

What promotes a successful utilization of competence in the labour market five years after graduation? Does vocational higher education result in a better match than academic generalist education?

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Introduction

During the last decades there has been a substantial growth in higher education in Norway as well as in the other Western countries. In Norway the number of students in higher education increased by 40 per cent in the decade 1990–2000 (Næss and Støren 2006). The increase was especially large within Health and welfare (111 per cent), and Teaching and pedagogy (75 per cent). In Social science and law, and Science and technology the increase was 36 per cent in this decade. Humanities and Business and administration had less growth (17 per cent).¹ Much attention the last decades has been paid to what extent the increased supply of graduates has led to increased labour market problems for graduates. Mismatch in the labour market may arise in several ways; as unemployment; vertical mismatch; horizontal mismatch or as both vertical and horizontal mismatch. Especially has vertical education-job mismatch in terms of overeducation received attention in a lot of studies during the last 10–15 years, both in general labour market studies and studies on the situation of higher education graduates. In this paper we will address questions of different forms of education-job mismatch among Norwegian graduates five–six years after graduation (in 2005). Different forms of mismatch will be studied, both the most extreme form, i.e. unemployment as well as vertical educational mismatch which refers to the lack of correspondence between the level of the education acquired and the level required in the job, and horizontal mismatch which refers to the lack of correspondence between field of study and field of work. We are interested in to what extent variation in mismatch might be explained by the type of education–‘generic’ or ‘vocational’– and/or by the competency profiles that the graduates possess.

Theoretical background and previous studies

Different theories have different explanations of mismatch in the labour market. A simple neoclassical economic model would explain labour market mismatches as a temporary problem caused by imbalance between the supply and demand for labour. The simple model can not explain the persistent existence of unemployment and overeducation in most western countries. According to the assignment theory (Sattinger 1993) the existence of many labour market phenomena as mobility, unemployment, overeducation etc. can be motivated as labour market responses to the problem of assigning workers to jobs. The basic premises underlying assignment models are that both supply and demand are relevant and that individual performance vary from job to job. According to the assignment theory (Sattinger 1993), both individuals and jobs can be ranked in terms of skills. Individuals will be ranked according to the skill level they possess and jobs in accordance with the skill level they require. The allocation of workers to jobs is optimal when the most competent worker is assigned to the most demanding job, the next most competent individual in the next most demanding job and so on. If there are more skilled workers than there are complex jobs, some individuals will end up in jobs for which they are overqualified. This implies that persons with no-matching jobs will be overeducated, have lower productivity and receive lower wages. Empirical research also shows that overeducated workers receive lower wages than workers with the attained level of education (Hartog 2000).

¹ After 2000 there has been no growth in Science and technology, and a large increase in Business and administration.

An alternative expression for assigning workers to jobs is matching (Jovanovic 1979, 1984). According to the matching theory lack of information in the labour market may cause temporary mismatches. A lack of information among graduates or employers implies that individuals do not find the most appropriate job for their skill. The search theory (Hammermesh and Rees 1984) also points to lack of information as a source of labour market mismatches. Unemployment and overeducation may exist temporarily and be a result of “waiting room effect”. This may be due to the search process and to imperfect information (Hartog 2000) or to rigidities (Green and McIntosh 2002), such as family obligations, unwillingness to move etc.

Also in the human capital perspective overeducation may exist temporarily; it may result from a choice because the low-level job is a good investment opportunity (Hartog 2000), or overeducation may exist when the education or skills of a graduate are not fully utilised for instance because of institutional rigidities (Green et al. 1999). As Green et al. (1999, 2002) point out; a firm may take on a graduate in a secretarial role but the graduate may be less productive than in a ‘graduate job’ and no more productive than a less educated secretary. The graduate will be overeducated and earn less than a person in a graduate job, and he/she is not paid according to his/hers potential marginal products.

Several papers approach the conceptual problems concerning overeducation (for instance Green et al. 2002) and the theoretical framework for analysing and understanding education-job mismatch (for instance Hartog 2000; Allen and van de Velden 2001; Green and McIntosh 2002; Allen and de Vries 2004; Gervasi 2006). The distinction between *skills* and *educational* mismatch is in some papers an important distinction when discussing for instance the assignment theory (Sattinger 1993). The basic assumption of the assignment theory is that the educational mismatch implies skills mismatch. This is discussed by Allen and van der Velden (2001); Allen and de Vries (2004) and Green and McIntosh (2002): Individuals can be overqualified in terms of their formal education but still not necessarily over-skilled in terms of their actual skills (heterogeneous skill theory), an assumption that is supported in their analyses.

The extent to which overeducation or other types of mismatch varies by type of education, which is a main focus in this paper, is studied less frequently in the literature. Green and McIntosh (2002) find that business and management studies, as well as social sciences, have the highest over-qualified graduate rates. They point to—as one possible explanation—that these studies produce the highest number of graduates of all the subjects, but in their view a more likely explanation is that graduates are quite heterogeneous. Allen and de Vries (2004) use a different approach, finding among other things, that there is a higher discrepancy between the acquired competency level and the competency level required in the job among persons who reports that they are overeducated or have a job outside the field than among those in appropriate work. This refers to different competency items, such as analytical competency and the competency level in own field or discipline, 1½ year after graduation. Berger (1988) found that graduates from generic fields of study as science and liberal arts are more sensitive to changes in the cohort size than graduates in engineering and business administration. The reason is that graduates from vocationally oriented studies are more substitutable with other worker than those with a generic education. For example, graduates with a generic oriented education need to use more time to learning activities. This implies that graduates with generic oriented education to greater extent will experience mismatch-problems when the supply of graduates increases than will those with a vocationally oriented education. Generally, generic competencies are seen as transferable between different

educational domains and we will expect those with a generic oriented field of study to greater extent than those with a vocationally oriented field of study to have a job outside own field. Heijke et al. (2002) examine the role of ‘generic’ or ‘vocational’ educations in the transition to the labour market. They classify Dutch graduates in two clusters having either ‘generic’ or ‘vocational’ education by the use of the graduates’ answers concerning to which extent they had a given competency at time of graduation. They found, among other things, that those with vocational competencies more often had an occupation within own educational domain than those with generic competencies, further, that there was a negative wage effect of having work outside own domain.

Variations in the labour market situation by human capital related variables such as grades, further educations and employment experience are considered as being in accordance with human capital theory as well as heterogeneous skill theory; the same applies to variation by the level of possessed competencies referring to a set of competency items. Variations in the labour market situation by type of education after controlling for human capital related variables are considered to be the cause of labour market variations, or more specific; differences in the supply-demand relation between the educations and thus, in accordance with the assignment theory.

Mismatch

The labour market situation will be examined by the use of the variable ‘mismatch’ as the dependent variable, which is established according to the following:

1. *Unemployed*. This refers to respondents who answered that they were not currently employed and who reported that they actively had tried to obtain paid work in the past 4 weeks, or who reported that they were awaiting the results of earlier job applications.
2. *Horizontally mismatched* (and not vertically mismatched). This refers to persons who gave an answer to the question “*What field of study do you feel is most appropriate for this work?*” that indicated that their work did not correspond to their own or a related field.
3. *Vertically mismatched* (and not horizontally mismatched). This refers to those who gave an answer to the question “*What type of education do you feel is most appropriate for this work?*” (“type” is referring to “level” according to the response options in the questionnaire) that indicated a level below their educational level. We have taken into account the fact that some have acquired a higher educational level after their graduation in 1999/2000 (as masters or PhDs). Bachelors who had taken further education and have become masters and hold a job that corresponds to the bachelor level are regarded as vertically mismatched, and vice versa for master who have obtained a PhD degree.
4. *Both vertically and horizontally mismatched*.
5. *Employed with relevant work*.

Horizontal and vertical mismatch will be based on the respondents’ self-assessment, which is viewed as the best available measure (Hartog 2000) concerning the measurement of education-job mismatch.² We will concentrate on educational mismatch. Skills mismatch and educational mismatch are highly correlated in the data set, however, a rather small group is reporting skills mismatch, and this will not be in focus here.³

² See Hartog (2000), Allen and van der Velden (2005) and van der Velden and van Smoorenburg (1997) for a discussion of methods concerning the measurement of skills and education-job (mis)match.

³ Of the total sample of employed persons only 4 per cent were experiencing skills mismatch (to a high or very high extent); of those 3 per cent belonged to the group who were vertically or horizontally mismatched (or both) and 1 per cent per cent to the group with relevant (appropriate) work. Skills mismatch is then measured by the respondents answers concerning to which extent there is an under-utilization of skills in their present job. Other

Data and method

The dataset used is a part of the international REFLEX dataset. REFLEX is an international project financed by the European Commission. The project examines the labour market situation among higher education graduates and is currently being conducted. A survey of graduates completing higher education in the academic year 1999/2000 was carried out in 14 countries during 2005 (for some countries, in 2006).⁴ This paper is based on the Norwegian dataset. About 2160 persons answered the questionnaire, and the response rate was about 50. Of the Norwegian sample 97 per cent belonged to the labour force (that is 2097 persons) and this is the group that will be examined in the analyses below.

In analysing the probability of being mismatched we use multinomial logistic regression. The estimations are made according to the formula

$$p = \frac{\sum e^{Z_j}}{1 + \sum e^{Z_j}}$$

where Z = the intercept plus the effects of the control variables ($Z = B_0 + B_1X_1 + B_2X_2 \dots$), and j is an expression of the different outcomes on the dependent variable (the logit has $j - 1$ different sets of parameters).

In analysing the influence of competencies on the probability of being mismatched, different indicators of competencies will be utilised. One set of indicators will be based on factor analyses of the 19 questions on competencies in the questionnaire. In factor analysis number of variables will be reduced to a set of underlying components. The variables can be decomposed in the following way:

$$\begin{aligned} X_1 &= b_{11}F_1 + \dots + b_{1k}F_k + d_1U_1 \\ &\cdot \\ &\cdot \\ X_m &= b_{m1}F_1 + \dots + b_{mk}F_k + d_mU_m \end{aligned}$$

where X_1 to X_m are the variables, F_1 to F_k are the underlying common factors and U_1 to U_m are the unique factors.

Independent variables

Educational categories – what is ‘generic’ and what is ‘vocational’?

A variable consisting of ten categories of vocational or generic educations, *one generic and nine vocational* educations (see Table1), was first constructed. This categorization only partly coincides with the ISCED fields of study; rather, it deviates from this classification scheme in several respects, see Appendix 1. Our classification ‘generic/vocational’ is based upon our knowledge of the educational system and our assessment of to what extent the different types of educations provide higher professional education that provide the graduates with

‘skills’ measurements will be used and controlled for in our analyses by the control for set of competency items (see below), and grades from higher education.

⁴ For more information, see: <http://www.reflexproject.org>.

knowledge that is linked to a particular occupation or profession (Heijke et al., 2002). A further description of the ten groups is given in the Appendix 1 and 2.⁵

Due to the restricted number of respondents we could not include all the ten categories as dummies in the regressions; else the results would be confusing because of high standard errors. Another reason was the fact that there was no variation for some of the groups concerning some of the outcomes (for instance: no lawyers were vertical mismatched or both vertical and horizontal mismatched). At the second step we reduced the ten categories into *four* categories, one generic and three vocational.

According to our classification ‘generic/vocational’ the respondents with generic education constitute one fourth of the respondents. The ‘generic’ group includes respondents who do not fit into any of the vocational categories (see Appendix 1). It includes educations in the fields of Humanities, Social science and Business (including Economics), Science and Mathematics, and a few educations in the field Services. Half of the “generic” group is educated in Social sciences or business, one fourth in Humanities. These educations are mainly university educations (70 per cent of the generic group has a higher degree); those with lower degree in the generic category (in our sample) are mainly graduated in Business and Administration. The category ‘technical’ includes engineers (both lower degree and graduate engineers) and persons educated in computer science and in agriculture. The category ‘soft’ includes health and welfare, education (lower degree) and higher degree of special education; ‘legal’ includes lawyers and police. The vocational categories are further described in Appendix 1.

Other independent variables

In the analyses we have included control for age, gender, grades and other human capital related variables, as well as whether or not the respondents lived in Oslo (the capital and the largest city in Norway) at the time of the survey, the latter because the labour market possibilities are more varied in Oslo.

The variable ‘age’ refers to the difference between the age of the respondent in 2005 and the average age of the respondents, which was 34 years in 2005. We have also included a second order variable for age; that is the square of the difference between the age of the respondents and the average age, divided by 100.

The grades variable is based on the respondents’ answers to the question “*How do you rate this grade (average grade when finishing study programme) compared to other students that graduated from your study programme?*” We have dichotomised this variable. Only a few reported having lower grades than their fellow students. Those with lower grades and those with medium grades, as well as those who answer “do not know” have got the value 0, the other got the value 1.

In some of the analyses we have included the variables ‘completed a further education’, ‘work related courses during the last 12 months’ and ‘the number of months employed since graduation (work experience).

We have also included different indicators of the graduates’ competencies. These indicators will be presented later.

⁵ Appendix 1 describes the relation between the ISCED classification and our classification of educational groups. Appendix 2 (with Table A.1) describes the relation between the ‘generic–vocational’ variable and the respondents’ assessment of to what extent their study programmes were vocational.

Results

Before presenting the results from our analyses, we will give a very brief description of the general labour market for persons with higher education in the period 1999–2005. The graduates who completed their education in 1999/2000 entered the labour market at the end of an economic boom. The unemployment rate for persons with a higher education rose from 1.9 per cent in 1999 to 3.1 per cent in 2003 and then dropped to 2.7 per cent in 2005 (Statistics Norway, Labour force sample survey). These figures indicate, by international standard, a rather favourable labour market for persons with higher education despite an increased unemployment rate in the period.

Table 1 shows the distribution of the dependent variable across the four education groups among persons belonging to the labour force is shown. (For the distribution of the dependent variables across the different education groups, see Tables A.2 and A.3 in Appendix 2).⁶

Table 1. Match/mismatch in the labour market 2005 by type of education. 4 education groups. Per cent

	Unemployed	Horizontal mismatch	Vertical mismatch	Both horizontal and vertical mismatch	Employed with relevant work	N (=100%)
Generic	3.9	5.5	13.8	7.2	69.6	542
Technical	1.3	1.6	15.3	5.6	76.1	373
Soft	1.9	1.2	7.3	1.3	88.3	1039
Legal	0.7	2.1	1.4	0.7	95.1	143
Total	2.2	2.4	10.0	3.6	81.7	2097

Approximately four of five are employed in relevant work five–six years after graduation, but the situation varies by education group. The generic group has the worst situation, and the soft and legal group has the best. The ‘generic group’ is a broad category, and we have investigated whether there are large differences by field of study *within* this group (Table A.2). Graduates in the classical sciences of humanities and natural science face poorer labour market opportunities than almost all other education groups. Overall, the differences within the ‘generic’ group are small and we have chosen not to split this group further. In the regressions we will have to use rather broad groups.

Multinomial logistic regression analyses

Table 2 shows the results of our first two regression models. In Model 1 only dummies for the educational groups are included. In Model 2 we have included control for age, gender, grades, ‘completed a further education’, ‘work related courses during the last 12 months’ and work experience, as well as whether or not the respondents lived in Oslo.⁷

After the control for all these variables, we find more or less the same differences in mismatch between the educational groups as we see in Model 1. The generic group (which serves as the

⁶ Table A.2 depicts great variation between the ten education groups. The respondents who have the best labour market situation are those with vocational higher educations, with some exceptions; situation among the engineers is more or less the same as for the generic group. Those educated in computer science have a much better situation than engineers. The respondents were educated in a period when the demand for computing skills was rather high (our sample graduated in the period 1 April 1999 to 31 March 2000), partly caused by the world-spread fear of a data collapse at the turn of the 20th century. However, a large share of those of this group who have higher degree, reports vertical mismatch. This *may* indicate that the more difficult labour situation for persons with computing skills during the years 2001–2004 has resulted in problems getting promoted.

⁷ Educational level (master level or above, versus below master level) has been controlled for in additional analyses. It turned out to be far from significant for none of the outcomes in none of the analyses in this paper, and is thus not included.

reference category) has a significant higher risk of being horizontally mismatched than all the other three groups, which is in accordance with Heijke et al.'s (2002) finding, although our definition of 'generic' differs from theirs. The generic group also has a higher risk of being unemployed than the technical and the soft group and a higher risk of being vertically or both vertically and horizontally mismatched than those in the soft and the legal group. The results indicate that the mismatch variable pictures that the labour market situation differs between the groups, with a special favourable labour market for persons with the 'soft' and 'legal' vocational educations.

Although the inclusion of the control variables in Model 2 does not change the main picture of differences between the education groups, the impact of the human capital related variables is large. Grades are important. Those with the best grades have lower risk of being unemployed and lower risk of being vertically mismatched (or being both vertically and horizontally mismatched) relative to being employed with relevant work. Those who have completed a further education have lower risk of being both horizontally and vertically mismatched, else it has no effect.

Those who had taken work related courses during the last 12 months have increased unemployment risk. The reason is probably that those who are more loosely connected to the labour market than the others more often have taken such courses, for instance labour market courses arranged by an employment agency, and the coefficient should not be interpreted as an effect of the course in itself.

The duration of the labour market participation is of large importance; the higher the number of months employed, the less is the risk of being unemployed, vertically mismatched or both horizontally or vertically mismatched.

We expected that living in Oslo might decrease the risk of being unemployed, but at the same time possibly increase the risk of being horizontally and/or vertically mismatched. Still, the results in Table 3 reveal that living in Oslo decreases the risk of being vertically mismatched; else it has no significant effect. (The sign of the coefficients for living in Oslo are, however, in the supposed direction, positive for horizontal mismatch and negative for unemployment.)

Age is significant for the risk of being vertically mismatched, which increases only up to a certain age. The effect of gender is not significant. The control for gender is kept in all the regressions, because gender is close to be significant and in some models—depending on the number of observations and control variables included—this variable has a significant effect; that is an increased risk of being unemployed among females.

Table 2. Multinomial logistic regression predicting labour market match/mismatch controlling for human capital variables and demographic variables.ⁱ

	Unemployed versus relevant work		Horizontal mismatch vs. relevant work		Vertical mismatch vs. relevant work		Horizontal & vertical mismatch vs. relevant work	
	B ⁱⁱ	S. E.	B	S. E.	B	S. E.	B	S. E.
Model 1								
Intercept***	-2.950	0.242	-2.473	0.193	-1.682	0.136	-2.314	0.180
Technical***	-1.193	0.559	-1.264	0.456	0.104	0.204	-0.325	0.303
Soft***	-0.854	0.339	-1.823	0.360	-0.854	0.188	-1.815	0.332
Legal***	-1.862	1.033	-2.339	1.023	-2.437	0.726	-2.498	1.020
Pseudo R-Square, Nagelkerke	0.086							
N ⁱⁱ	1863							
Model 2								
Intercept	0.100	0.654	-1.813	0.868	0.485	0.412	0.368	0.610
Technical**	-1.059	0.590	-1.155	0.477	0.036	0.221	-0.525	0.326
Soft***	-1.120	0.378	-1.669	0.390	-0.920	0.206	-1.867	0.357
Legal***	-1.583	1.048	-2.459	1.026	-2.494	0.729	-2.509	1.026
Relative grades***	-1.018	0.346	-0.332	0.308	-0.613	0.164	-0.840	0.264
Female	0.465	0.398	-0.084	0.321	-0.123	0.181	-0.185	0.281
Age (dif. From average)**	0.001	0.045	0.077	0.048	0.071	0.024	0.017	0.037
Age ² /100**	0.188	0.254	-0.752	0.470	-0.380	0.178	0.081	0.214
Lives in Oslo	-0.048	0.394	0.343	0.320	-0.341	0.203	-0.171	0.300
Completed further education** ⁱⁱⁱ	-0.087	0.380	0.045	0.373	-0.222	0.216	-1.406	0.529
Work-related course/training**	0.824	0.348	-0.442	0.405	-0.396	0.216	-0.427	0.374
Months employed since graduation***	-0.055	0.009	-0.005	0.013	-0.023	0.006	-0.031	0.009
Pseudo R-Square, Nagelkerke	0.166							
N ⁱⁱ	1863							

^{*} The variable is significant at level $p < 0.1$. ^{**} The variable is significant at level $p < 0.05$. ^{***} The variable is significant at level $p \leq 0.001$.

ⁱ When the coefficient is in bold type and not in italics, the coefficient is significant at level $p < 0.05$.

When the coefficient is in bold type and in italics, the coefficient is significant at level $p < 0.1$.

ⁱⁱ This is the number of observations that responded to all the relevant variables included in Model 2.

ⁱⁱⁱ This refers to further education that did not result in a higher level of qualification than the level of the study programme the respondents graduated from in 1999/2000. Further education that has resulted in a higher level of qualification (for instance PhD for those who graduated as masters in 1999/2000 or master degree for those who graduated as bachelors in 1999/2000) is taken into account when defining the educational groups and the mismatch variable, see the introductory section.

The influence of competencies

The next step in our analyses is to include competency items in the analyses. The REFLEX questionnaire provides extensive information on the different kinds of competencies that the respondents possess at the time of the survey (five–six years after graduation). The competency items are shown in Table A.4 in Appendix 4. It shows the average distribution of the response to this question: “*Below is a list of competencies. Please provide the following information: How do you rate your own level of competence?*” The competency list consisted of 19 items. The number of persons who gave response to the competency list is high (on average 96 per cent of the persons in the labour force answered these questions, however fewer gave response to all the 19 items).

The particular competency refers to the time of the survey, and it may have been acquired through the study programme they graduated from in 1999/2000, work experience, further education or the “school of life”. In the regressions we have controlled for the impact of further education and work experience, in order to see the effect of a given competency among persons with the same amount of work experience etc.

If a job seeker has graduated just *recently* the types of competencies such as leadership, efficiency, cooperation and coordination (etc.) abilities are – to a very large extent – of a kind that the potential employer will have little or no information on. Such competencies will be far more visible for the employer or potential new employers through participating in the world of work. Thus, it is of interest to see whether and how the labour market situation varies according to the competencies – or the competency profiles – that the graduates possess five–six years after graduation, even though we cannot trace the exact point of time for when the competencies were acquired.

However, the interpretation of the results may be ambiguous. Favourable labour market experience may promote a positive development of the competencies. In such cases it is not the “independent” variable (the particular competency) that causes the outcome on the dependent variable (labour market situation), but the situation might be reverse. If we find an association, this should not be seen as a causal relationship, but only as a statistical association.

With these reservations, we proceed to include the competency variables in the regressions. It is reasonable to assume that some of the 19 variables may be correlated and be indicators of some common underlying factors. Our first approach is to perform factor analysis to reduce the number of variables to some underlying factors and include these factors in the regression.

Factor analyses

The utilization of factor analyses makes it possible to reduce the 19 competency items to a few underlying variables (factors) if some of the items are correlated. We have run factor analysis of the 19 competency variables and it resulted in four components (factors); see Table A.5 in Appendix 4.

- 1) The first component covers first of all *leadership ability*. Also *communication ability* has high scores on this factor. This component may to some degree also cover flexibility (cf. high factor loadings on “willingness to question own and other ideas”, “negotiate effectively” and “come up with new ideas and solution”). Factor 1 explains 15.5 per cent of the variance.
- 2) The next component covers *efficiency/productivity*. To some degree flexibility might be seen as one of the underlying competencies (also) of this component (cf. the factor scores for “perform well under pressure”, “use time efficiently”). Some of the items with high factor scores on Factor 1, have high scores also on Factor 2, such as “ability to make your meaning clear to others” and “ability to mobilize the capacities of others”. Factor 2 explains 15.4 per cent of the variance.
- 3) The next factor is a combination of *innovative and professional ability and analytical thinking*. Also this factor can be said to cover some flexibility-characteristics, and perhaps clearer than the first two, cf. the factor scores for “knowledge of other fields or disciplines”, “rapidly acquire new knowledge”, “alertness to new opportunities”, “come up with new ideas and solutions”. Factor 3 explains 13.1 per cent of the variance.

- 4) The last factor is rather special, covering both language proficiency and ability to use computers (as well as writing reports). This factor might be labelled as “instrumental competency”. This factor explains 9.8 per cent of the variance.

Totally, 53.8 per cent of the variance on the competency items is explained by these four components. Table A.4 in appendix gives the results of factor analyses of the 19 types of competencies. Table 3 below shows the bivariate relation between labour market mismatch and the graduates’ scores on the competency factors, and Table 4 shows how the mean factor scores differ between the education groups.

Table 3. Relation between labour market mismatch and mean factor scores (mean score of each factor=0)

	Factor 1. Leadership (and communication)	Factor 2. Efficiency/ productivity	Factor 3. Innovative/ professional ability/analytical thinking (and flexibility)	Factor 4. Language proficiency, ability to use computers	N
Unemployed	0.112	-0.161	0.046	-0.034	42
Horizontal mismatch	0.104	-0.228	0.274	0.374	43
Vertical mismatch	-0.233	0.002	0.240	-0.233	188
Horizontal and vertical mismatch	-0.224	-0.317	0.062	-0.015	66
Relevant work	0.032	0.024	-0.040	0.019	1564

Table 4. Mean factor scores by type of education (mean score of each factor=0)

	Factor 1. Leadership (and communication)	Factor 2. Efficiency/ productivity	Factor 3. Innovative/ professional ability/analytical thinking (and flexibility)	Factor 4. Language proficiency, ability to use computers	N
Generic	-0.026	-0.148	0.305	0.399	496
Technical	-0.389	-0.265	0.284	0.328	346
Soft	0.142	0.200	-0.242	-0.335	926
Legal	0.119	-0.152	-0.193	-0.004	135

The bivariate relation between labour market mismatch and the graduates’ competencies indicates that the relation is not very strong. A score below average on the factor leadership seem to some extent to be related to vertical and horizontal and vertical mismatch, while a score below average on the factor efficiency/productivity seem to increase the probability of being horizontally and horizontally and vertically mismatched. Somewhat surprisingly, a score above average on innovative, professional ability seem to increase the probability of being horizontally as well as vertically mismatched. A score above average in language proficiency, seem to be connected to increased risk of being horizontally mismatched.

There are also differences between the groups concerning the profiles of their competencies (Table 4). The technical group and the generic group resemble each other with regard to their profiles, and the same can be said about the legal and soft group. The first two groups score above average on Factor 3 (innovative, analytical, professional ability) and Factor 4 (language, computers, writing reports, i.e. instrumental abilities), while the soft group scores far below average on both Factor 3 and 4, and the legal group below average on Factor 3. The

soft and legal group score above average on Factor 1 (leadership etc.), and the soft group also on Factor 2 (efficiency etc.) In the analysis below we will see if the competency-factors have an independent influence on labour market mismatch after controlling for the other explanatory variables, and whether the differences between the education groups are reduced after the control for the competency-factors.

In Table 5 we have merged the ‘soft’ and the ‘legal’ groups into one group because else, the restricted number of respondents makes the results confusing. In Model 1 we have included the same number of respondents as in Model 2; in order to compare the results of the two models and to see whether or not the inclusion of the competency factor variables influence the results. As we see, the Pseudo R-Square is somewhat increased in Model 2 compared to Model 1 (Table 5); this shows that the factor-competency-variables do make a substantial contribution concerning the explanation of the variation in labour market adaptation, however not large. The competency factors seem primarily to have impact on the risk of being vertically mismatched in line with the bivariate results. The differences between the educational groups are still large after control for the competency factor variables, and the effects of the different human capital related variables (grades; further education; work experience) are also more or less the same.

Table 5. Multinomial logistic regression predicting labour market match/mismatch controlling for competency indicators based on factor analysis

	Unemployed versus relevant work		Horizontal mismatch vs. relevant work		Vertical mismatch vs. relevant work		Horizontal & vertical mismatch vs. relevant work	
	B	S. E	B	S. E	B	S. E	B	S. E
Model 1								
Intercept	-0.485	0.726	-2.307	0.984	0.546	0.435	0.578	0.646
Technical**	-1.174	0.663	-1.287	0.516	0.027	0.226	-0.420	0.334
Soft/ Legal***	-1.149	0.383	-2.141	0.430	-1.067	0.209	-1.919	0.362
Relative grades***	-0.979	0.361	-0.205	0.340	-0.577	0.170	-0.985	0.278
Female	0.834	0.440	0.114	0.343	-0.094	0.183	-0.077	0.292
Age (dif. from average)*	-0.016	0.048	0.028	0.052	0.070	0.025	0.032	0.042
Age ² /100	0.293	0.263	-0.366	0.438	-0.376	0.186	-0.226	0.307
Lives in Oslo	0.000	0.412	0.362	0.339	-0.450	0.211	-0.385	0.327
Completed further education*	-0.273	0.410	0.079	0.398	-0.205	0.224	-1.294	0.534
Work-related course/training**	0.910	0.364	-0.131	0.417	-0.370	0.225	-0.480	0.397
Months employed since graduation***	-0.050	0.010	-0.003	0.015	-0.024	0.006	-0.032	0.010
Pseudo R-Square, Nagelkerke	0.162							
N ⁱ	1728							

Table 5 (continued)

Model 2								
Intercept**	-0.697	0.755	-2.654	1.027	0.560	0.448	0.523	0.661
Technical**	-1.112	0.665	-1.250	0.520	-0.053	0.231	-0.464	0.339
Soft/ Legal***	-1.060	0.434	-1.926	0.457	-1.282	0.228	-2.169	0.392
Relative grades***	-0.985	0.364	-0.272	0.345	-0.509	0.175	-0.895	0.282
Female	0.962	0.455	0.194	0.354	-0.101	0.194	-0.018	0.304
Age (dif. From average)*	-0.025	0.049	0.015	0.053	0.075	0.026	0.033	0.042
Age ² /100*	0.325	0.265	-0.297	0.428	-0.421	0.190	-0.237	0.313
Lives in Oslo	0.023	0.416	0.344	0.342	-0.396	0.216	-0.268	0.333
Completed further education	-0.326	0.413	0.067	0.401	-0.140	0.227	-1.229	0.534
Work-related course/training*	0.887	0.367	-0.216	0.421	-0.329	0.230	-0.457	0.402
Months employed since graduation***	-0.050	0.010	0.000	0.015	-0.025	0.006	-0.032	0.010
Factor 1. Leadership*	0.164	0.189	0.149	0.181	-0.222	0.086	-0.119	0.143
Factor 2. Efficiency*	-0.204	0.175	-0.134	0.175	0.134	0.088	-0.091	0.139
Factor 3. Innovative/ professional/ analyt.	0.069	0.186	0.208	0.184	0.166	0.092	-0.044	0.145
Factor 4. Language proficiency, ability to use computers***	0.057	0.191	0.199	0.196	-0.400	0.093	-0.379	0.148
Pseudo R-Square	0.194							
N ⁱ	1728							

ⁱ See notes below Table 2. The number of respondents is lower than in Table 2 because only persons who gave response all the competency questions (as well as other variables) are included.

The effect of the competency-factors on the dependent variable ‘mismatch’ may differ between the educational groups. A factor that increases the probability of being (for instance) vertically mismatched in one of the groups may *decrease* the probability in one of the other groups. If this is the case, it may be the reason why we see few effects of the competency-variables in Table 5. We have conducted separate analyses for the educational groups, see Table 6 below, to examine whether the effects of the competency-factors differed between the education groups. In these analyses we have excluded a lot of the control variables due to the restricted number of respondents. The results of the analyses presented in Table 6 are further illustrated in Figures 1 and 2.

Table 6. Multinomial logistic regressions for three education groups predicting labour market match/mismatch controlling for competency indicators based on factor analysis

	Unemployed versus relevant work		Horizontal mismatch vs. relevant work		Vertical mismatch vs. relevant work		Horizontal & vertical mismatch vs. relevant work	
	B	S. E	B	S. E	B	S. E	B	S. E
The techn. Group								
Intercept	-2.104	2.151	-3.089	2.132	0.428	0.671	-1.344	1.094
Months employed since graduation**	-0.054	0.040	-0.016	0.035	-0.035	0.011	-0.023	0.018
Factor 1. Leadership*	-0.538	0.639	0.341	0.508	-0.301	0.158	-0.263	0.248
Factor 2. Efficiency	1.167	0.660	0.248	0.526	0.159	0.168	-0.026	0.248
Factor 3. Innovative/ professional/ analytical	-0.707	0.732	0.267	0.501	0.100	0.167	-0.025	0.248
Factor 4. Language prof., / computers***	-0.664	0.715	0.234	0.547	-0.450	0.170	-0.924	0.264
Pseudo R-Square	0.179							
N	330							

Table 6 (continued)

Soft/legal								
Intercept***	-0.972	0.730	-3.108	1.528	-2.858	0.746	-1.989	0.962
Months employed since graduation***	-0.053	0.013	-0.025	0.025	-0.001	0.012	-0.043	0.016
Factor 1. Leadership	0.448	0.256	-0.071	0.364	-0.249	0.134	0.216	0.300
Factor 2. Efficiency	-0.148	0.223	-0.430	0.316	0.256	0.136	0.146	0.280
Factor 3. Innovative/professional/analytical**	0.359	0.247	0.737	0.366	0.267	0.134	-0.209	0.289
Factor 4. Language prof., computers**	-0.379	0.239	0.136	0.359	-0.517	0.140	-0.357	0.286
Pseudo R-Square	0.100							
N	999							
Generic								
Intercept**	-0.612	0.863	-3.580	1.289	0.027	0.631	-0.684	0.772
Months employed since graduation***	-0.051	0.015	0.015	0.020	-0.028	0.011	-0.029	0.013
Factor 1. Leadership	0.095	0.275	0.158	0.222	-0.091	0.151	-0.246	0.192
Factor 2. Efficiency	-0.566	0.243	-0.169	0.212	-0.084	0.149	-0.246	0.189
Factor 3. Innovative/professional/analytical	-0.189	0.267	-0.141	0.224	-0.015	0.154	-0.193	0.201
Factor 4. Language prof./ computers**	0.448	0.295	0.245	0.239	-0.444	0.161	-0.036	0.212
Pseudo R-Square	0.105							
N	471							

Note: See notes below Table 2 and Table 5.

Table 6 shows that the influence of the competency profiles differs a lot between the groups. High score on Factor 1, *leadership* etc. increases the probability of being *unemployed* in the soft/legal group, but has no significant effect for the other groups concerning unemployment. High score on Factor 2, *efficiency* etc. increases the risk of being unemployed in the technical group, but has no effect in the soft/legal group and decreases the probability of being unemployed in the generic group. The effects just mentioned concerning the unemployment risk are not intuitively interpretable. This also applies to some of the other results, as mentioned below.

High factor score on *innovative/professional/analytical* ability increases the probability of being horizontally as well as vertically mismatched for the soft/legal group, while this factor has no effect on horizontal or vertical mismatch in the two other groups. In the soft/legal group the probability of being vertically mismatched decreases with high factor scores on leadership etc. and increases with high factor scores on efficiency.⁸

The soft/legal group very seldom experience education-job mismatch in the labour market, so even though several effects of the competency-factor-variables are significant (in different directions) for this group the substantial influence is minor, as illustrated in Figures 1 and 2.

⁸ We have checked whether these somewhat surprising results are due to the fact that we have not controlled for grades in the analyses shown in Table 6, but all the effects are in the same direction also after including control for grades (control for grades are excluded in Table 6 because else the restricted number of respondents, especially in the technical group, makes the results confusing).

Both in the soft/legal group and in the technical group *leadership* ability (Factor 1) as well as *instrumental abilities in computer science and/or foreign language* (Factor 4) reduces the probability of being *vertically* mismatched.

Also in the generic group high scores on Factor 4 reduces the probability of being vertically mismatched, but at the same time this competency-factor increases the probability of being unemployed in this group; so, the net effect of this type of competency relative to the probability of holding relevant employment is zero.

Figure 1 Estimated probability of being mismatched/employed in relevant work by education group and competency factors 1 and 2

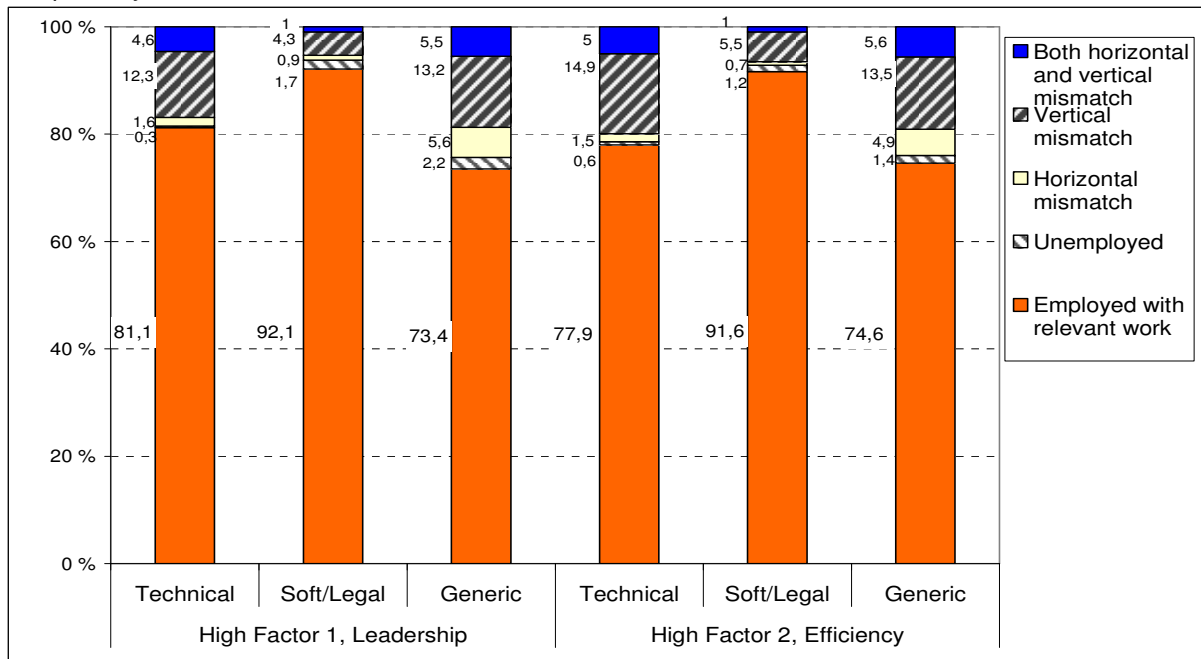
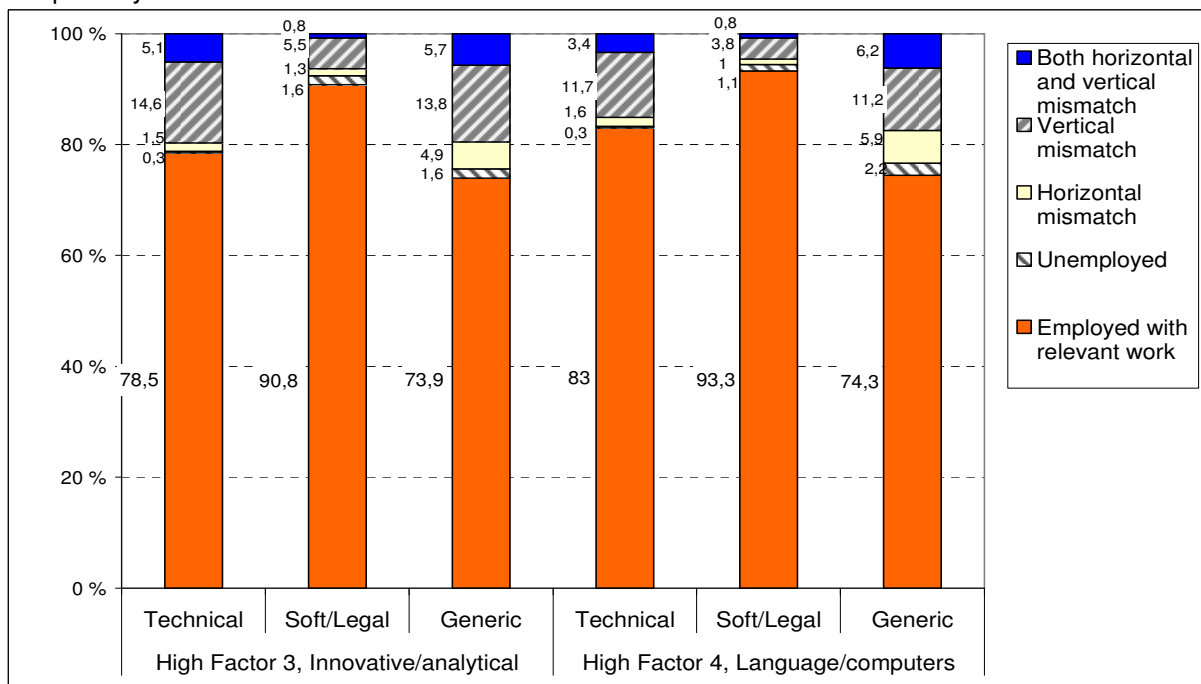


Figure 2 Estimated probability of being mismatched/employed in relevant work by education group and competency factors 3 and 4



The results in Figures 1 and 2 are based on the results of the analyses shown in Table 6. What varies, are the factor scores and the educational groups. In the estimations high factor score is set to 0.5 for the particular factor variable; else the value is 0 (mean value). The reference group for the estimations has value 0 on age (average age), value 0 on grades (average or below average grades), has 61 months of work experience (the average) and had not participated in work related course or further education.

The figures illustrate that the ‘soft/legal’ group has the best labour market situation irrespective of competency-factor scores and that the ‘generic’ group has the worst situation irrespective of factor scores; thus, the labour market situation varies a lot between the educational groups irrespective of the profile of their reported competencies. Only to *some* degree the labour market situation varies within the educational group dependent of the profile of competency of the respondent. The latter applies to the technical group; it does not apply to the ‘generic group’, and also for the soft/legal group the differences are rather small.

Which competencies are acquired through higher education?

The analyses above have shown that the competency-factors only to a small extent explain the labour market mismatch five–six years after graduation, further; that the differences between the education groups remain after the control for the competency factors – despite the differences between the groups concerning the profiles of their competencies. As pointed out earlier, the interpretation of the coefficients may be ambiguous. We do not know to what extent their competency is a result of their labour market experience or a result of what they acquired during study. We want now to limit the analysis to competencies acquired during study. In order to examine this, we have made use of information based on the following question in the questionnaire: “*Name a maximum of 3 competencies from the list above that you regard as strong points, and a maximum of three competencies that you regard as weak points of your study programme*”. On the basis of the respondents’ answers to the first part of this question we have constructed new competency-variables. If the respondent named a particular competency item as either the first, second or third strong point of study programme, he/she falls into the category mentioning the particular competency item as a strong point of study programme. Table A.6 shows the distribution of the response to the question “strong point of study programme” referring to ten of the competency items.⁹

In addition we created dummy-variables for the respondents’ rating of their competency on the different items; if the respondent’s competency rating is *above* average for the particular item the item was coded 1, else 0. The new dummy-variables to be included in the regressions were based on a combination of this information: If the given item was mentioned as a strong point of study programme *and* if the respondent’s competency rating was above average for the particular item, it was coded 1, else 0. Thus, we were able to examine the effects of the different competencies supposedly acquired through the study programme. Table A.7 shows the distribution the new competency variables

Table A.6 shows that the soft and legal groups more often than the other groups mention ‘mastery of own field’ as one of three strong points of study programme; further, that

⁹ Preliminary analyses of the association between the different 19 competency items and the labour market situation resulted in significant effects for only ten of the items. For each item we constructed two dummy variables, one indicating whether the rating was one standard deviation above average and one indicating whether the rating was one standard deviation below average. 10 of the items showed significant results for at least one of the variables.

approximately half of the total group of respondents mentioned this item as a strong point of study programme.¹⁰ Table A.7 shows, however, that only 27 per cent pointed to this item as strong point of study programme *and* rated their competency on this item as higher than the average level. Table A.7 indicates that the competence-profiles among those experiencing some kind of labour market mismatch do not deviate very much from those in relevant employment, with some exceptions. For instance, those who are unemployed score above those in relevant employment on the item ‘question own/others ideas’, and those who were horizontally mismatched and those who were both horizontally and vertically mismatched score below the other groups on the item ‘mastery of own field’.

In Table 7 the new set of competency-variables are included in the regression model. Of the ten items presented in table A.6 and A.7 only three items resulted in significant effects on some of the outcomes, and the analysis in Table 7 includes only these three items, i.e. mastery of own field, ability to question own or others ideas and foreign language proficiency.

Table 7. Multinomial logistic regression predicting labour market mismatch controlling for a set of competencies acquired through education, human capital variables and demographic variables

	Unemployed versus relevant work		Horizontal mismatch vs. relevant work		Vertical mismatch vs. relevant work		Horizontal & vertical mismatch vs. relevant work	
	B	S. E.	B	S. E.	B	S. E.	B	S. E.
Intercept*	-0.022	0.667	-2.202	0.917	0.435	0.421	0.474	0.629
Technical*	-0.981	0.596	-1.042	0.488	0.058	0.223	-0.512	0.331
Soft***	-1.087	0.391	-1.281	0.405	-0.880	0.210	-1.740	0.365
Legal***	-1.433	1.057	-2.046	1.036	-2.442	0.731	-2.383	1.030
Relative grades***	-0.988	0.351	-0.279	0.312	-0.605	0.165	-0.798	0.266
Female	0.532	0.399	-0.265	0.327	-0.130	0.181	-0.269	0.284
Age (dif. From average)**	-0.013	0.045	0.087	0.050	0.071	0.024	0.025	0.038
Age ² /100**	0.226	0.253	-0.760	0.479	-0.377	0.178	0.078	0.223
Lives in Oslo	-0.092	0.398	0.339	0.327	-0.342	0.204	-0.136	0.303
Completed further education**	-0.053	0.382	0.124	0.378	-0.226	0.216	-1.400	0.531
Work-related course/training**	0.780	0.352	-0.584	0.414	-0.408	0.217	-0.508	0.378
Months employed since graduation***	-0.054	0.009	0.000	0.013	-0.023	0.006	-0.030	0.009
<i>High level of mastery and strong point of study programme:</i>								
Own field***	-0.475	0.437	-1.592	0.607	-0.124	0.191	-1.171	0.440
Question own/others ideas	0.974	0.416	0.548	0.478	0.218	0.277	-0.415	0.549
Foreign language***	-19.976	0.000	1.764	0.416	0.244	0.372	0.888	0.418
Pseudo R-Square	0.199							
N	1863							

Note: See the notes below Table 2.

The inclusion of these competency-variables – which supposedly refer to competencies acquired during study – does not have a major impact on the differences between the four education groups concerning the labour market situation five–six years after graduation. Also,

¹⁰ Results of preliminary analysis indicate that respondents from other countries participating in the REFLEX project, such as Austria, United Kingdom and The Netherlands far more seldom mention ‘mastery of own field’ as strong point of study programme, whereas the Finnish respondents report this slightly more often than the Norwegians.

the effects of grades and the other human capital related variables remain more or less the same as in Table 2 (Model 2). The effects of the set of competency-variables seem to be complementary to the effects of the other variables.

High level of mastery in own field acquired during study strongly decreases the risk of being horizontally mismatched, or both horizontally and vertically mismatched. The variable ‘question own and others ideas’ is the only competency-variable that has significant effect on the risk of being unemployed. The higher the willingness to question own and others’ ideas, the higher is the probability of being unemployed. The result may “represent” the oppositional type who either regards this ability/willingness to be the reason why he/she is unemployed, or it *may* be a result of unwillingness among employers to hire the oppositional type.

Good proficiency in foreign languages acquired during study *increases* the risk of being horizontally mismatched and both horizontally and vertically mismatched. This result has a logical explanation as language proficiency is found among graduates in Humanities who have the least favourable labour market situation (see Table A.3).

The effects of mastery of own field, as well as grades, are illustrated in Figures 3 and 4. The estimations in the figures are based on the results of Table 7. The difference between Figure 3 and 4 refers to the grades. In Figure 3 all the respondents have grades above the average; in Figure 4 all the respondents have grades below the average or average grades. Else, the reference person for the estimates lives outside Oslo; is a male; 34 years of age in 2005, has been employed for 61 months (the average), and has not participated in work-related courses or further education. What varies is whether or not the respondent had a high level of mastery of own field of study and had reported this as a strong point of the study programme.

Figure 3. Estimated probability of being mismatched/employed in relevant work among persons with grades above average by educational group and level of mastery of own field

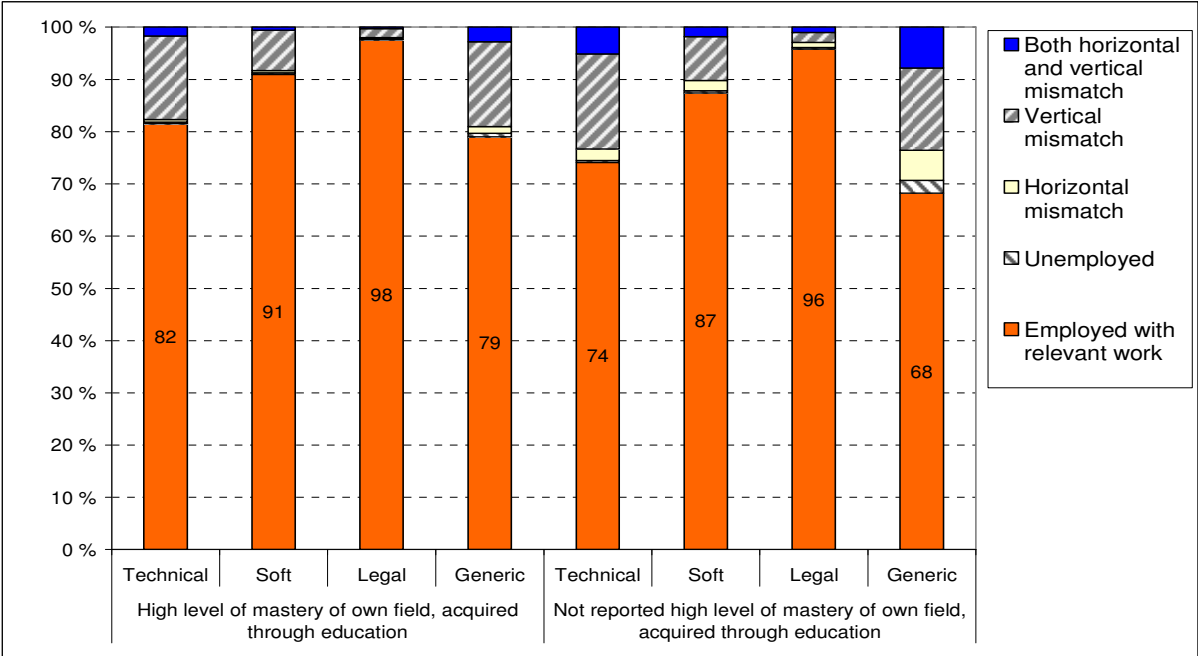
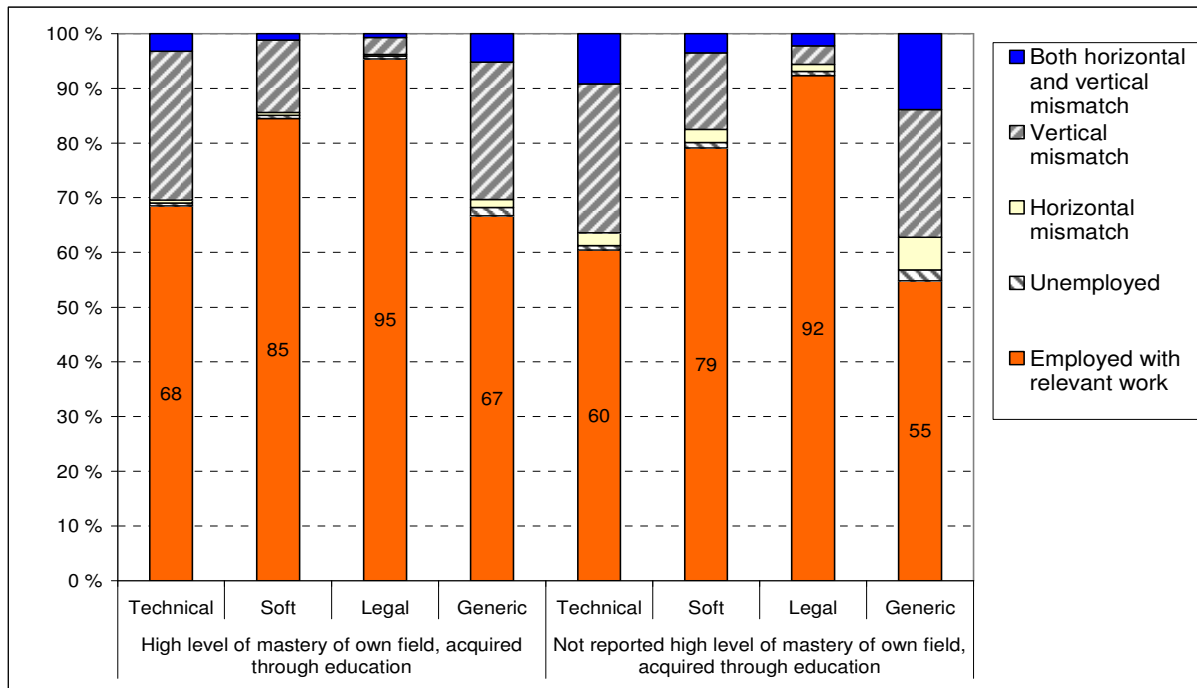


Figure 4. Estimated probability of being mismatched/employed in relevant work among persons with grades below average or average grades, by educational group and level of mastery of own field



The Figures 3 and 4 show that the differences between the extreme points are large. Among respondents in the legal group the estimated probability of being employed in relevant work is 98 per cent if they have grades above average and they belong to the group that has high level of mastery of own field and mentions this item as strong point of study programme. Among respondents in the generic group with equivalent qualifications the corresponding probability is 79 per cent. Among respondents in the legal group with grades below average (or average grades) and who do *not* belong to the group that has high level of mastery of own field and do not mention this item as strong point of study programme, the corresponding probability is still very high (92 per cent), but in the generic group with equivalent qualifications the probability is only 55 per cent.

The Figures 3 and 4 indicate that both high level of mastery of own field acquired during study and grades are of importance, however especially for the two groups (the technical and the generic group) who did not have the same favourable labour market situation as the other two groups.

The overall conclusion is that variations in labour market demand (relative to the supply of graduates) tend to explain most of the differences between the education groups. This is *not* a result of a special high increase in the number of graduates with generic educations or technical vocational education, who face a poorer labour market situation than the other two vocational groups, because other educations (other than the technical and generic educations) experienced a *higher* increase in the number of students and graduates during the 1990–2000 decade (see the introduction). Rather, it indicates that the demand for the other types of vocational educations has been especially high. The latter refers to a really high demand of labour in the health and welfare sector as well as of persons educated in the fields of teaching/pedagogy and law, despite a high increase in the supply of graduates in these fields.

Our results differ from the conclusions of Green and McIntosh (2002) concerning the interpretation of the differences in the over-qualification rates between different subject fields found in their study. They argue that if the graduates of some subjects fare better than others, this may not reflect that these subject-specific skills are in high demand: it may simply be that these subjects are deemed to be harder, and therefore their graduates more able. This *may* not serve as a good explanation of our results. We have controlled for a set of competency items in our analyses and grades (however measured by the respondents' rating of their grades compared to other students), and—also—we do not find it reasonable to assess the technological studies or the 'generic' university studies in for instance natural science or humanities as less hard than other fields of study.

Conclusions

The labour market situation five–six years after graduation varies a lot by type of education measured as 'generic' or 'vocational' and between different vocational educations. The generic group has a poorer labour market situation than those with vocational education; this refers to all types of mismatch. Some of the results are in line with previous research by Heijke et al. (2002); those with a generic education experience horizontal mismatch to a greater extent than the vocational groups. We also find large differences between different vocational education groups. Those educated in law had the best situation, closely followed by those in 'soft' educations (health and welfare professionals, teachers), while the respondents with 'technical' vocational educations did not have the same favourable situation by 2005.

The analyses also show that the labour market situation differs by type of competency-profiles measured by factor analysis and by grades. However, the competency-profiles seem to explain less of the variation than other human capital related variables. Another finding is that the competency-profiles vary among the graduates by type of education. However, although the labour market situation to some extent varies by type of competency-profiles, and although the educational groups vary by competency-profiles, the variations in labour market situation between the education groups could *not* be explained by differences in the type of competencies among the graduates.

The above refers to the competencies that the graduates possess five–six years after graduation. When we take into account information on whether the competency was acquired during study, this is that a high level of mastery of a specific competency-item was associated with this item being a strong point of study programme, the results clearly indicate that high level of mastery of own field acquired though the study increased the probability of being employed in relevant work. Other human capital related variables such as grades also have a large impact on the probability of being (mis)mismatched. These results are in accordance with human capital theory and heterogeneous skill theory.

However, neither the control for a set of competency items nor the control for other human capital related variables (grades, further education and work experience) reduce the differences between the education groups. The labour market situation simply was not as good for the 'generic' group (in special) and the 'technical' groups as for the 'soft' and 'legal' group. Taken into account that the results refer to a situation five–six years after graduation, the results should not be interpreted as a result of the search process (effect of lack of information or "waiting room"). Rather, the results indicate that to some extent there exists an educational-job mismatch dependent on surplus of supply relative to the demand in accordance with the assignment theory; over-education exists because it is a difference

between the share of complex jobs and the share of skilled workers for some types of education.

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Appendix 1. Classification of education groups

The 'generic' category includes respondents who do not fit into any of the vocational categories (see below). The generic category includes educations in the ISCED fields 2 Humanities; 3 Social science and Business (including Economics); 5 Science and Mathematics, and a few educations in the field 8 Services. A small group with higher (master) degree within ISCED field 1 Education is also included, however not those with a higher degree in special education (and not teachers, see below). 'Lawyers' are removed from the ISCED Field 3 Social Science, Business and Law in order to constitute a separate group according to our categorization

Persons educated in the ISCED Field 8 Services are categorized as having generic educations, with important exceptions: According to the ISCED classification *police* educations are placed in the field Services. We have categorized them as having a typical vocational education. Some educations in engineering/technology (such educations which include focus on nature and environment) belong to the ISCED Field 8 Services. We have included them in the group of engineers. Other more generic (not engineering) educations in environmental study programmes in Field 8 Services are kept in the generic category.

The categories 'engineers' and 'graduate engineers' are mainly educated in the ISCED Field 5, Engineering, Manufacturing and Construction, but also persons with codes—according to the national classification—for engineering and graduate engineering who belong to other ISCED Fields (such as Field 4, 7 and 8) are placed among the engineers/graduate engineers according to our categorization. A small group of engineers belong to the ISCED Field 7 (Health and welfare). They are all opticians (which in Norway is an education given at college for engineers) and are categorized as engineers.

All person educated in the Field 3 Social Science etc. are placed in the category 'generic' education except lawyers as mentioned above, and except psychologists, who are placed in the 'Health and welfare' category. Our category 'Health and welfare' includes all the educations in Field 7 Health and Welfare (medicine, nursing, dental studies, social services etc.). As mentioned above, we have also included psychologists in this group. In addition, we have included persons with higher degree of special education (originally in the ISCED field 1 Education), in this group, as well as the veterinaries. The category Health and welfare may be divided into lower degree (nurses, social workers, physiotherapists, who make up 86 per cent of the health and welfare group) and higher degree (medicine, psychologist etc., 14 per cent of the group).

We have removed Veterinaries from Field 6 Agriculture and Veterinary to the category Health and Welfare. Thus, we have a category called 'Agriculture etc.' which (only) includes persons graduated in agriculture, forestry and fishery.

The respondents in the group 'education/pedagogy, low' are mainly teachers (with four years of college education) or pre-school teachers (three years).

Persons with a degree from computing science belong to Field 4 Science, Mathematics and Computing according to the ISCED standard classification. We regard educations in computing as a vocational educations, and those with the ISCED field of study code 481 constitute an own category (in Tables 2 and 3). The computer science group may be divided into lower degree (they are mainly engineers) and higher degree.

Appendix. 2. About the ‘generic–vocational’ groups

Our classification of ‘generic’ and ‘vocational’ deviates from the categorization of for instance Heijke et al. (2002) (see above), whose categorization is based on the respondents’ assessment of their competencies at the time of graduation.¹¹ The Dutch survey used by Heijke et al. was conducted three years after graduation. The REFLEX survey did not contain exactly the same competency-questions and was conducted five–six years after graduation, and because of expected memory problems, the REFLEX questionnaire did not include questions about the competencies at the time of graduation, but at the time of the survey. That is one of the reasons why our definition deviates from the definition of Heijke et al. (2002) and why we did not use the REFLEX competency questions to establish a variable for whether or not the study programme was mainly vocational or generic. Another reason is that we wanted to use the competency questions in the REFLEX questionnaire as additional (complementary) information. The third reason is that we wanted to look at different types of vocational/professional educations (not one “block”), because there are large differences between the vocational educations with regard to the labour market situation.

Table A.1 shows the distribution of ten education categories across the response to the question of to what extent their study programme was vocational oriented. The categorization of vocational and generic education fits quite well to the graduates’ assessment of their study programme. The majority of those with an educational background that we have categorized as vocational assess their study programme as vocational oriented, and the majority of the ‘generic group’ assess their study programme as not vocational or only to some extent vocational. We have chosen not to use the answers to this question as a criterion for whether or not their education was vocational or generic, because our purpose was to examine different kinds of vocational educations and because we are not sure how the respondents have interpreted the question and to what extent they have a common understanding of the term ‘vocationally oriented’. For instance, when 20 per cent of the engineers assess their education as *not* vocational oriented, it would not be correct to categorize those persons as having generic education as long as other engineers, and the majority of them, assess their study programme as vocational.

Table A. 1 The education groups by the respondents’ assessment of the extent to which their study programme was vocational oriented. Per cent

	Rating of study programme:			N (=100%)
	Value 1 + 2	Value 3	Value 4 + 5	
Generic educations	43.7	25.1	31.2	538
Engineer (lower degree)	20.2	32.6	47.2	89
Graduate engineer	22.1	32.5	45.4	163
Police	0	10.8	89.2	37
Agriculture and fishing	23.3	23.3	53.5	43
Education (ped.), lower degree	6.6	16.0	77.4	363
Health/welfare, lower degree	4.6	12.6	82.8	522
Health/welfare, higher degree	2.9	19.9	77.2	136
Lawyer	20.0	27.6	52.4	105
Computing, lower degree	29.4	26.5	44.1	34
Computing, higher degree	31.6	34.2	34.2	38
Total	19.1	20.9	60.0	2068

¹¹ Heijke et al. (2002) identify two clusters of competencies representing generic and vocational competencies: i) Generic: learning abilities, reflective thinking, assessing one’s own work, problem-solving abilities, analytical competencies, documenting ideas and information. ii) Vocational competencies: Field-specific theoretical knowledge, field-specific knowledge of methods.

Appendix 3. The distribution of the mismatch variable across different educational groups

Table A.2. Match/mismatch by type of education. 10 education groups. Persons in the labour force. Per cent

	Unemployed	Horizontal mismatch	Vertical mismatch	Both horizontal and vertical m.	Employed with relevant work	N (=100%)
Generic educ.	3.9	5.5	13.8	7.2	69.6	542
Engineer (lower degree)	1.1	2.2	15.4	7.7	73.6	91
Graduate engineer	1.8	1.8	15.9	3.0	77.4	164
Police		2.7	5.4	2.7	89.2	37
Agriculture and fishing	2.3	0	14.0	20.9	62.8	43
Education (ped.), lower degree	2.2	2.2	6.2	1.6	87.8	370
Health/welfare, lower degree	2.3	0.6	8.1	1.5	87.6	532
Health/welfare, higher degree	0	0.7	7.3	0	92.0	137
Lawyer	0.9	1.9	0	0	97.2	106
Computing, lower degree	0	2.7	2.7	0	94.6	37
Computing, higher degree	0	0	26.3	0	73.7	38
Total	2.2	2.4	10.0	3.6	81.7	2097

Table A.3. The generic group. Match/mismatch by field of study. Per cent

	Unemployed	Horizontal mismatch	Vertical mismatch	Both horizontal and vertical mismatch	Employed with relevant work	N (=100%)
Education ⁱ	3.3	6.7	20.0	6.7	63.3	30
Humanities and Arts	3.8	6.0	18.8	10.5	60.9	133
Social sciences, Business and administration	3.0	4.2	11.4	5.7	75.7	263
Science, Mathematics	4.6	8.0	11.5	6.9	69.0	87
Services	10.3	6.7	13.8	6.9	62.1	29
Total, 'generic'	3.9	5.9	13.8	7.2	69.6	542

ⁱ This is the small group educated in the field Education which is neither included in the vocational category 'Education (ped.), lower degree' (teachers etc.) nor in 'Health/welfare' (higher degree of special education).

Appendix 4. Competencies

Table A.4. Average values (means) of the respondents' rating of their competencies. Scale 1–7.

	Mastery of your own field or discipline	Knowledge of other fields or disciplines	Analytical thinking	Ability to rapidly acquire new knowledge	Ability to negotiate effectively	Ability to perform well under pressure	Alertness to new opportunities
Generalist edu.	5.4	4.5	5.4	5.7	4.6	5.7	5.1
Technical	5.3	4.3	5.2	5.6	4.3	5.5	4.9
Soft	5.4	4.1	4.4	5.2	4.7	5.6	5.0
Legal	5.4	4.2	4.8	5.4	4.9	5.6	4.7
Mean, total	5.4	4.3	4.9	5.4	4.6	5.6	5.0
N, total	2029	2021	2001	2021	2015	2013	2002

Table A.4 (continued)

	Ability to coordinate activities	Ability to use time efficiently	Ability to work productively with others	Ability to mobilize the capacities of others	Ability to make your meaning clear to others	Ability to assert your authority
Generalist edu.	5.4	5.3	5.4	4.9	5.6	4.6
Technical	5.2	5.0	5.3	4.6	5.3	4.3
Soft	5.5	5.5	5.6	5.0	5.6	4.9
Legal	5.2	5.1	5.2	4.7	5.6	5.1
Mean, total	5.4	5.3	5.5	4.9	5.6	4.7
N, total	2019	2018	2013	2013	2021	2017

Table A.4 (continued)

	Ability to use computers and the internet	Ability to come up with new ideas and solutions	Willingness to question your own and others' ideas	Ability to present products, ideas or reports to an audience	Ability to write reports, memos or documents	Ability to write and speak in a foreign language
Generalist edu.	6.0	5.4	5.5	5.1	5.6	5.2
Technical	6.2	5.4	5.3	4.6	5.2	4.9
Soft	5.2	5.2	5.2	4.6	5.4	4.1
Legal	5.5	4.8	5.1	4.7	5.8	4.3
Mean, total	5.6	5.3	5.3	4.7	5.4	4.5
N, total	2021	2011	2018	2016	2018	2019

Table A.5. Results of factor analyses of the 19 types of competencies

	Factor 1	Factor 2	Factor 3	Factor 4
Own field or discipline	0.058	0.437	0.472	0.084
Knowledge of other fields or disciplines	0.167	0.085	0.640	0.086
Analytical thinking	0.073	0.008	0.625	0.368
Rapidly acquire new knowledge	0.022	0.417	0.519	0.370
Negotiate effectively	0.590	0.139	0.328	-0.179
Perform well under pressure	0.189	0.628	0.308	0.071
Alertness to new opportunities	0.369	0.386	0.526	-0.046
Coordinate activities	0.336	0.678	0.131	0.088

Table A.5 (cont.)

Use time efficiently	0.090	0.804	0.113	0.066
Work productively with others	<i>0.364</i>	0.605	0.011	0.141
Mobilize the capacities of others	0.650	<i>0.388</i>	0.129	-0.020
Make your meaning clear to others	0.528	<i>0.408</i>	-0.023	0.277
Assert your authority	0.714	0.261	0.103	0.006
Use computers and the internet	-0.034	0.111	0.308	0.620
Come up with new ideas and solutions	<i>0.423</i>	0.145	0.573	0.208
Willingness to question your own and others' ideas	0.522	0.078	<i>0.426</i>	0.213
Present products, ideas or reports to an audience	0.597	0.028	0.202	0.410
Write reports, memos or documents	<i>0.340</i>	<i>0.304</i>	0.030	0.477
Write and speak in a foreign language	0.039	0.036	0.122	0.746

Table A.6. Percentage who report that a given type of competency has been one of three strong points of their study programme

	Generic education	Technical	Soft	Legal	Total
Own field	41.0	45.2	58.5	51.9	51.1
Other fields	6.0	9.0	7.0	4.5	6.9
Acquire new knowledge	30.9	38.5	13.1	24.1	23.0
Use time efficiently	5.6	7.0	10.5	6.8	8.3
Work productively with others	11.2	18.4	33.8	6.8	23.3
New ideas, solutions	11.0	9.3	11.1	3.8	10.3
Question own/others ideas	19.1	9.0	12.9	9.8	13.6
Presenting	12.2	10.5	10.6	0.8	10.3
Writing reports	30.3	24.8	26.5	53.4	29.1
Foreign language	10.6	6.1	1.6	2.3	4.8
N ⁱ	498	343	946	133	1920

ⁱ The number of respondents refer to persons in the labour force who responded to the question concerning "strong point of study programme".

Table A.7 Percentage who report that a given type of competency has been one of three strong points of their study programme and reported above average competency level

	Unemployed	Horizontal mismatch	Vertical mismatch	Horizontal and vertical mismatch	Relevant work	Total
Own field	20.9	6.4	25.1	9.0	29.1	27.3
Other fields	4.7	2.1	2.7	0.0	4.4	4.0
Acquire new knowledge	14.0	19.1	18.2	20.9	15.1	15.7
Use time efficiently	2.3	2.1	7.5	6.0	5.7	5.7
Work productively with others	18.6	4.3	12.3	10.4	16.0	15.2
New ideas, solutions	4.7	6.4	10.7	3.0	6.2	6.5
Question own/others ideas	25.6	12.8	10.7	9.0	7.9	8.7
Presenting	9.3	8.5	7.0	10.4	9.1	9.0
Writing reports	23.3	21.3	15.5	22.4	21.2	20.7
Foreign language	0.0	23.4	5.9	16.4	3.4	4.5
N ⁱ	43	47	187	67	1576	1920

ⁱ See note below Table A.6.