6 Flexibility and Structure of the Dutch Labour Market

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Introduction

The labour market is not completely subdivided into separate submarkets for each category of educated labour. In practice, occupations can be fulfilled by individuals with different educational backgrounds. As a result of the similarities and differences of qualifications, two different types of education may have a joint occupational domain, but may also have occupational opportunities that are mutually exclusive.

This overlapping structure of the labour market makes it possible to adjust the employment of individuals with a particular educational background to the changing needs of society. If the relationship between occupation and education were a one-to-one relationship, the available supply of workers in the labour force with a particular educational background would be the only factor determining the occupational structure of the labour force. Due to overlap in the occupational domains of various types of education, however, adjustments in the educational background of the workforce in a certain occupation are possible, even indirectly, by employment changes of types of education that are not primarily suited for the occupation concerned.

Imagine, for example, that lawyers find work as civil servants, while economists become both civil servants and computer programmers, and technically skilled individuals also become programmers and can find work in technical jobs. If there is an increasing demand for technicians, the overlapping structure of the labour market might make it possible for workers with a technical educational background to move to the technical jobs, leaving the programming jobs for the economists. Similarly, the economists may leave the civil service jobs to the lawyers, of whom there may not be such a shortage on the labour market. The overlapping structure of the labour market therefore enables flexible adjustment to changing needs by possibly long chains of occupational job-to-job mobility.

A similar adjustment potential would be created if education had a very general nature, focussing on general abilities as is often propagated. The disadvantage of such an approach, however, would be that in this case flexibility would lead to a

great decrease of productivity. The curriculum should then provide the skills that are suited for a large number of occupations, while only one occupation will actually be taken. Given the amount of time available for education, this implies a reduction of the depth of the study. There is therefore a trade-off between a general curriculum and the degree of specialisation.

In the labour market, many changes may occur in the structure of occupational needs. Two types of changes can be distinguished. Firstly, the volume of certain occupational groups may increase while that of others shrinks. Since all types of education focus on specific occupations, this immediately implies a changing demand for education. Secondly, changes with respect to the qualifications required may take place within specific occupations. On the one hand, these changes of the required qualifications may be due to an upgrading process in which employers require higher skill levels because of the increased complexity of the technology used. On the other hand, these shifts may be caused by a change of the character of certain occupations. In certain logistic occupations, for example, technical knowledge is becoming less important, while economic qualifications are gaining importance, because the available equipment requires less knowledge, while at the same time the value of the capital involved increases. Finally, shifts of required qualifications may be caused by changes in the scarcity of different groups of workers, making it more attractive for employers to recruit workers with an educational background that is more prevalent and whose wages can be lower.

This chapter investigates the changes in the structure of the Dutch labour market between 1981 and 1993. Attention will be focussed on the occupational structure of the labour force with a certain educational background. The occupational domain of types of education and their mutual overlaps will be investigated for both 1981 and 1993, and we will analyse how the educational structure has been adjusted to the changing needs of the labour market in this period.

The remainder of the chapter is structured as follows. The second section gives a brief overview of the quantitative changes between 1981 and 1993. The third section investigates the measurement of the size of the occupational domain and the similarities between the occupational domains of different types of education. The fourth section provides an example of a changing overlapping structure. The fifth section describes the changes in the occupational structure, while the sixth section analyses the developments in similarity between types of education. Lastly, the seventh section contains some conclusions.

Changes in the Dutch labour market

In 1981 the Dutch working population consisted of 5.1 million people. In 1993 approximately 5.8 million people were employed. This implies an increase of 0.7 million people.[1] This increase is the result of both the entry of newcomers and the withdrawal of those employed in 1981. In addition, some changed occupations without leaving the labour market. These processes have led to increasing numbers of people working in certain occupational and educational groups and a reduction of employment in others. The educational groups which grew all together increased by 1.3 million people, while the others shrunk by 0.6 million. The growing occupations contain 1.2 million people more than in 1981, while there was an employment reduction of half a million for others. Occupational dynamics therefore, has been larger than educational dynamics.

Looking at each combination of type of education and occupation separately, there has been a total employment increase of 1.76 million people in some groups, while there has been a reduction of 1.09 million people in others. This means that there have been many more changes in the labour market than needed for a quantitative adjustment for the increase and decrease of occupations.

Table 1 provides an overview of the number of people in the workforce for different types of education. The table shows that there has been a major reduction of people with only Primary Education (PE). Also, some types of education at the Preparatory Vocational Education (PVE) level faced a small reduction in numbers of people. All other educational groups have been growing. In particular, some types of education at the academic level experience very large increases.

The changes of employment per educational category may correspond to the changes in the number of people required for specific occupations. In addition to the employment for all types of education in 1981 and 1993, the table therefore provides a calculation of the number of people required to cover the employment growth per occupation from 1981 until 1993, when the educational structure of all occupations was constant. This fixed structure projection for 1993, however, appears to be much more similar to the employment situation in 1981 than the educational distribution actually observed. Since the labour force grew between 1981 and 1993, more workers were required for most types of education, but this growth was not concentrated in certain types of education. PVE Agriculture and Technical were the only exceptions, facing a decline of the demand based on this fixed structure forecast, while at Intermediate Vocational Education (IVE) level Nursing and Paramedic Services and Commerce and Administration, at Higher Vocational Education (HVE) level Commerce and Administration, and Social and Cultural, and at University Education (UE) level Mathematics and Natural Sciences, Engineering, Medical Sciences, Pharmacy, Economics and Law

Table 1
Employment in 1981 and 1993 per educational category, and a comparison
between actual employment and projected employment based on
the educational structure in 1981

	Employ-ment 1981	Fixed struct. projection 1993	Employ-ment 1993	'Excess supply' p e r s o n s
%'81	× 1,000	× 1,000	× 1,000	× 1,000
PE	986	995	586	−410
	−42			
Lower General Secondary Education	418	455	399	−56
	−13			
PVE				
Agriculture	115	111	95	−16
	−14			
Technical	557	553	512	−42
	−7			
Transport & Harbour	12	12	39	27
	223			
Commerce & Administration	102	112	131	20
	19			
Community Care, Hotel & Catering	231	233	209	−24
	−10			
Security	3	4	7	3
	102			
Higher General Secondary Education	217	272	279	7
	3			
IVE				
Agriculture	89	92	122	30
	34			
Non-Medical Laboratory	5	6	13	7
	160			
Engineering	505	548	679	131
	26			
Transport & Harbour	44	49	44	−6
	−12			
Medical Laboratory	17	22	22	0
	1			

Nursing & Paramedical Services	113	170	173	3
3				
Commerce & Administration	482	568	666	99
20				
Administrative, Legal & Fiscal	40	50	46	−4
−9				
Social & Cultural	26	33	44	11
43				
Community Care	120	136	212	76
63				
Hotel, Catering & Hairdressing	35	36	47	11
33				
Police, Fire & Defence Forces	55	57	87	30
53				
HVE				
Teacher Training	209	234	243	8.5
4				
Interpreter & Translator	4	5	6	1
22				
Theology	3	3	4	0.5
20				
Agriculture	8	10	16	6.5
85				
Non-Medical Laboratory	14	20	29	9
63				
Engineering	89	141	118	−22.5
−25				
Transport & Harbour	20	26	26	−0.5
−2				

Table 1 (continued)
**Employment in 1981 and 1993 per educational category, and a comparison
between actual employment and projected employment based on
the educational structure in 1981**

%'81	Employ-ment 1981 × 1,000	Fixed struct. projection 1993 × 1,000	Employ-ment 1993 × 1,000	'Excess supply' p e r s o n s × 1,000
Medical Laboratory	13	16	19	3
24				
Nursing & Physiotherapy etc.	34	56	78	22
65				

Commerce & Administration	66	114	172	59	88
Business Administration Technology	1	2	11	9	777
Administrative, Legal & Fiscal	11	17	20	4	34
Social & Cultural	45	71	104	33	73
Hotel & Catering Industry	3	4	4	0	−3
Fine Arts	23	30	34	4	17
Police, Fire & Defence Forces	6	7	10	3	43
UE					
Teacher Training	12	14	20	6	46
Arts	14	18	36	18	130
Theology	6	6	7	1	17
Agriculture	4	6	10	4	94
Mathematics & Natural Sciences	21	32	39	8	35
Engineering	31	52	55	3	10
Veterinary & Medical Sciences & Dentistry	33	47	48	2	5
Pharmacy	2	4	5	2	95
Economics, Econometrics & Busin. Admin.	22	40	50	10	44
Law & Public Administration	23	41	50	9	41
Social Sciences	28	38	74	37	132
Fine Arts	2	2	5	3	222

experienced a large increase of the demand in the occupations which were relevant for them in 1981.

The last two columns of the table indicate the absolute and relative surpluses if only this fixed structure demand were relevant. The table shows that if we only count the changes in occupational structure, there would be large shortages for primary education and some other educational types at lower levels. Excess supply appears for relatively new types of education, such as PVE Security, HVE Business Administration Technology and UE Social Sciences.

As mentioned before, it is unlikely that these new types of education are the ones facing most of the excess supply. The table indicates that, besides occupational shifts, changes in employers' requirements with respect to the educational background required to fulfil an occupation are highly relevant. These changing requirements may be caused by exogenous shifts of the skills needed, due to technological changes, but are of course partly also caused by market reactions. As a result of the relatively high level of supply of higher levels of education, these groups became less scarce and therefore it became easier for employers to recruit people at higher skill levels for the same job.

Measuring switching opportunities and educational similarities

In order to investigate the extent of the occupational domains and the overlaps in the occupational domains between types of education, we need measurements. In this chapter, the extent of the occupational domain is measured by an index which is closely connected to the indicator for switching opportunities introduced by Warnken (1986) and de Grip and Heijke (1988). The overlap in the occupational domain is measured by the similarity index introduced in Borghans (1992). In this section, both measurements will be explained and attention will be paid to the way in which these indices can give additional information about the developments in the occupational structure of types of education.

The extent of the occupational domain

As mentioned above, although vocational education is sometimes focused on a specific category of jobs, in actual practice individuals with a certain educational background are employed in a range of occupations.

According to Warnken (1986), the extent of an occupational domain can be measured by the Gini-Hirschman index. This index is based on the probability that two individuals with the same educational background are in the same occupational group. If f_{ij} reflects the fraction of people with an educational background i in occupation j (and therefore $\sum_i f_{ij}=1$), then this probability equals:

$$P_i = \sum_j f_{ij}^2 \tag{1}$$

The probability equals 1 if everyone is in the same occupational group, while it equals $1/m$ – where m denotes the number of occupational groups – if all workers are spread equally over all occupations. The following transformation of P_i:

$$K_i = \frac{1}{P_i} \tag{2}$$

has the property that if people with an educational background i are occupied in n occupations, where in all these occupations the fraction equals $1/n$, then $K_i = n$. This index can therefore be interpreted as the *equivalent number of occupations* of the occupational domain.[2]
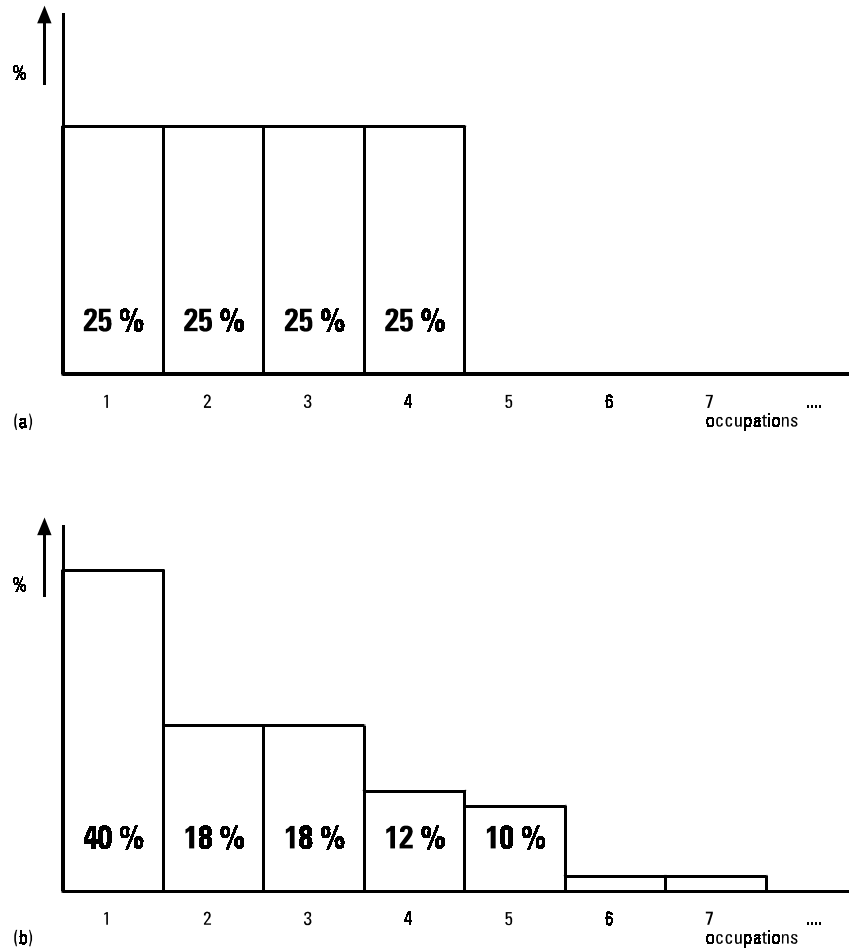
A stylised example

Figure 1   Example of two occupational distributions (a) with a uniform spread and (b) with occupations of different importance, both of which have an extent of the occupational domain of 4

Figure 1a gives an example of this. It shows an imaginary type of education. The individuals in the working population with this educational background are spread equally over four different occupations. This implies that the probability that two people with the same educational background work in the same occupation equals 0.25. There is a probability of $1/4 \times 1/4 = 1/16$ that both work in occupation 1, and also a probability of 1/16 that they both work in occupation 2, 3 or 4. This

implies that the measure of the extent of the occupational domain equals $1/0.25 = 4$, i.e. the number of occupations involved.

In practice, of course the occupational spread of a type of education will be less uniform than in this example. Figure 1b gives an example of this. By merely counting the number of occupations in which the individuals in the working population with this educational background work, the importance of the smaller occupations would be overemphasised. The index used, however, gives more weight to the larger occupations since the probability that two workers with the same educational background meet in this occupation is larger. Although the example of Figure 1b is on the one hand more concentrated in some occupations and on the other hand more spread over other occupations, the extent of the occupational domain is also measured as 4.[3]

Overlap in occupational domains

Besides the fact that most types of education have an occupational domain of more than one occupation, it will in general also be the case that within one occupation there will be individuals with different educational backgrounds. There is therefore a certain amount of overlap in the occupational domain of different types of education. To get an impression of the degree of overlap between educational types, we need to measure the similarity.

In the same way as measuring the probability that two individuals with the same educational background are in the same occupation, the probability that two individuals with different educational backgrounds are occupied in the same job can be calculated:

$$P(i,ii) \;=\; \sum_j \; f_{ij} f_{iij} \tag{3}$$

This probability gives insight in the degree of overlap between the occupational domains of two types of education. The similarity measurement (Borghans, 1992) equals this probability, relative to the probability that individual with the same educational background are in the same occupation:

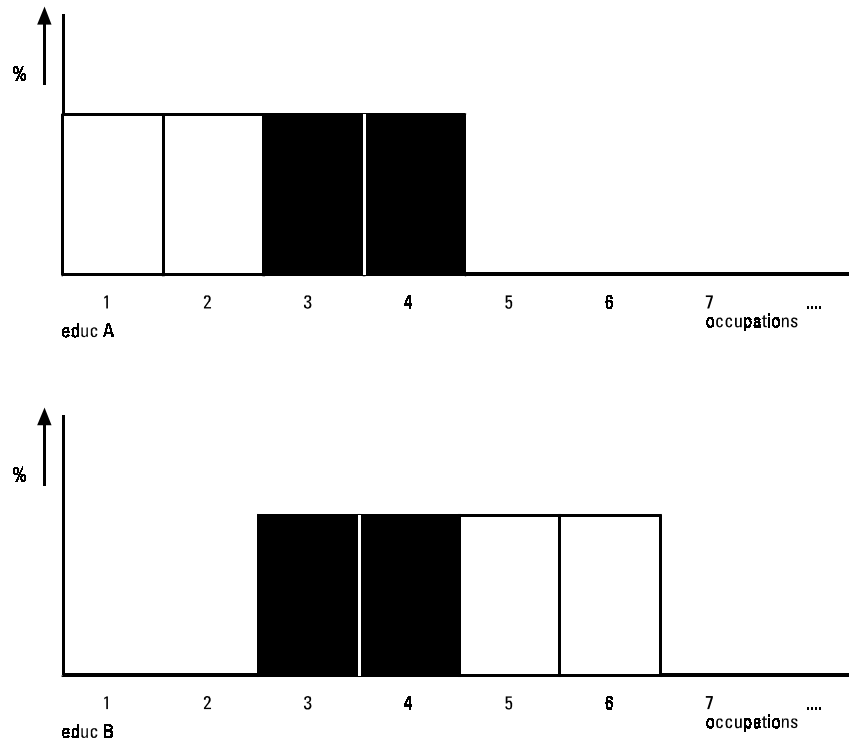$$Sim(i,ii) \;=\; \frac{P(i,ii)}{\sqrt{P_i P_{ii}}} \tag{4}$$

Figure 2   Example of two types of education with equally sized occupational domains, which have an overlap of 50%

This similarity equals 1, if *i* and *ii* have the same distribution across the occupations; it equals 0, if there is no occupation in which both a worker with the educational background *i* and one with the background *ii* is employed.

Figure 2 provides an example of this measurement. It provides the occupational distribution of two types of education, both of which have an occupational domain of 4. There are in this example two occupations in which both types of education meet each other. Therefore the probability that a worker with the one educational background meets a worker with the other educational background in the same occupation equals $1/4 \times 1/4 + 1/4 \times 1/4 = 1/8$. Since the probability that workers with the same educational background meet in the same occupation equals 1/4 for both types of education, the ratio between these probabilities equals 0.50, i.e. the two types of education share 50% of their occupational domains.
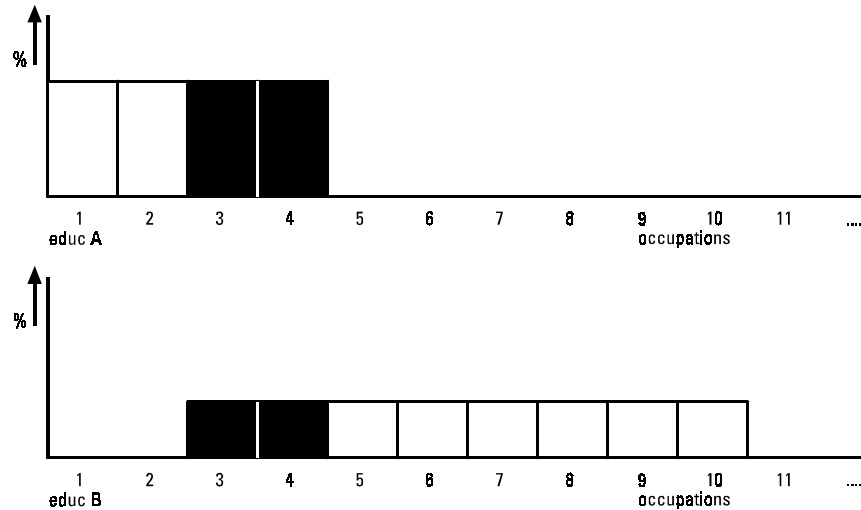
Figure 3   Example of two types of education with differences as to the extent of their occupational domains

As was the case in the example of the extent of occupational domains, the distribution across the occupations in this example is also more uniform than would be found in practice. The similarity measurement deals with the effects of larger and smaller jobs in a similar way, however. The example is also stylised since both types of education have occupational domains of equal size. Figure 3 provides an example in which two types of education share two occupations, but in which the number of the occupational domain is 4 for one and 8 for the other type of education. The probability that workers with these educational backgrounds meet is reduced to 1/16, due to the wider spread of the second type of education. Comparing this probability to the extent of the occupational domain of the first type of education would imply a similarity of 0.25, while the similarity would be 0.50 if the second type of education were used as a reference. These outcomes reflect the fact that the first type of education overlaps 0.25 of the second, but reversely the second overlaps 0.5 of the first occupational domain. The similarity measurement compromises between these outcomes and equals 0.35, which equals the geometric mean of 0.50 and 0.25.

Developments in occupational domains

In this chapter, the focus is on the development of the occupational domains over time. The measurements introduced also provide the possibility of analysing such

developments. In the same way as the occupational overlap of two types of education at the same moment in time, the overlap of types of education at different moments of time can also be measured.[4]

Suppose, for example, that the third occupation in Figure 2 becomes much more important, e.g. 4 times as large as in the previous period. If both types of education react to this growth by also increasing their employment levels in this occupation by the factor 4, the extent of the occupational domain will reduce in both from 4 to 2.6.
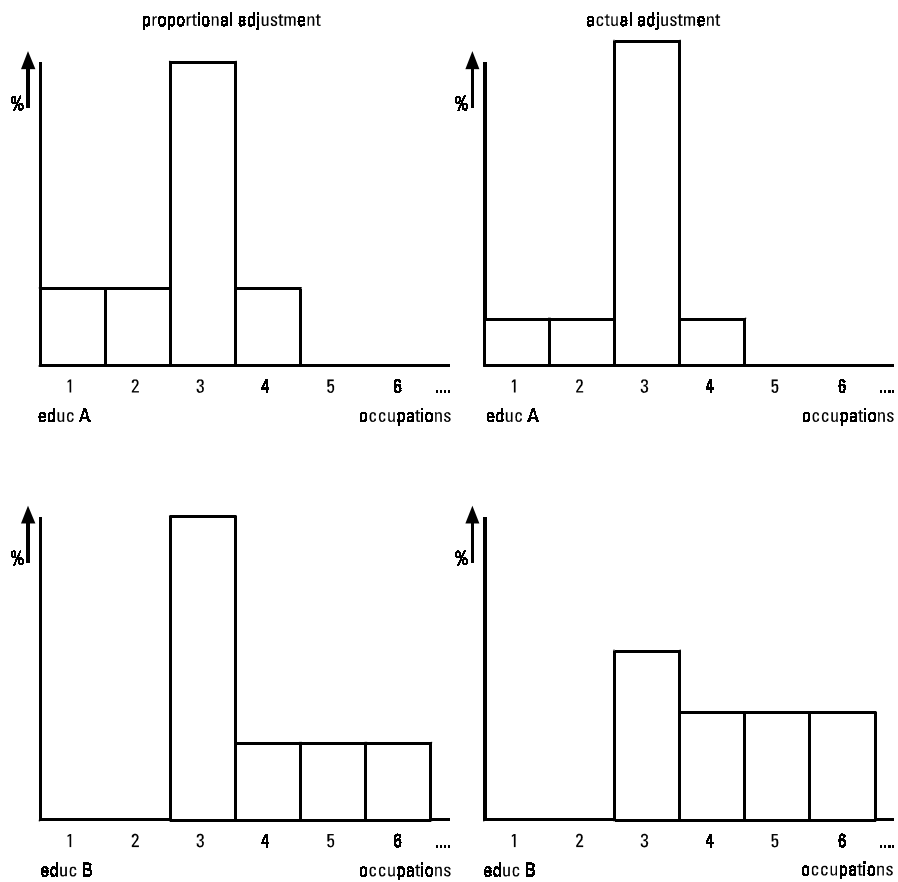

Figure 4   Example of the occupational structure of types of education in Figure 2 after the growth of occupation 3, with (a) a proportional adjustment of both types of education and (b) a more than proportional reaction of A and a modest adjustment of B

If, however, as indicated in Figure 4, the first type of education (A) grows even more than proportional in this occupation, while the growth of the second type of education is limited, the extent of the occupational domain for the first will decrease to 2.1, while for the second type of education the extent of the occupational domain equals 3.9.

Tables 2 and 3 show what happens to the similarities between the types of education. This is analysed by not only comparing the occupational domain of the two types of education in each year separately, but also by comparing the occupational domain of *t* with the occupational domain of *t*+1. Table 2 provides the projected changes in occupational overlap that would occur if both types of education reacted proportionally to this change of importance of the occupation involved. In that case, both types of education would become much more similar in 1993 than in 1981, due to the fact that this increasing occupation has become more important for both. This similarity would increase from 0.50 to 0.89. Furthermore, the character of both A and B would change. The similarity between the type of education A in 1981 and the type of education A in 1993 would then only be 0.80.

Table 2
Similarity between occupational structure in *t* and projected structure in *t+1*
between A and B of Figures 2 and 4

Type of education	A in *t*	B in *t*	A in *t*	B in *t*
A in *t*	1.00	0.50	0.80	0.57
B in *t*	0.50	1.00	0.57	0.80
A in *t*+1	0.80	0.57	1.00	0.89
B in *t*+1	0.57	0.80	0.89	1.00

Table 3 provides the actual similarity changes. Since B adjusts less to the new occupational structure than A, their similarity only grows to 0.70, i.e. 0.10 less than expected. In addition, the table shows that the type of education B is still similar to the situation in 1981, while the similarity of A between 1993 and 1981 is lower than expected. Therefore, the type of education B still has a similarity of 0.98 in 1993 with the situation in 1981, while proportional adjustment would have led to a similarity of 0.80. Therefore only 0.02/0.20= 10% of the projected change, based on a proportional adjustment to occupational growth, has been realised, while for type of education A 140% of the expected change has been realised. These ratios therefore show the underreaction and overreaction of both educational types. Lastly, the table shows that the type of education A in *t*+1 is

more similar to B in *t* than reversely, indicating that A made a bigger move towards the new situation than B.

Table 3
Similarity between occupational structure in *t* and *t+1* between
A and B of Figures 2 and 4

Type of education	A in *t*	B in *t*	A in *t*	B in *t*
A in *t*	1.00	0.50	0.72	0.55
B in *t*	0.50	1.00	0.56	0.98
A in *t*+1	0.72	0.56	1.00	0.70
B in *t*+1	0.55	0.98	0.70	1.00

An example

The similarity index presented in the previous section provides detailed information about the labour market position of a type of education and its developments, in relation to the position of other ones. Since 49 types of education are distinguished, there are $1/2(49 \times 48) = 1,176$ similarities for each year in the analyses, so by distinguishing two different years $3 \times 1,176 = 3,528$ similarities have to be taken into account. To get an impression of the structure and the developments on the labour market, it is therefore necessary to aggregate the available information. In the fifth and sixth sections, the structure of the labour market will be described using average tendencies in the similarities. In this section, however, the focus will be on an example, to illustrate the usefulness of the similarity index at micro-level.[5]

From this point of view, one of the most interesting developments during the eighties has been the rise of the computer programmer occupation. The growth of this occupation has been considerable, from 17,500 in 1981 to 73,500 in 1993, but at the same time, the main suppliers for this computer programmer occupation have been educational types which are relatively small. Hence the impact of this change on the occupational structure of UE Economics and UE Engineering is very large.

While in 1981 the main suppliers to this occupation were HVE Engineering and HVE Commerce and Administration, and at the academic level Mathematics and Natural Sciences, in 1993 these groups were supplemented by HVE Non-medical Laboratory, Business Administration Technology, and UE Engineering and Economics. In addition, some closely related occupations have also become more important for these educational groups.
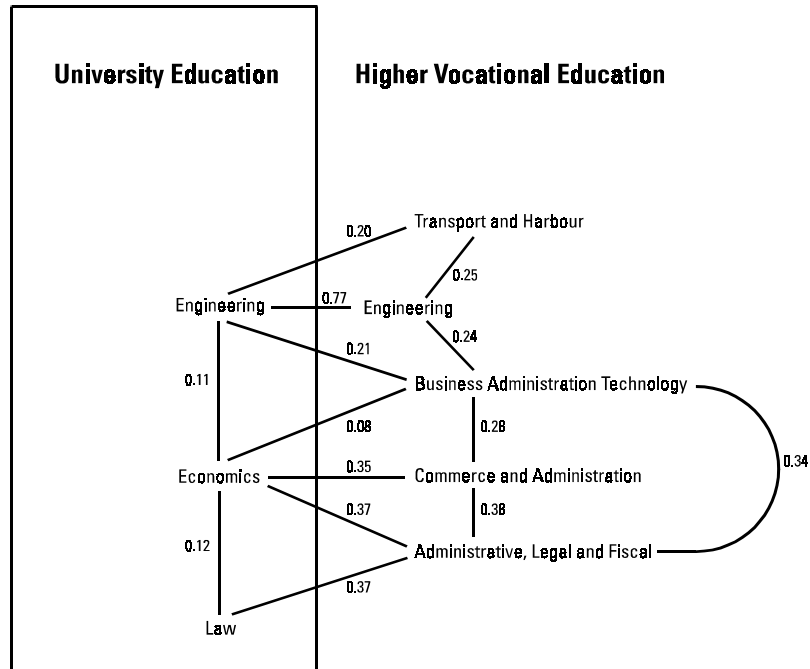
Figure 5   UE Economics and UE Engineering and similar types of education in 1981

Figure 5 illustrates the major labour market similarities of UE Economics and UE Engineering in 1981. The lines indicate the similarities, while the similarity index has been added to each line. The figure is complete from the point of view of UE Engineering and UE Economics, but all other types of education in the figure also have other neighbours, which have not been included. Adding all relevant relationships would lead to a map of the entire labour market. Such a map was presented in ROA (1995). The figure shows that the most important relationships of UE Economics are Commerce and Administration and Administrative, Legal and Fiscal, both at the HVE level. The similarities are 0.35 and 0.37 respectively. At university level, Engineering and Law are most closely related with UE Economics with similarities of only 0.11 and 0.12. UE Engineering has a very strong similarity with Engineering at HVE level, and moderate similarities with HVE Harbour and Transport and Business Administration Technology.
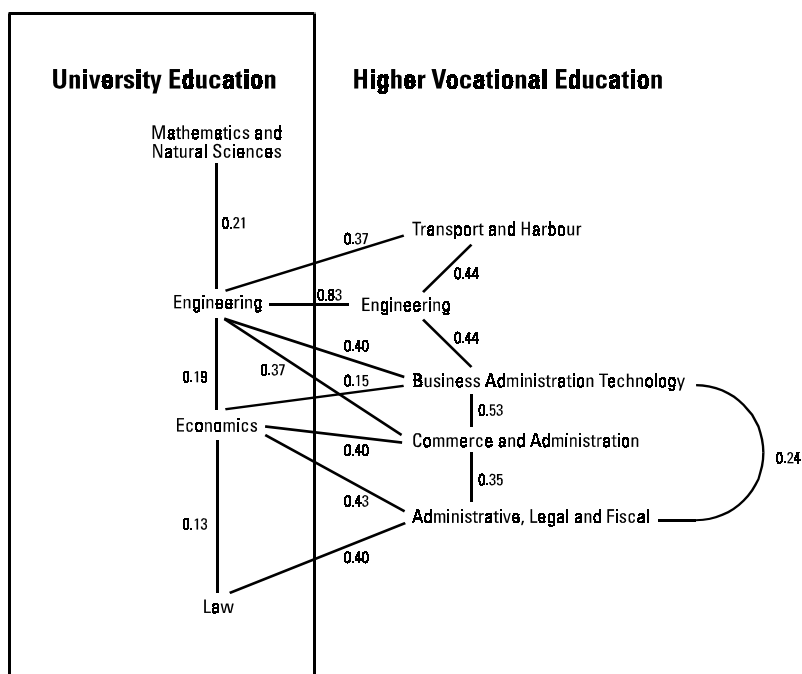
Figure 6   Projected changes of the labour market position of UE Economics and UE Engineering for 1993, based on occupational structure 1981

During the eighties, the rise of new computer technologies caused an increase of occupations which relied on both economic and technical skills. Figure 6 shows that this occupational growth would have led to larger similarities between the types of education involved. The figure presents the similarities that would have resulted from a proportional adjustment of the occupational structure for each type of education. Most obvious are the increases in similarity of UE Engineering with some of its neighbours. For UE Economics these changes are more modest. The reason for this is that in 1981 only a small fraction of the economists was working in computer occupations. At the beginning of the eighties, computer programming was mainly an engineering skill. For that reason, the increase of the number of computer programmers would mainly have led to more similarity between these technical types of education.
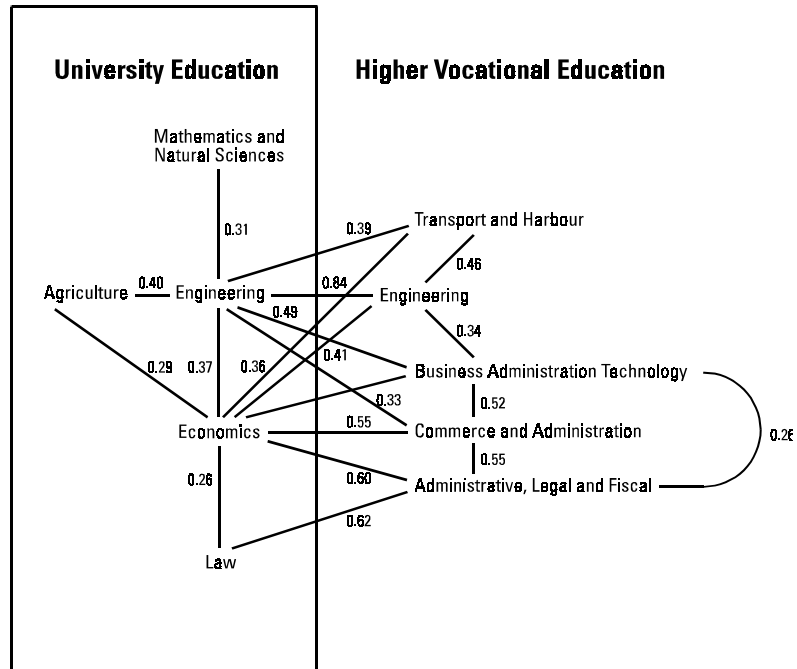
Figure 7   UE Economics, UE Engineering and similar types of education in 1993

Figure 7 provides the similarities actually observed in 1993. It shows that in practice the similarity of UE Economics and UE Engineering increased from 0.11 to 0.37. Other similarities also increased more than expected from an extrapolation of the educational structure of occupations. What actually happened was that on the one hand there has been a shift in the skills required, making computer work less technical and hence making economics a more appropriate educational background for such occupations, while on the other hand the scarcity of computer programmers forced employers to recruit personnel from alternative types of education to fill their vacancies.

Changes of the occupational structure

Table 4 presents the extent of the occupational domains for the various types of education. The occupational classification used distinguishes over 300 occupa-

Table 4
The extent of the occupational domain per type of education

	Extent of occupational domain	
	1981	1993
PE	42.0	45.1
Lower General Secondary Education	20.3	31.5
PVE		
Agriculture	6.1	9.8
Technical	42.1	49.3
Transport & Harbour	11.8	3.1
Commerce & Administration	12.9	20.1
Community Care, Hotel & Catering	14.6	19.8
Security	2.2	3.7
Higher General Secondary Education	19.4	29.5
IVE		
Agriculture	7.2	9.5
Non-Medical Laboratory	5.0	4.7
Engineering	50.9	60.2
Transport & Harbour	24.3	26.9
Medical Laboratory	4.0	4.4
Nursing & Paramedical Services	4.1	4.9
Commerce & Administration	20.3	25.2
Administrative, Legal & Fiscal	4.5	6.3
Social & Cultural	10.5	15.2
Community Care	9.1	12.1
Hotel, Catering & Hairdressing	8.1	10.1
Police, Fire & Defence Forces	3.7	7.4
HVE		
Teacher Training	5.2	7.1
Interpreter & Translator	8.3	11.7
Theology	1.7	3.1
Agriculture	14.7	16.8
Non-Medical Laboratory	4.5	7.3
Engineering	23.8	29.4
Transport & Harbour	18.4	23.4
Medical Laboratory	2.4	4.2
Nursing & Physiotherapy etc.	4.3	5.0

Table 4 (continued)
The extent of the occupational domain per type of education

| | Extent of occupational domain | |
	1981	1993
Commerce & Administration	11.9	17.4
Business Administration Technology	11.6	11.2
Administrative, Legal & Fiscal	9.2	13.1
Social & Cultural	4.9	9.5
Hotel & Catering Industry	12.3	11.1
Fine Arts	8.4	10.0
Police, Fire & Defence Forces	2.9	3.7
UE		
Teacher Training	2.9	4.8
Arts	2.9	6.8
Theology	2.1	4.0
Agriculture	6.7	16.1
Mathematics & Natural Sciences	6.8	11.6
Engineering	18.0	22.0
Veterinary & Medical Sciences & Dentistry	2.1	2.4
Pharmacy	2.6	3.3
Economics, Econometrics &		
Business Administration	7.8	14.2
Law & Public Administration	5.7	8.5
Social Sciences	4.7	14.1
Fine Arts	7.9	11.9

tions. The table shows that the similarity index of the extent of the occupational domain of the educational types varies from 1.7 for HVE Theology in 1981 to 60.2 for IVE Engineering in 1993. Other large domains are found for primary education (PE) and PVE Technical. Very restricted domains include Medical Sciences and Pharmacy at the UE level. It is interesting to note that almost all types of education experience an extension of their educational domain. There are only four exceptions. The decrease of the extent of the occupational domain of PVE Transport and Harbour is the largest, with a reduction of its occupational domain from 12 to 3 occupations. Huge increases of the occupational domain are observed for both the higher and the lower general secondary education, and for HVE Social and Cultural and UE Social Sciences, but also for UE Agriculture.

Table 5 summarises these results by presenting the average sizes of the occupational domains per educational level. An interesting aspect, also noticed by de Grip and Heijke (1989) and ROA (1995), is that the extent of the occupational domain decreases with the level.[6] This observation seems to imply that larger educational investments decrease rather than increase the extent of the occupational domain. The reason for this is of course that the higher levels of education lead to occupations in which people can less easily substitute one another. Learning another occupation on the job would require too great an effort.

Table 5
The extent of the occupational domain per educational level

| | Extent of occupational domain | | |
	1981	projected '93	1993
PE	42.0	43.3	45.1
GE	20.0	25.0	30.8
PVE	28.4	30.7	34.6
IVE	26.0	27.5	31.4
HVE	9.7	10.1	12.9
UE	6.8	7.2	11.0

The developments of the occupational structure of the labour market have been such that the occupational domains would increase at all educational levels if their educational structure remained constant. This effect is most prominent for lower and higher general secondary education (GE) and HVE. Actually, the occupational domains increased even more than this. This additional increase of the extent of the occupational domain has been most prominent for GE, PVE, but most of all for university education (UE).

Due to the changes in the occupational structure and due to changes in required qualifications, there have been shifts in the occupational domains of types of education between 1991 and 1993. This can be observed in Table 6, which provides both the projected and the actual similarities between the occupational domains of the types of education in 1981 and 1993. The ratio shows to what degree the employment structure of types of education has been adjusted to new occupational developments. This ratio is extremely low for PE. This implies that, although there have been some shifts in the employment in the occupations which are relevant for PE, the workers with this educational background are still employed in the same jobs as in 1981. The same is the case for Commerce and

Table 6
Projected and actual similarity of occupational structure of types of education
in 1981 and 1993

	Similarity		
	projected	actual	ratio
PE	0.95	0.98	0.41
Lower General Secondary Education	0.98	0.93	3.41
PVE			
Agriculture	0.99	0.95	5.68
Technical	0.98	0.97	1.62
Transport & Harbour	0.99	0.69	34.25
Commerce & Administration	0.98	0.96	2.54
Community Care, Hotel & Catering	0.99	0.98	2.37
Security	1.00	0.98	14.45
Higher General Secondary Education	0.95	0.90	1.89
IVE			
Agriculture	0.99	0.98	1.68
Non-Medical laboratory	0.99	0.96	3.33
Engineering	0.95	0.96	0.88
Transport & Harbour	0.97	0.93	2.29
Medical Laboratory	0.99	0.99	0.93
Nursing & Paramedical Services	1.00	0.98	3.24
Commerce & Administration	0.96	0.97	0.84
Administrative, Legal & Fiscal	0.96	0.96	1.03
Social & Cultural	0.97	0.81	5.36
Community Care	0.99	0.97	1.99
Hotel, Catering & Hairdressing	0.95	0.91	1.69
Police, Fire & Defence Forces	1.00	0.99	2.79
HVE			
Teacher Training	0.99	0.99	0.70
Interpreter & Translator	0.98	0.68	18.37
Theology	0.99	0.97	5.82
Agriculture	0.96	0.88	3.17
Non-Medical Laboratory	0.98	0.93	3.18
Engineering	0.93	0.86	2.06
Transport & Harbour	0.88	0.84	1.35
Medical Laboratory	1.00	0.97	75.60
Nursing & Physiotherapy etc.	1.00	0.95	16.43
Commerce & Administration	0.87	0.96	0.27

Table 6 (continued)
Projected and actual similarity of occupational structure of types of education
in 1981 and 1993

| | Similarity | | |
	projected	actual	ratio
Business Administration Technology	0.87	0.51	3.93
Administrative, Legal & Fiscal	0.95	0.86	2.98
Social & Cultural	0.98	0.96	2.53
Hotel & Catering Industry	0.96	0.83	3.97
Fine Arts	0.95	0.94	1.11
Police, Fire & Defence Forces	0.98	0.97	1.84
UE			
Teacher Training	0.99	0.98	1.20
Arts	1.00	0.96	17.56
Theology	0.98	0.96	2.68
Agriculture	0.98	0.83	9.40
Mathematics & Natural Sciences	0.95	0.92	1.71
Engineering	0.94	0.87	2.14
Veterinary & Medical Sciences & Dentistry	1.00	1.00	2.21
Pharmacy	0.99	0.97	2.98
Economics, Econometrics & Business Administration	0.99	0.88	9.46
Law & Public Administration	1.00	0.97	5.51
Social Sciences	0.99	0.87	12.95
Fine Arts	0.92	0.38	7.90

Table 7
Projected and actual similarity of occupational structure of types of education
in 1981 and 1993 per educational level

| | Similarity | | |
	projected	actual	ratio
PE	0.95	0.98	0.41
GE	0.97	0.92	2.55
PVE	0.99	0.97	2.35
IVE	0.97	0.96	1.10
HVE	0.96	0.94	1.34
UE	0.98	0.93	3.74

Administration at HVE level. This type of education seems not to have followed the occupational trends of the eighties. Table 7 summarises these results per educational level. It shows that the most important occupational changes have been at PE level and HVE level. The first column shows that relatively few occupational changes are found at the PVE and UE levels. In fact, general secondary education and university education experienced the largest changes in their occupational domains. The ratio between the actual change and the projected change is small for PE, and relatively large for GE, PVE and UE. For IVE and HVE, employment changes were on average in accordance with the expected changes due to occupational shifts.

Developments of similarity

Table 8 shows for each type of education the type of education which is most similar according to its occupational structure. For 15 of the 49 educational types, the most related competitor on the labour market changed between 1981 and 1993.

Table 8
Most similar type of education in 1981 and 1993

Educational type	Most similar educational types	Similarity 1981	1993
PE	PVE Community Care, Hotel & Catering	0.69	0.71
Lower General Secondary Education	Higher General Secondary Education	0.95	0.93
	PVE Commerce & Administration	0.91	0.96
PVE Agriculture	IVE Agriculture	0.98	0.95
PVE Technical	IVE Engineering	0.77	0.79
PVE Transport & Harbour	IVE Transport & Harbour	0.68	0.65
PVE Commerce & Administration	IVE Commerce & Administration	0.92	0.90
	Lower General Secondary Education	0.91	0.96
PVE Community Care, Hotel & Catering	PE	0.69	0.71
	Lower General Secondary Education	0.59	0.74
PVE Security	IVE Police, Fire & Defence Forces	0.10	0.19
Higher General Secondary Education	Lower General Secondary Education	0.95	0.93
	IVE Commerce & Administration	0.89	0.95
IVE Agriculture	PVE Agriculture	0.98	0.95
IVE Non-Medical laboratory	HVE Non-Medical Laboratory	0.97	0.84
IVE Engineering	PVE Technical	0.77	0.79
IVE Transport & Harbour	PVE Transport & Harbour	0.68	0.65
IVE Medical Laboratory	HVE Medical Laboratory	0.21	0.19

Table 8 (continued)
Most similar type of education in 1981 and 1993

Educational type	Most similar educational types	Similarity 1981	1993
IVE Nursing & Paramedical Services	HVE Nursing & Physiotherapy etc.	0.56	0.71
IVE Commerce & Administration	PVE Commerce & Administration	0.92	0.90
	Higher General Secondary Education	0.89	0.95
IVE Administrative, Legal & Fiscal	Higher General Secondary Education	0.81	0.69
	HVE Administrative, Legal & Fiscal	0.62	0.70
IVE Social & Cultural	HVE Social & Cultural	0.89	0.76
IVE Community Care	PVE Community Care, Hotel & Catering	0.64	0.66
IVE Hotel, Catering & Hairdressing	HVE Hotel & Catering Industry	0.27	0.36
IVE Police, Fire & Defence Forces	HVE Police, Fire & Defence Forces	0.58	0.59
HVE Teacher Training	Higher General Secondary Education	0.06	0.10
HVE Interpreter & Translator	Higher General Secondary Education	0.30	0.39
	HVE Commerce & Administration	0.26	0.44
HVE Theology	UE Theology	0.97	0.95
HVE Agriculture	UE Agriculture	0.78	0.60
	IVE Agriculture	0.49	0.62
HVE Non-Medical Laboratory	IVE Non-Medical laboratory	0.97	0.84
HVE Engineering	UE Engineering	0.77	0.84
HVE Transport & Harbour	IVE Transport & Harbour	0.53	0.45
	HVE Engineering	0.25	0.46
HVE Medical Laboratory	HVE Non-Medical Laboratory	0.29	0.57
HVE Nursing & Physiotherapy etc.	IVE Nursing & Paramedical Services	0.56	0.71
HVE Commerce & Administration	IVE Commerce & Administration	0.71	0.78
HVE Business Administrat. Technology	Higher General Secondary Education	0.51	0.36
	HVE Engineering	0.24	0.64
HVE Administrative, Legal & Fiscal	IVE Administrative, Legal & Fiscal	0.62	0.70
HVE Social & Cultural	IVE Social & Cultural	0.89	0.76
HVE Hotel & Catering Industry	IVE Hotel, Catering & Hairdressing	0.27	0.36
HVE Fine Arts	UE Fine Arts	0.24	0.40
HVE Police, Fire & Defence Forces	IVE Police, Fire & Defence Forces	0.58	0.59
UE Teacher Training	UE Social Sciences	0.04	0.13
UE Arts	UE Social Sciences	0.11	0.19
	HVE Interpreter & Translator	0.08	0.24
UE Theology	HVE Theology	0.97	0.95
UE Agriculture	HVE Agriculture	0.78	0.60
UE Mathematics & Natural Sciences	UE Engineering	0.12	0.31
	HVE Business Administration Technology	0.08	0.32
UE Engineering	HVE Engineering	0.77	0.84
UE Veterinary & Medical Sciences & Dentistry	UE Economics, Econometrics & Business Administration	0.02	0.03
	UE Agriculture	0.00	0.08

Table 8 (continued)
Most similar type of education in 1981 and 1993

Educational type	Most similar educational types	Similarity 1981	1993
UE Pharmacy	IVE Medical Laboratory	0.06	0.02
	UE Agriculture	0.01	0.07
UE Economics, Econometrics & Business Administration	HVE Administrative, Legal & Fiscal	0.37	0.60
UE Law & Public Administration	HVE Administrative, Legal & Fiscal	0.37	0.62
UE Social Sciences	UE Fine Arts	0.40	0.31
	HVE Social & Cultural	0.33	0.64
UE Fine Arts	UE Social Sciences	0.40	0.31
	HVE Fine Arts	0.24	0.40

Table 9 summarises the structure of Table 8. It shows that for most types of education, the most similar competitor is one level above or below the type's own level. In 1981, it was only for general secondary education that the percentage of types of education which had the most similar competitor at the same level was 100% since lower and higher general secondary education were relatively similar, while this percentage was 56% for university level. In 1993, these high within-level similarities have disappeared, however, indicating that preparatory and higher vocational education grew away from each other, and more interestingly that the typical academic occupational domain seems to decrease.

It is also interesting to note that the main competitors of IVE in 1981 are at the PVE level. In 1993, this percentage of 81% has decreased to 49%. Partly, the competition with HVE became stronger, but most of all, general secondary education became a more relevant competitor for IVE.

This tendency of more similarity with general secondary education can also be seen at PVE level and HVE level. In 1981, 23% of the types of education at PVE level still had its main similarity with primary education, but in 1993 there were no longer any types of education for which primary education is the main competitor.

The results of Table 9 illustrate that the largest similarities between types of education are not within but between the different levels. Vertical similarity seems to be more important than horizontal similarity.

Table 9
Most similar type of education in 1981 and 1993 per educational level

	PE %	GE %	PVE %	IVE %	HVE %	UE %
1981						
PE	0	0	100	0	0	0
GE	0	100	0	0	0	0
PVE	23	0	0	77	0	0
IVE	0	3	81	0	16	0
HVE	0	39	0	36	2	22
UE	0	0	0	1	43	56
1993						
PE	0	0	100	0	0	0
GE	0	0	59	41	0	0
PVE	0	34	0	66	0	0
IVE	0	31	49	0	20	0
HVE	0	27	0	48	7	17
UE	0	0	0	0	82	18

Table 10
Average largest similarity within the same level

	1981	projected by fixed structure 1993	1993
GE	0.90	0.89	0.96
PVE	0.46	0.49	0.55
IVE	0.47	0.49	0.56
HVE	0.16	0.23	0.31
UE	0.14	0.17	0.26

Table 10 gives the average highest similarity within each level of education. This similarity clearly decreases with the level. At PVE and IVE levels, types of education have on average a competitor at the same level, with a similarity of more than 0.45 in 1981 and more than 0.55 in 1993. For HVE and UE this within-

level similarity is much lower, although it also increased between 1981 and 1993. At these higher levels, the average highest similarity almost doubled. This increase of similarity is only partly explained by the changing occupational structure.

Tables 11 and 12 provide similar information for the average highest similarity at one level below and one level above the own level of education. Again, the data show that the similarities are to be found between levels and not within the level, reflecting the vertical structure of the labour market. Here too, similarities decrease with the level. At each level, these similarities increase between 1981 and 1993. At the same time, the growth of these inter-level similarities is only partly explained by the changing occupational structure.

Table 11
Average largest similarity with types of education at one level below the own level

	1981	projected 1993	1993
GE	0.66	0.66	0.74
PVE	0.58	0.59	0.65
IVE	0.72	0.69	0.72
HVE	0.36	0.35	0.39
UE	0.32	0.37	0.47

Comparing the figures of Tables 11 and 12, we can see that for PVE the similarities with types of education at a lower level (i.e. primary education) are less important than those with types above its level, but this difference is decreasing due to the increased similarities between PVE and primary education. IVE has higher similarities at PVE level than at HVE level, but these differences also tend to become smaller. Lastly, HVE is more closely related to IVE than to university education, but this difference has almost completely disappeared in 1993.

In the tables presented so far, similarities with most closely related competitors on the labour market have been considered. These figures showed that in most cases, the nearest competitors are types of education in the same or a related field of study, but at a different level. This picture changes if the average similarity with all types of education within a certain level is regarded. Table 13 provides these average similarities for 1981. The table shows that for each level, the highest average similarity is recorded for the types of education at the same level.

Again, however, this similarity decreases with the level. The same is true for the average similarity between subsequent levels. General secondary education has relatively high average similarities with all levels of education. Only the average similarity with university education is below 0.20.

Table 12
Average largest similarity with types of education at one level above own level

	1981	projected 1993	1993
PE	0.69	0.66	0.71
GE	0.83	0.80	0.87
PVE	0.78	0.75	0.79
IVE	0.50	0.46	0.58
HVE	0.25	0.30	0.37

Table 13
Average similarity between all types of education at a certain level in 1981

	PE	GE	PVE	IVE	HVE	UE
PE	1.00	0.45	0.58	0.30	0.05	0.01
GE	0.45	0.98	0.35	0.45	0.15	0.04
PVE	0.58	0.35	0.51	0.31	0.05	0.01
IVE	0.30	0.45	0.31	0.34	0.10	0.03
HVE	0.05	0.15	0.05	0.10	0.24	0.06
UE	0.01	0.04	0.01	0.03	0.06	0.15

Table 14 provides the projected changes of average similarities based on actual employment growth in the occupations and the educational structure of 1981. Due to occupational growth, an increase of average similarity is projected only for HVE and university education and of the similarity between these two levels. Table 15 compares the projected occupational structure in 1993 with the one in 1981. The figures show that HVE in 1993 is expected to be closer to IVE in 1981 than IVE in 1993 to HVE in 1981. This implies that the growth of overlap between these two levels is in intermediate level occupations, rather than occupations at higher level. The same is true for IVE and PVE, in which the

growth at the lower level also seems to contribute more to the expected increase of similarity than vice versa. This is, however, not the case for the similarity between UE and HVE and between PE and PVE.

Table 14
Average similarity between all types of education at a certain level,
projection for 1993

	PE	GE	PVE	IVE	HVE	UE
PE	1.00	0.45	0.59	0.30	0.04	0.01
GE	0.45	0.96	0.35	0.44	0.14	0.06
PVE	0.59	0.35	0.52	0.31	0.04	0.01
IVE	0.30	0.44	0.31	0.34	0.11	0.05
HVE	0.04	0.14	0.04	0.11	0.27	0.09
UE	0.01	0.06	0.01	0.05	0.09	0.17

Table 15
Average similarity between all types of education at a certain level,
1981 compared with projection for 1993

'81 '93	PE	GE	PVE	IVE	HVE	UE
PE	0.95	0.43	0.57	0.28	0.04	0.01
GE	0.43	0.94	0.34	0.41	0.11	0.04
PVE	0.56	0.36	0.50	0.29	0.04	0.01
IVE	0.30	0.45	0.31	0.32	0.08	0.03
HVE	0.06	0.21	0.06	0.13	0.22	0.07
UE	0.02	0.06	0.01	0.04	0.07	0.16

   Table 15 gives the actual average similarities for 1993. The overall picture remains the same as in 1981, but almost all average similarities have increased. Remarkably high is the increase in average similarity of university education with other types of education at the same level, but also at all other levels.
   Lastly, Table 17 compares the occupational structure of 1993 with the structure of 1981. It shows that due to the actual changes of the occupational structure, all levels became more similar to one level below in 1981 than reversely. For general

secondary education, the employment structure became more similar to the structure of PVE in 1981 than the structure of PVE adjusted towards the 1981 situation of general secondary education. At the same time, general secondary education also became more similar to the employment structure of primary education in 1981.

Table 16
Average similarity between all types of education at a certain level, 1993

	PE	GE	PVE	IVE	HVE	UE
PE	1.00	0.56	0.64	0.35	0.08	0.04
GE	0.56	0.97	0.46	0.49	0.25	0.14
PVE	0.64	0.46	0.55	0.35	0.08	0.04
IVE	0.35	0.49	0.35	0.37	0.17	0.09
HVE	0.08	0.25	0.08	0.17	0.26	0.15
UE	0.04	0.14	0.04	0.09	0.15	0.23

Table 17
Average similarity between all types of education at a certain level, 1993
compared with 1981

'81	PE	GE	PVE	IVE	HVE	UE
'93						
PE	0.98	0.42	0.56	0.30	0.05	0.01
GE	0.56	0.90	0.41	0.45	0.15	0.05
PVE	0.63	0.36	0.51	0.31	0.05	0.01
IVE	0.34	0.45	0.33	0.34	0.11	0.04
HVE	0.08	0.22	0.07	0.14	0.22	0.07
UE	0.03	0.12	0.03	0.07	0.10	0.17

Conclusions

This chapter started with the observation that there is not a one-to-one relationship between type of education and occupation, but that most types of education give access to a range of occupations, while the occupational domains of different types of education seem to overlap. These switching opportunities and overlaps provide flexibility to the labour market to adjust supply to demand more easily. The aim of the chapter was to investigate which developments have occurred in this labour market structure between 1981 and 1993.

Firstly, although at all levels each type of education gives access to a range of occupations and at all levels there is overlap between the occupational domains, both the extent of the occupational domain and the similarities with others diminish with the level. The greatest gap in this respect is between IVE and HVE.

The closest competitor on the labour market is generally not found at the same educational level, but one level below or above the own educational level. The strongest labour market relationships are therefore vertical rather than horizontal. Again, the greatest gap is between IVE and HVE. If we consider not merely the nearest competitors, but all types of education at a certain level, average similarities become larger within than between different levels. There seem to be specific occupations that are typical for a certain educational level irrespective of the specific field of study concerned.

In general, both the extent of the occupational domains and the similarities between types of education increased between 1981 and 1993. The overall structure outlined above did not change, but all relationships became closer. This means that education has become less occupation-specific.

The largest occupational changes occurred at primary education level and for IVE and HVE. For the latter two levels, a large part of the changes of the occupational structure can be explained by changes of the relative importance of certain occupations. General secondary education, PVE, and most of all university education experienced a change of their occupational structures, which was much larger than needed to adjust for occupational shifts. Primary education, on the other hand, changed less with respect to its occupational structure than was needed to adjust for occupational shifts.

Both general secondary education and PVE seem to have taken over the role of primary education on the labour market. These types of education grew more into the direction of the role of primary education in 1981 than to the occupational distribution of primary education in 1993. University education clearly lost its special position on the labour market. In 1981, there still was a relative large proportion of university studies which had their closest competitor at university level. In 1993, this position has disappeared and the occupational structure of academics has become much closer to the 1981 position of higher vocational education graduates, while the similarities with lower levels also increased.

Today, university education is more similar to vocational education than in 1981, while special academic occupations have become less important for the labour market of university-educated individuals.

Notes

1   Due to differences in the sources for both years, these numbers are not completely comparable. The 1981 data, based on the 'Arbeidskrachtentelling' (AKT, or Workforce Count), contain more occupations of only a limited number of hours (<12 h) than the data for 1993, which are based on the 'Enquête Beroepsbevolking' (EBB, or Working Population Survey). Therefore, the actual growth will have been even larger.

2   Warnken (1986) and de Grip and Heijke (1988) used the Gini-Hirschman index, which can be calculated as:

$$GH_i = \left(1 - P_i\right)\frac{m}{m-1}$$

This linear transformation of the variable P_i is such that GH_i equals 0 when every worker with the educational background i is in the same occupational group, while the index equals 1 if there is an equal spread over all occupations.

3   $1/(0.40^2 + 0.18^2 + 0.18^2 + 0.12^2 + 0.10^2 + 0.01^2 + 0.01^2) \approx 4$.

4   Borghans, Hughes and Smits (1997) used the same similarity index to compare Irish and Dutch types of education.

5   The analyses are based on data from the EBB mentioned in note 1. Occupations have been aggregated in 316 categories. A major source of overlap in the educational domain is the occupation of teacher. For example, many graduates from both arts and mathematics find work as teachers. However, this does not imply that these types of education can be regarded as substitutes. For that reason, the similarity between types of education from the teacher occupation is only counted for people with the same field of study.

6   The only 'exceptions' are lower and higher general secondary education (both combined in GE), but this level cannot really be treated as an intermediate level between primary education and PVE.

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