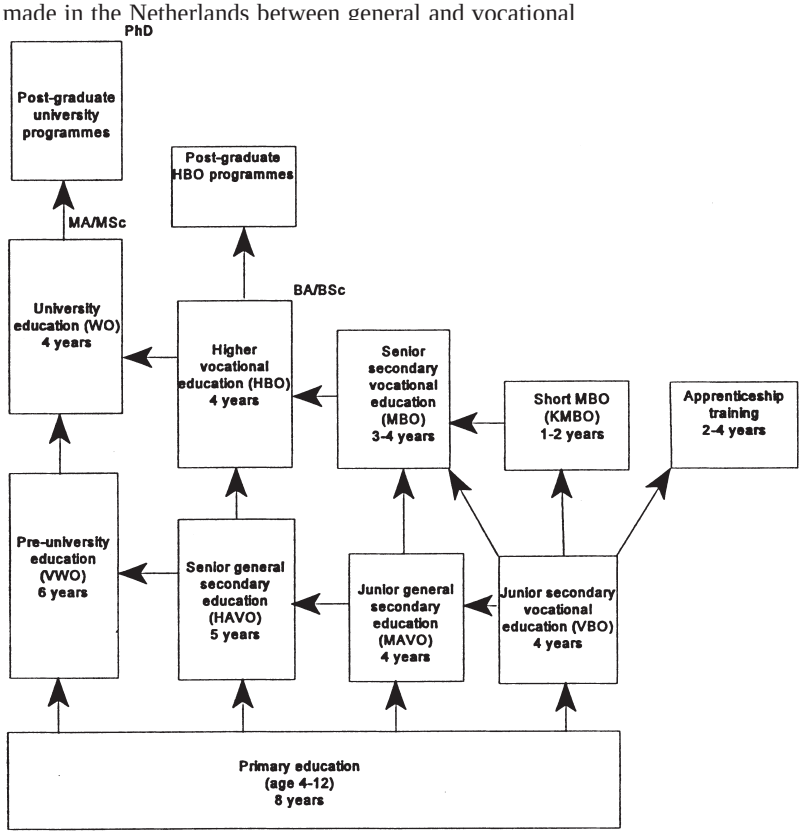
The question of whether training can compensate for any deficiencies in formal education (substitution) or only increases already existing differences in human capital (complementarity) has not been solved in this article. One could conclude, however, that the substitution character of training is merely detected in the characteristics of the job (level and type of the job) while

evidence for the complementarity character of training is merely found in the characteristics of the formal education (level and width).

Appendix A

A.1. Dutch educational system

Like most other European countries, a distinction is made in the Netherlands between general and vocational education. As shown in the diagram of the Dutch educational system, vocational education ('Beroeps Onderwijs') takes place at three educational levels: the level of junior secondary vocational education (VBO), the level of senior secondary vocational education (MBO) and the level of higher education (vocational colleges (HBO) and university (WO).



Appendix B

One measure of the possibilities of switching occupations offered by a type of education is the Gini–Hirschman coefficient of the occupational dispersion of workers with that education, GH_i^{occ} (see Sheldon, 1985):

$$GH_i^{occ}=\left(1-\sum_o p_{io}^2\right)\frac{N_o}{N_o-1}$$

in which p_{io} is the proportion of workers with education i who work in occupation o, and N_o is the number of occupations.

This factor can range between 0 and 1. If the GH^{occ} coefficient is 1, workers with that education are equally spread over all occupations, and if GH^{occ} is 0, workers with that education are found in only one occupation. Thus, the higher the value of the GH^{occ} coefficient, the greater the possibilities available to workers with that education to switch occupations.

Appendix C

Table 3

Appendix D

Tables 4 and 5

Table 3
Averages and standard deviations for all variables[a]

	Unweighted plus listwise deletion of missing values (for estimates)		Weighted plus pairwise deletion of missing values (for description)	
	Average	SD	Average	SD
Female	0.54	0.50	0.51	0.50
Ethnic minority	0.02	0.13	0.02	0.14
KMBO	0.03	0.17	0.12	0.33
MBO	0.29	0.46	0.48	0.50
HBO (ref.)	0.68	0.47	0.40	0.49
Width of initial education	0.71	0.20	0.73	0.17
1–9 employees	0.12	0.33	0.15	0.36
10–49 employees (ref.)	0.33	0.47	0.37	0.48
50–499 employees	0.29	0.46	0.26	0.44
500 or more employees	0.25	0.43	0.21	0.41
Agriculture and fisheries	0.02	0.14	0.02	0.15
Industry and mining (ref.)	0.15	0.36	0.16	0.37
Construction	0.04	0.19	0.06	0.23
Commerce, hotel and catering	0.16	0.37	0.21	0.41
Transport and communication	0.05	0.21	0.05	0.22
Commercial services	0.27	0.45	0.21	0.41
Other services	0.14	0.34	0.14	0.35
Health care	0.17	0.37	0.14	0.35
Overeducation	0.26	0.44	0.30	0.46
Matching level (ref.)	0.72	0.45	0.67	0.47
Undereducation	0.02	0.12	0.04	0.19
Own field (ref.)	0.20	0.40	0.20	0.40
Related field	0.55	0.50	0.51	0.50
Another field	0.05	0.21	0.05	0.22
No particular field	0.19	0.40	0.24	0.42
Permanent contract	0.76	0.43	0.72	0.45
Part-time job	0.19	0.39	0.22	0.41
Length of service	9.8	5.8	9.9	5.9
Firm training	0.43	0.50	0.37	0.48

[a] KMBO, Short Senior Secondary Vocational Education; MBO, Senior Secondary Vocational Education; HBO, Higher Vocational Education.

Appendix E

Table 6

Table 4
MBO: estimation results of the probability of participation in firm training in the basic model, and separately for school-leavers working in a job for which training in their own field, another field, and no particular field is required. Values are regression coefficients with standard errors (SE)[a]

	Total		Own field		Related field		Another field		No particular field	
	b	SE	*b*	SE	*b*	SE	*b*	SE	*b*	SE
MBO		(6a)		(7a)		(8a)		(9a)		(10a)
Female	−0.09	0.09	−0.20	0.22	−0.17	0.12	−0.02	0.43	0.07	0.18
Ethnic minority	−0.24	0.25	0.33	0.44	−0.38	0.38	−1.08	1.06	−0.88	0.71
1–9 employees	−0.20	0.11	−0.29	0.22	−0.23	0.16	0.40	0.52	−0.24	0.23
10–49 employees	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
50–499 employees	−0.07	0.10	0.26	0.24	−0.09	0.14	0.45	0.55	−0.38	0.23
500 or more employees	0.10	0.11	−0.15	0.29	0.20	0.15	−0.02	0.57	0.04	0.23
Agriculture and fisheries	0.07	0.21	−0.03	0.48	0.16	0.30	−0.59	1.30	0.25	0.44
Industry and mining	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Construction	0.57**	0.19	0.40	0.37	0.55*	0.27	−0.40	1.02	1.17*	0.49
Commerce, hotel and catering	0.42**	0.13	0.90**	0.31	0.29	0.18	0.22	0.58	0.55	0.29
Transport and communication	0.61**	0.18	0.89	0.49	0.60**	0.24	1.07	0.80	0.54	0.41
Commercial services	0.80**	0.15	0.50	0.35	0.76**	0.20	0.77	0.70	1.19**	0.34
Other services	0.58**	0.17	0.22	0.40	0.52*	0.24	0.47	0.74	1.27**	0.37
Health care	−0.53**	0.16	−0.86*	0.36	−0.40	0.22	−1.37	1.00	0.07	0.48
Permanent contract	0.37**	0.10	0.67**	0.27	0.28*	0.13	0.68	0.49	0.31	0.19
Part-time job	−0.09	0.10	0.45	0.26	−0.24	0.15	−0.41	0.50	0.04	0.20
Length of service	0.00	0.01	−0.01	0.02	0.01	0.01	0.02	0.04	−0.02	0.01
Constant	−2.03**	0.43	−1.30	0.91	−2.43**	0.62	−4.14	2.81	−2.76**	1.00
Other derminants (see Table 2)	y	y	y	y	y	y	y	y	y	y
No. of cases		3477		725		1778		146		828
−2 log likelihood		4113		819		2140		173		922

[a] Asterisks indicate significance: *$p<5\%$; **$p<1\%$.

Table 5
HBO: estimation results of the probability of participation in firm training in the basic model, and separately for school-leavers working in a job for which training in their own field, another field, and no particular field, respectively, is required. Values are regression coefficients with standard errors (SE)[a]

	Total		Own field		Related field		Another field		No particular field	
	b	SE	*b*	SE	*b*	SE	*b*	SE	*b*	SE
HBO		(6b)		(7b)		(8b)		(9b)		(10b)
Female	0.00	0.05	−0.02	0.13	0.05	0.07	−0.08	0.23	−0.13	0.13
Ethnic minority	−0.15	0.21	−0.19	0.51	−0.10	0.25	−1.08	1.25	−0.14	0.59
1–9 employees	−0.11	0.10	0.30	0.18	−0.42**	0.14	0.57	0.45	−0.23	0.24
10-49 employees	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
50-499 employees	0.38**	0.06	0.21	0.15	0.34**	0.08	0.60*	0.30	0.63**	0.16
500 or more employees	0.65**	0.06	0.67**	0.16	0.60**	0.08	0.28	0.31	0.87**	0.16
Agriculture and fisheries	−0.28	0.39	−4.58	7.67	−0.34	0.55	−4.89	9.55	0.70	0.64
Industry and mining	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Construction	0.18	0.14	0.41	0.29	0.20	0.19	−1.37	0.73	0.23	0.44
Commerce, hotel and catering	−0.00	0.10	0.26	0.29	−0.01	0.12	−0.02	0.41	0.07	0.23
Transport and communication	0.33**	0.13	0.42	0.39	0.44**	0.17	−0.22	0.53	0.44	0.27
Commercial services	0.74**	0.07	0.59**	0.19	0.70**	0.09	0.65	0.34	1.11**	0.19
Other services	0.07	0.09	−0.16	0.21	0.06	0.12	−0.14	0.39	0.45	0.25
Health care	−0.29**	0.10	−0.24	0.23	−0.43**	0.13	−0.20	0.52	0.02	0.36
Permanent contract	0.71**	0.06	0.56**	0.14	0.72**	0.09	0.74**	0.27	0.90**	0.16
Part-time job	−0.29**	0.08	−0.13	0.14	−0.30**	0.11	−0.62	0.40	−0.39	0.21
Length of service	0.02**	0.00	0.02*	0.01	0.03**	0.01	0.03	0.02	0.02	0.01
Constant	−1.20**	0.13	−0.79**	0.28	−1.06**	0.19	−1.52*	0.69	−1.49**	0.41
Other determinants (see Table 2)	y	y	y	y	y	y	y	y	y	y
No. of cases		8057		1667		4694		385		1311
−2 log likelihood		10303		2158		6011		474		1570

[a] Asterisks indicate significance: *$p<5\%$; **$p<1\%$.

Table 6
Estimation results of a logit model of the probability of being overeducated e.g. having a job with a lower required educational level than the educational attainment of the school-leaver[a]

	Regression coefficients (11)	Standard errors
Female	0.25**	0.05
Ethnic minority	0.22	0.18
KMBO	0.40**	0.13
MBO	−0.36**	0.06
HBO	ref.	ref.
Width of initial education	0.99**	0.16
1–9 employees	0.16*	0.08
10–49 employees	ref.	ref.
50–499 employees	−0.05	0.06
500 or more employees	−0.33**	0.06
Agriculture and fisheries	0.90**	0.16
Industry and mining	ref.	ref.
Construction	0.56**	0.13
Commerce, hotel and catering	0.37**	0.08
Transport and communication	0.23*	0.12
Commercial services	−0.82**	0.08
Other services	−0.24**	0.10
Health care	0.19*	0.09
Own field	ref.	ref.
Related field	0.94**	0.08
Another field	2.32**	0.12
No particular field	2.50**	0.09
Permanent contract	−0.48**	0.06
Part-time work	0.39**	0.07
Length of service	0.01*	0.00
Constant	−2.75**	0.15
Number of cases	11901	
−2 Log Likelihood	11341	

[a] Asterisks indicate significance: *$p<5\%$; **$p<1\%$.

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