

## **What Do Educational Mismatches Tell Us About Skill Mismatches? A Cross-country Analysis**

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### **Introduction**

There is a substantial research literature which deals with various aspects of imperfect matching between graduates' educational attainment and the educational requirements of jobs. In the economic literature on over-education, over-utilisation and underutilisation more especially, the relationship between higher education and employment is interpreted in terms of the extent to which the higher education sector provides graduates with the knowledge and skills to match employment needs (see Borghans & De Grip, 2000; Büchel, De Grip & Mertens, 2003). This match is believed to affect productivity, earnings, and work satisfaction. Most of this research concentrated on the effects of working in a job that does not match one's level of education, the underlying assumption being that this imposes a limitation on the use of skills. In addition, many studies also take into account the effects of working in a job for which a different field of study is required.

This article seeks to analyse how far the knowledge acquired in higher education corresponds to that required on the job. The central issue is what a perceived mismatch means in terms of the match between required and available skills. Do educational mismatches necessarily imply mismatches between acquired and required skills? To answer this question, five countries that participated in the 1998 CHEERS study will be examined in more detail. Particular attention will be paid to the differences between these countries.

Five countries were selected which differed from each other in terms of both the structure of their national labour markets and of their higher education systems: Spain, Germany, the Netherlands, the UK and Japan. There are widespread beliefs about differences and common elements in these countries. Germany and the Netherlands are examples of countries where the match is generally believed to be rather close. In the UK and Japan, it is generally thought to be rather loose and indirect and employers tend to give greater value to generic skills. Spain is somewhere in between. These countries also differ considerably in the incidence of both over- and under-education. Although the impressive evolution of the supply of highly educated people has not been matched by an equal increase in the supply of skilled vacancies, countries show a varied pattern in this respect. In countries such as the UK and Germany, studies have found overeducation to be more pronounced than undereducation, while in the Netherlands and Spain, some studies have found the opposite (see for country-specific studies Dolton & Vignoles, 1998; Groot, Maassen & Brink,

2000; Alba-Ramirez, 1993; Alba-Ramirez & Blásquez, 2003; See also the overview by Sloane, 2003).

### **Theoretical Background**

The human capital theory was developed in the early 1960s to explain the relationship between individuals' level of schooling and their earnings in the labour market. Education develops skills ('human capital') that make graduates more productive in their jobs and this is reflected in higher earnings (Becker, 1964; Mincer, 1974). The human capital theory is based on three main propositions (Rumberger, 1994):

- the primary role of formal schooling is to develop the human capital, or the knowledge and skills, of future workers;
- the labour market efficiently allocates educated workers to firms and jobs where they are required;
- the human capital of workers increases their productivity in the workplace which is then rewarded with higher earnings.

Although this theory has been well supported by the results of research, it has been criticised. Some of the main criticisms have come from scholars who emphasise the demand side of the labour market. One such criticism is that it ignores important qualitative differences in the types of knowledge and skills produced in higher education. Although the theory acknowledges differences in general skills that can be applied to a wide variety of jobs, there are important independent dimensions to human abilities and skills that cover not only the cognitive area, but also the physical and social areas (Gardner, 1983). Another criticism is the effects of mismatches between graduates' acquired skills levels and those that are required in the workplace. They are thought to have adverse effects on both productivity and earnings.

More than the standard human capital model, the job assignment model is very explicit about the relevance of the demand side of the labour market. This model as developed by Sattinger (1993) is based on the proposition that there is an allocation problem in assigning heterogeneous workers to jobs that differ in their complexity. The allocation is regarded as optimal when the most competent workers are assigned to the most complex job and the less competent workers are assigned to simpler jobs. In other words, if you can get the right person in the right place, you will optimise earnings, productivity gains, job satisfaction, etc. In the case of a mismatch, the limitations of the worker or the job impose an unnecessary restriction on the productivity that can be achieved. Employees working below their educational level will find that the characteristics of the job impose a limitation to the use of their skills and therefore to productivity and earnings. Conversely, employees working in a job above their level will lack some of the skills needed to realise the productive potential of the job.

An important assumption of the assignment model is that different categories of education and jobs can be characterised as having fixed levels of available and required knowledge and skills. In other words, educational mismatches imply skill mismatches. Although the assignment model in itself seems highly plausible, this basic assumption can be questioned. Using data from a survey of graduates from Dutch universities and higher professional institutions, Allen and Van der Velden

(2001) made a distinction between a formal mismatch between actual and required education (educational mismatch) and between actual and required skills (skill mismatch). Two kinds of skill mismatch were considered. Graduates were asked (1) whether their current job offered sufficient scope to use their knowledge and skills (skill use), and (2) whether they felt that they would perform better in their current job if they had additional knowledge and skills (skill deficit). Their study revealed only a rather weak relationship between educational mismatches and these two forms of skills mismatches. Their results provide strong support for the assumption that the match between individual human capital and the characteristics of the job matters. Contrary to the assumptions of the assignment theory, however, educational mismatches are neither a necessary nor a sufficient condition for skill mismatches. It appeared that a high number of Dutch graduates who were working in jobs that were not closely related to their level and/or field of study nonetheless stated that they made great use of their knowledge and skills in their work. Furthermore, only a small proportion of the wage effects of educational mismatches was accounted for by skill mismatches. These had a strong negative impact on job satisfaction, unlike educational mismatches.

### **CHEERS Data**

It is worth considering whether the CHEERS data provide further insight. In his concluding chapter of the forthcoming book on the CHEERS project, U. Teichler questions the assumption that a close 'match' between education and employment categories is a good indicator of graduates' preparation for their professional tasks. He goes on to claim that employment outside graduates' traditional professional areas cannot be taken as an indication that study is irrelevant for employment and work. He bases this claim on the finding that at least a third of the graduates working in a position for which a lower level of education would have been more appropriate reported that they made use of some of the knowledge they acquired during their course of study in their work assignments (Teichler, forthcoming, pp. 277–279).

Concentrating on five countries that participated in the 1998 CHEERS study, namely Spain, Germany, the Netherlands, the UK and Japan, we will attempt to replicate the results of Allen and Van der Velden (2001). We will first describe the extent of educational and skill mismatches and the relationship between the two in the five countries and then examine the labour market effects of mismatches in terms of hourly wages, job satisfaction and the intention to quit.

### **Method**

Two major issues will be analysed:

- (1) The relationship between the education-job match on the one hand and the use of knowledge and skills on the other;
- (2) The effects of educational and skill mismatches on wage, job satisfaction and on-the-job search.

#### *Relationship between the Education-Job Match and Use of Knowledge and Skills*

Several methods will be employed to measure the extent of matching. In determining educational mismatches, graduates were asked to indicate what was the

most appropriate level of course of study/degree. Answer categories were: higher, same level, lower tertiary level, and below tertiary level. Graduates from universities and non-university HE institutions were represented in all five countries.

The mismatch between required and actual education will also be measured in terms of the extent to which the degree course is related to the job. Five categories were established:

- 'my field of study is the only possible / by far the best field'
- 'some other fields could prepare for the area of work as well'
- 'another field would have been more useful'
- 'field of study does not matter very much'
- 'higher education studies are not at all related to my area of work'.

The first two categories were combined to indicate work within one's own broad field, the last three to indicate work that was clearly outside one's field. For the analyses, mismatches according to level and field of education were divided into the following five categories:

- Job at a higher level than own education
- Job at own level and within own field
- Job at own level but in different field
- Job at lower tertiary level
- Job below tertiary level

Respondents were asked to report on a five-point scale the extent to which they used the knowledge and skills they had acquired in the course of their studies. In contrast to skill use, there is no direct question in the CHEERS survey on skill shortages. It is, however, possible to reconstruct an indicator of these from the data on competences possessed at the time of graduation and those required in the current job. Because not all are likely to be equally important, a selection was made of 18 competences from the original list of 36. The primary criterion for selecting the items was the degree of importance in the five countries studied in this article. In each country, the ten competences that were ranked highest in terms of mean requirements for the current job were selected. There was a high degree of overlap in this list and this first step resulted in a list of 16 competences. Interestingly, field-specific competences were not in the top ten in any of the countries. To avoid possible bias against highly field-specific disciplines or work domains, two items were included to indicate field-specific competences. This resulted in the following list of 18 competences:

- Field-specific theoretical knowledge
- Field-specific knowledge of methods
- Planning, coordinating and organising
- Problem-solving ability
- Learning abilities
- Working under pressure
- Accuracy, attention to detail
- Time management
- Fitness for work
- Working independently
- Initiative

- Adaptability
- Assertiveness, decisiveness, persistence
- Power of concentration
- Getting personally involved
- Loyalty, integrity
- Communication skills
- Taking responsibilities, decisions

Both own and required competences were measured on a five-point scale, ranging from 1 'not at all' to 5 'to a very high extent'. Taking this list of competences as a point of departure, we first determined those where graduates had a clear shortage. A shortage was defined as a negative discrepancy of more than one scale point between own and required competences. A discrepancy of just one point was not regarded as a shortage, since personal competences were retrospectively assessed at the time of graduation and required competences were assessed at the time of the survey. It is likely that both will have developed since time of graduation. Finally, the percentage of competences on which each graduate reported a clear shortage was calculated as a summary indicator for skill shortages in general.

#### *Effects of Mismatches on Wage, Job Satisfaction and On-the-job Search*

Some regression models will be used to measure the effects of educational and skill mismatches on the dependent variables. In the explanatory analysis, we will assess the effects on the following dependent variables: natural logarithm of hourly wage, job satisfaction, and on-the-job search. In each of these analyses, the dependent variable of the previous analysis will be included in order to account for their effect. Relevant control variables will be taken into account.

## **Analysis**

### *Descriptive Analysis*

Table I provides an overview of the match between the field and level of higher education graduated from in 1994/1995 and the current job.

About half the graduates found work that corresponded to their level and field of education. About one in seven found work at a higher level, about one in eight worked at their own level but in a different field, and slightly more than a quarter had jobs for which a lower level of education would have been more appropriate.

TABLE I. Match between education and job

	ES %	DE %	NL %	UK %	JP %	All 12 countries %
Job at higher level	14.9	4.5	10.7	15.8	10.4	13.6
Job at own level and field	49.3	57.3	62.1	40.8	30.6	48.8
Job at own level but different field	6.0	10.4	11.1	18.6	24.2	11.7
Job at lower tertiary level	11.3	18.7	9.5	15.4	18.3	14.2
Job below tertiary level	18.6	9.1	6.6	9.4	16.5	11.6
N	2,147	3,181	2,907	3,046	2,959	27,219

More than half of these lower level jobs are jobs for which a lower level of tertiary education was considered most appropriate.

There are great differences between countries. Overeducation is most common in Japan and Spain and under-education in (again) Spain and the UK. Japanese and British respondents were more likely to work in a different field. German and Dutch graduates were most likely to have work that was a 'perfect match' in terms of level and field of education. These findings do not really represent the general pattern as described by Sloane who concludes on the basis of a literature review that in countries such as the UK and Germany overeducation seems to be more pronounced than undereducation, while in the Netherlands and Spain it is the opposite (Sloane, 2003).

From the point of view of the assignment theory, Table I only paints part of the picture. Having a job that corresponds to one's level and field of education need not mean that one uses one's knowledge and skills. Table II provides an overview of the reported level of use of knowledge and skills in the current work situation.

TABLE II. Use of knowledge and skills acquired at university in working life

	ES	DE	NL	UK	JP	All 12 countries
Mean	3.40	3.30	3.48	3.45	2.71	3.48
S.D.	1.18	1.04	0.93	1.21	1.18	1.13
N	2,154	3,233	2,915	3,151	2,880	31,802

Question: 'Taking into consideration your current work tasks, to what extent do you use the knowledge and skills you acquired in the course of your studies' (5 = 'to a very high extent', 1 = 'not at all').

At the aggregate level, there is some similarity between these figures and those for educational (mis)matches. Japanese graduates show lower mean levels of use than European graduates, which is what one would expect in a country where a high proportion of graduates works in jobs either outside their field or below their level of education. These findings may reflect national differences in the extent to which countries have an occupational labour market which is horizontally linked to specialised education and qualifications. Also, the characteristics of national labour markets may account for this. For example, Yoshimoto (2002) analysed the use of university knowledge in working life and included explanatory factors at the national, organisational and individual levels which may affect this. More than the choice of graduates' institution of study (as an organisational-level variable), Yoshimoto considers the average graduation age at the national level as an important factor in determining the correspondence between acquired knowledge and knowledge use.

Use of knowledge and skills is only one side of the story in terms of skills mismatches. Equally important are possible skill shortages that graduates may suffer. Table III gives an overview by country.

In general, graduates across all countries reported a shortage on about 17% of the listed competences. Interestingly, Japanese graduates, who reported low levels of skill use, also reported high levels of shortages. This apparent paradox could be explained by the high proportion of graduates who work in jobs for which

TABLE III. Mean percentage of competence items on which graduates reported a clear shortage, per country

	ES	DE	NL	UK	JP	All 12 countries
Mean	16.0	18.5	12.1	18.2	27.3	17.3
S.D.	17.2	17.4	13.6	18.1	22.5	17.8
N	2,137	3,213	2,900	3,115	2,934	32,147

a different field would have been more appropriate. It is plausible that such graduates are in a position where they make little use of the knowledge and skills acquired in higher education, but at the same time lack much of the knowledge and skills needed to do well in their new line of work.

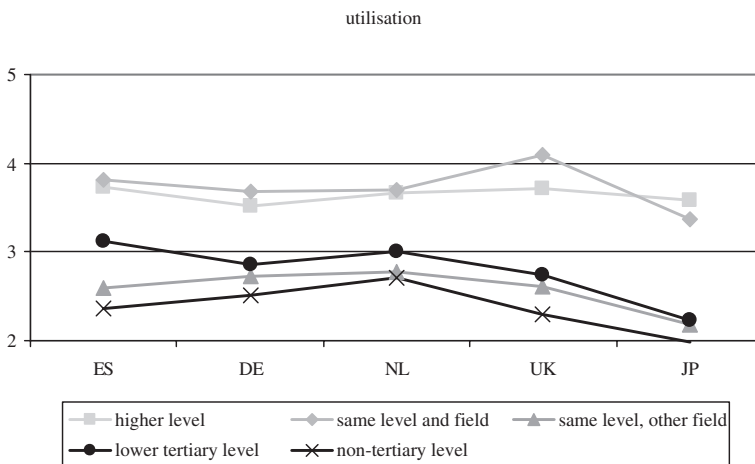


FIGURE 1. Use of knowledge and skills acquired at university in working life, by country and education-job match

Figure 1 shows the relation between educational and skill (mis)matches in the five countries. The picture is remarkably consistent. Those graduates working in jobs that match both their level and field of education or working in jobs for which a higher level would have been more appropriate show high levels of use on average. But graduates working outside their field at their level and those working in jobs below their own level show much lower levels of use. Interestingly, although the general pattern is similar, the relation between educational mismatches and skill use appears to be weakest in the two countries (Germany and the Netherlands) where the higher education system is generally regarded as being more closely linked to the labour market and greatest in the two countries (the UK and Japan) where the link is thought to be weakest. This is the opposite of what we would intuitively expect: the more highly attuned higher education is to later work, the more we would expect it to matter if the work does not match the education level. A possible interpretation of this finding is that in the UK and Japan work-related education lends itself to work in a broader sense, rather than to just the specific domain of work on which the education was focused.

Figure 2 shows the shortages of knowledge and skills acquired at graduation in working life. It appears that the pattern of shortages is less clear than that for use, but nonetheless generally consistent with what we would expect. Shortages are most prevalent amongst graduates working above their level or outside their field. This latter category shows high levels of both sorts of mismatches. Shortages are least prevalent amongst graduates working in jobs below their level, whilst those whose level and field of work match their education occupy an intermediate position. Germany, and to a lesser extent, Japan are exceptions to the general pattern in one respect: German graduates working in lower level jobs reported a higher proportion of shortages than those working in jobs that matched both their level and field of education, and in Japan the proportion was roughly the same in these two groups. A closer examination of the data suggests that this is related to the fact that German and Japanese graduates working below their level rate their competences as substantially lower than those of their peers in matching jobs, and to the fact that German graduates working in matching jobs only report slightly higher levels of required competences than those working below their level. With the exception of these anomalies, the pattern is rather similar in all the countries, although the absolute level of shortages is clearly different.

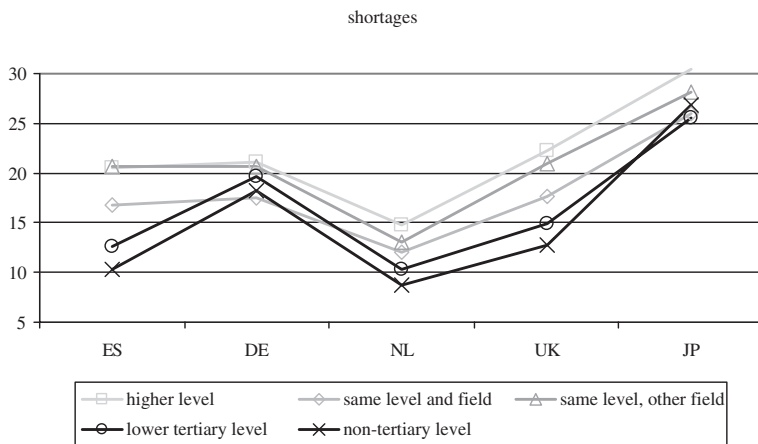


FIGURE 2. Shortages of knowledge and skills acquired at university in working life, by country and education-job match

Summing up, there is a clear relation between education and skill mismatches in the five countries, and the pattern of findings is consistent with what one would expect. Do these results mean that the two types of mismatches are interchangeable? A closer analysis of the data shows that this is not the case. Although graduates working in jobs that match their level and field of education are more likely to report a high level of use and a low level of shortage of knowledge and skills, the relationship is far from perfect. 10–20% of graduates working in jobs with a ‘perfect’ educational match nonetheless report a lower than average level of use of knowledge and skills (1 or 2 on the five-point scale). About 15% report



shortages on at least a third of the selected competence items. Conversely, around 20% of graduates who work below their level report higher than average levels of use of knowledge and skills (4 or 5 on the 5-point scale), and a quarter to a third report shortages on less than 5% of the selected competences.

Of course, it is possible that these discrepancies are just noise: respondents must fill in a large number of questions, and some may inadvertently give answers that are not entirely accurate and/or consistent. Furthermore, it may be that the constructed measure of skill shortages does not correspond to actual shortages experienced by graduates, either because of the discrepancy between the time periods referred to for own and required competences, or because the sum of individual shortages does not reflect shortages in a holistic sense. The best test is to look at the effects of the measures for education and skills mismatches on selected labour market outcomes. If the differences between the two kinds of mismatches are entirely due to noise in the data, we would expect skill mismatches to account for little or no variance in outcomes when educational mismatches are taken into account.

### *Explanatory Analysis*

Table IV shows the results of the ordinary least squares regression analysis with the natural logarithm of hourly wage as the dependent variable. Concentrating first of all on the effects of educational and skills match, we see that wages are particularly affected by working in jobs for which a lower level of education would have been more appropriate. In all five countries, there is a large and statistically highly significant negative effect of working in a job below tertiary level. In Spain, the UK and Japan, working in a job at a lower tertiary level also has a negative effect. In the Netherlands, working in a job for which a higher level would have been more appropriate carried a substantial wage bonus. Strangely, in Spain, graduates working in such jobs earned significantly less than those in 'matching' jobs. There was no significant effect of working in higher-level jobs in the other countries. None showed significant wage effects of working in a different field at one's own level.

In general, skills mismatches have less dramatic effects on wages than is commonly believed. In Germany and the UK skill shortages have a significant positive effect on wage levels, a finding which is similar to the positive effects of working above one's level of education. In other words, a skill shortage does not necessarily indicate that workers are below par, but may, in fact, indicate that they are working in a more 'high-powered' job (Allen & de Grip 2005) than other fellow graduates. Skill use has a rather weak positive effect in Japan and, strangely, a weak negative effect in Germany, but no effect in any of the other countries.

Briefly summarising the other effects, women clearly earn less than men in all the countries. We see numerous differences between fields of study, but no truly general pattern across countries. Tenure and age show the familiar positive effects on wages, and in Spain and the Netherlands the effect of tenure flattens out over time. Having a temporary contract has a detrimental effect on wages (although the effect is not significant in Germany). In Germany, the wages are highest in the reference category of private firms. In the other countries, the type of organisation has varied effects.

TABLE IV. Results of regression analysis, dependent variable ln (hourly wage)

	ES		DE		NL		UK		JP	
	Beta	t-value	Beta	t-value	Beta	t-value	Beta	t-value	Beta	t-value
Gender (female)	<b>-0.13</b>	-5.19	<b>-0.12</b>	-5.33	<b>-0.06</b>	-2.98	<b>-0.11</b>	-5.35	<b>-0.17</b>	-8.51
Field of study (ref. Business):										
— Arts & humanities	0.00	0.03	0.12	5.02	<b>-0.13</b>	-5.64	<b>-0.10</b>	-4.19	-0.03	-1.02
— Social Sciences	<u>0.07</u>	2.24	<u>0.03</u>	1.36	<u>0.04</u>	2.09	-0.02	-0.70	0.00	-0.05
— Law	-0.03	-1.11	<b>-0.07</b>	-3.27	<b>0.08</b>	3.91	0.00	0.06	0.01	0.48
— Natural Sciences	0.06	2.12	<b>0.07</b>	3.03	0.02	1.17	-0.02	-0.80	<b>0.06</b>	3.17
— Engineering	<u>0.14</u>	4.20	0.03	1.06	<b>-0.06</b>	-2.66	-0.01	-0.34	<u>0.05</u>	2.07
— Health	<b>-0.05</b>	-1.46	-0.03	-1.42	<b>-0.09</b>	-3.90	0.02	0.83	0.02	0.77
Age and experience										
— months in current job (tenure)	<b>0.25</b>	3.36	0.03	0.79	<b>0.43</b>	9.45	<u>0.09</u>	2.33	<b>0.22</b>	4.32
— tenure squared	<b>-0.19</b>	-2.63	0.03	0.91	<b>-0.18</b>	-4.00	0.03	0.74	-0.06	-1.27
— age at start of current job	<b>0.13</b>	5.04	<b>0.13</b>	5.54	<b>0.16</b>	8.30	<b>0.09</b>	4.49	0.04	1.37
Temporary contract	<b>-0.18</b>	-6.69	-0.03	-1.49	<b>-0.09</b>	-4.77	<b>-0.11</b>	-5.38	<b>-0.26</b>	-13.44
Type of organisation (ref. private firm):										
— Public organisation	<b>0.15</b>	5.63	<b>-0.17</b>	-6.66	0.01	0.57	<b>-0.06</b>	-2.90	-0.04	-2.20
— Non-profit organisation	0.00	-0.18	<b>-0.13</b>	-5.90	<u>0.05</u>	2.15	<b>-0.07</b>	-3.35	-0.02	-0.99
— Self-employed	<u>-0.06</u>	-2.37	<b>-0.08</b>	-3.86	-0.01	-0.38	-0.02	-1.15	0.00	0.23
— Other	0.00	-0.13	<u>-0.05</u>	-2.46	0.02	0.86	-0.03	-1.37	<u>-0.04</u>	-2.29
Education-job match (ref. own level and field):										
— job at higher level	-0.06	-2.24	-0.03	-1.44	<b>0.10</b>	5.31	0.00	0.06	0.03	1.55
— job at own level, other field	-0.03	-1.10	0.00	0.20	-0.02	-1.11	-0.01	-0.42	-0.01	-0.23
— job at lower tertiary level	<b>-0.09</b>	-3.56	-0.02	-0.81	-0.02	-1.16	<b>-0.24</b>	-10.88	<b>-0.15</b>	-6.97
— job below tertiary level	<b>-0.22</b>	-7.92	<b>-0.15</b>	-7.29	<b>-0.20</b>	-9.83	<b>-0.28</b>	-12.18	<b>-0.14</b>	-6.22
Skill mismatch										
— skill shortage	0.00	-0.06	<b>0.06</b>	3.25	0.00	-0.10	<b>0.07</b>	3.57	-0.02	-1.03
— skill utilisation	0.03	1.05	<u>-0.05</u>	-2.35	0.00	-0.23	0.01	0.48	<u>0.06</u>	2.55
(Constant)		10.10		35.67		50.04		53.14		18.30
N		1,452		2,302		2,280		2,257		2,375
Adj. R-Squared		0.18		0.14		0.21		0.20		0.26

underlined = significant at 5%; **bold** = significant at 1%.

In sum, the wage effects of educational mismatches, particularly the effects of working below one's level, are much stronger and more consistent across countries than those of skill mismatches.

Table V shows the effects of the same variables on job satisfaction. The dependent variable from the previous analysis, the natural logarithm of hourly wages, is also included, since it is likely that this will be an important factor in determining the job satisfaction of some respondents. Concentrating again first of all on the effects of mismatches, we see more balance between the effects of educational and skill mismatches. We see strong effects across all five countries of working in a job below one's level (which lowers job satisfaction) and of the degree to which one's knowledge and skills are used (which raises one's job satisfaction). Working at a higher level or working in a different field have no significant effects on satisfaction. In Spain, the Netherlands and especially the UK, skill shortages are associated with higher job satisfaction, although the effects are smaller than those of use. This seems to confirm the expectation that skill shortages are more indicative of high-powered jobs than of below-par workers.

Looking briefly at the other effects on job satisfaction, we see a positive effect of wages in all countries. Interestingly, women are significantly more satisfied than men in the Netherlands, the UK and Japan. Tenure and/or age have negative effects in Germany, the UK and Japan. This may suggest that the longer workers in those countries have been in a given job or in the labour market in general, the more critical they become. Not surprisingly, having a temporary work contract has a negative effect on satisfaction, although this is not significant in the Netherlands and Japan. Public sector workers in Spain, the UK and Japan are more satisfied with their work than private sector workers.

Summing up, we see that job satisfaction is determined in roughly equal measure by educational mismatches and job mismatches.

Finally, Table VI shows the effects of a logistic regression analysis of the probability that employed respondents are looking for other work at the time of the survey. This is probably strongly related to job satisfaction, the assumption being that those who are satisfied with their current work are less likely to look around for alternatives than those who are dissatisfied. We have decided, however, not to include job satisfaction as a predictor in these analyses because this is likely to mask the effects of the variables in which we are interested. After all, the main reason for thinking that a mismatch would lead to a greater chance of looking for other work is the belief that workers in jobs with a poor match are less satisfied with their work. In this analysis, we aim to investigate the behavioural consequences of dissatisfaction ensuing from mismatches.

In general, both educational and skill mismatches have less effect on respondents' propensity to look for other work than on job satisfaction. The strongest effects are seen in Germany: both a lower job level and a low degree of skill use seem to motivate workers to look for other work. A low job level is also a reason for Spanish, Dutch and British respondents to look for alternative work opportunities. German and British respondents who do not make great use of their knowledge and skills are more likely to look for other work. Interestingly, British workers with a skill shortage are also less likely to shop around than those with fewer shortages.

Briefly summarising the other effects: women are less likely than men to look for other work in the UK. Even though wages were one of the main determinants

TABLE V. Results regression analysis, dependent variable job satisfaction

	ES		DE		NL		UK		JP	
	Beta	t-value	Beta	t-value	Beta	t-value	Beta	t-value	Beta	t-value
Gender (female)	0.02	0.67	0.00	0.06	<u>0.05</u>	2.24	<b>0.08</b>	3.92	<u>0.05</u>	2.26
Field of study (ref. Business):										
— Arts & humanities	0.03	0.88	0.05	1.89	-0.04	-1.45	<b>-0.06</b>	-2.67	<u>0.07</u>	2.28
— Social Sciences	0.01	0.32	0.04	1.93	0.00	0.07	-0.01	-0.29	<u>0.06</u>	2.22
— Law	<u>-0.06</u>	-2.15	-0.01	-0.29	0.00	0.20	0.02	1.22	<u>0.06</u>	2.52
— Natural Sciences	0.00	0.04	<u>0.05</u>	2.25	0.00	-0.04	0.04	1.62	0.00	0.10
— Engineering	0.01	0.31	<u>0.05</u>	1.90	0.02	0.77	0.02	0.79	0.01	0.29
— Health	-0.05	-1.56	0.03	1.21	-0.01	-0.33	<b>-0.09</b>	-3.94	0.03	1.18
Age and experience										
— months in current job (tenure)	-0.12	-1.63	<u>-0.08</u>	-2.15	-0.07	-1.39	<b>-0.11</b>	-2.93	<b>-0.31</b>	-5.56
— tenure squared	0.07	0.95	-0.01	-0.27	0.03	0.54	0.06	1.61	<b>0.14</b>	2.87
— age at start of current job	-0.05	-1.93	<b>-0.09</b>	-3.91	-0.02	-1.05	-0.01	-0.42	<b>-0.10</b>	-3.30
Ln(hourly wage)	<b>0.13</b>	<b>5.03</b>	<b>0.23</b>	10.64	<b>0.09</b>	3.93	<b>0.18</b>	8.55	0.07	3.37
Temporary contract	<u>-0.05</u>	-1.98	<b>-0.13</b>	-5.75	-0.01	-0.33	<b>-0.07</b>	-3.28	-0.03	-1.50
Type of organisation (ref. private firm):										
— Public organisation	<b>0.13</b>	4.93	0.03	1.19	0.02	0.95	<b>0.08</b>	3.87	<b>0.10</b>	4.96
— Non-profit organisation	0.03	1.36	0.00	0.11	0.02	0.62	-0.01	-0.59	0.03	1.69
— Self-employed	0.03	1.27	0.01	0.67	-0.03	-1.66	0.04	2.08	-0.01	-0.35
— Other	-0.01	-0.41	0.01	0.39	-0.01	-0.45	0.03	1.79	<b>0.07</b>	3.40
Education-job match (ref. own level and field):										
— job at higher level	0.00	0.19	-0.03	-1.74	0.02	1.07	0.03	1.67	0.00	0.16
— job at own level, other field	-0.01	-0.23	-0.02	-1.02	0.02	0.93	0.03	1.34	-0.01	-0.61
— job at lower tertiary level	<b>-0.14</b>	-5.68	<b>-0.12</b>	-5.73	-0.05	-2.39	<b>-0.12</b>	-5.42	<b>-0.15</b>	-6.06
— job below tertiary level	<b>-0.29</b>	-10.14	<b>-0.11</b>	-5.23	<b>-0.16</b>	-7.36	<b>-0.11</b>	-4.80	<b>-0.16</b>	-6.77
Skill mismatch										
— skill shortage	0.05	1.97	0.03	1.46	0.05	2.39	<b>0.10</b>	5.24	-0.01	-0.61
— skill utilisation	<b>0.16</b>	5.93	<b>0.11</b>	4.74	<b>0.09</b>	4.13	<b>0.23</b>	9.70	<b>0.16</b>	6.87
(Constant)		11.34		8.61		12.81		7.84		7.66
N		1,452		2,302		2,280		2,257		2,375
Adj. R-Squared		0.23		0.11		0.06		0.21		0.14

underlined = significant at 5%; **bold** = significant at 1%.

TABLE VI. Results logistic regression analysis, dependent variable searching for other work

	ES		DE		NL		UK		JP	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
Gender (female)	-0.03	0.15	0.08	0.15	-0.03	0.13	-0.63	0.15	0.11	0.32
Field of study (ref. Business):										
— Arts & humanities	-0.47	0.26	0.39	0.23	-0.21	0.20	0.48	0.20	-0.76	0.41
— Social Sciences	0.11	0.22	0.48	0.32	0.19	0.23	0.15	0.26	-0.38	0.39
— Law	0.05	0.32	-0.08	0.39	-0.11	0.30	0.51	0.36	-0.53	0.51
— Natural Sciences	-0.26	0.28	0.13	0.23	0.13	0.27	-0.21	0.25	-0.29	0.58
— Engineering	-0.06	0.22	0.17	0.19	0.02	0.18	-0.31	0.27	-0.66	0.42
— Health	-0.26	0.24	-0.39	0.28	0.12	0.21	0.01	0.39	-0.94	0.75
Age and experience										
— months in current job (tenure)	-0.05	0.02	0.01	0.01	0.00	0.00	0.02	0.01	-0.03	0.02
— tenure squared	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
— age at start of current job	0.00	0.03	0.05	0.02	0.00	0.02	-0.04	0.01	0.05	0.09
Ln(hourly wage)	-0.56	0.16	-0.46	0.21	-0.44	0.27	-0.21	0.20	-0.13	0.42
Temporary contract	0.62	0.16	1.19	0.17	0.19	0.15	0.85	0.19	1.46	0.37
Type of organisation (ref. private firm):										
— Public organisation	-0.51	0.18	-0.53	0.17	0.06	0.15	-0.49	0.17	-0.13	0.33
— Non-profit organisation	-0.29	0.33	-0.52	0.32	0.21	0.18	0.16	0.27	-0.28	0.66
— Self-employed	-0.12	0.36	-0.45	0.38	0.23	0.46	-0.87	0.69	-18.17	10918.61
— Other	2.41	1.21	-1.61	0.66	-0.09	0.27	-0.23	0.76	0.30	0.71
Education-job match (ref. own level and field):										
— job at higher level	0.37	0.20	0.13	0.32	0.03	0.20	-0.47	0.27	-0.14	0.55
— job at own level, other field	-0.02	0.31	0.19	0.22	-0.21	0.22	-0.10	0.23	0.53	0.41
— job at lower tertiary level	0.43	0.22	0.43	0.17	0.35	0.20	0.31	0.22	0.35	0.44
— job below tertiary level	1.14	0.20	0.46	0.23	0.91	0.22	0.56	0.27	0.59	0.46
Skill mismatch										
— skill shortage	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.01	0.01
— skill utilisation	0.09	0.07	-0.21	0.07	-0.08	0.07	-0.33	0.07	0.01	0.14
((Constant)	-0.39	0.90	-2.10	0.92	-0.51	0.79	0.52	0.73	-3.96	2.63
N	1,361		2,287		2,281		2,117		2,326	
Nagelkerke R-Squared	0.13		0.09		0.04		0.15		0.11	

underlined = significant at 5%; **bold** = significant at 1%.

of job satisfaction, high wages only decrease the propensity to look for other work in Spain and Germany. A rather trivial result is that workers with a temporary contract are more likely to look for other work, although this effect is rather mysteriously absent (or at least is not significant) in the Netherlands. Public sector workers are more likely to stay put in Spain, Germany and the UK. Tenure and age have rather mixed effects, and field of study does not seem to matter at all.

## Conclusion

Our analyses indicate that educational and skill mismatches are indeed related, as one would expect. Graduates working below their level and/or outside their own field use fewer competences than those in 'matching' jobs. Graduates working above their level or outside their field experience more skill shortages than those in 'matching' jobs. However, educational mismatches by no means imply mismatches between available and required knowledge and skills, as claimed by the job assignment model. Many graduates in 'matching' jobs nonetheless report skill mismatches. Furthermore, a substantial proportion of 'overeducated' graduates report high levels of skill use and few skill shortages.

The multivariate analyses revealed strong wage effects of over-education. The wage effects of skill mismatches were much weaker. Interestingly, in Germany and the UK, there were *positive* wage effects of skill shortages. This seems to indicate that skill shortages do not indicate so much a below-par worker as a high-powered job. Job satisfaction was influenced by both educational and skill mismatches. The propensity to change jobs appears only weakly related to mismatches of either kind. The results of the analyses of job satisfaction and propensity to change jobs deviate somewhat from those of Allen and Van der Velden, who found strong effects of skill mismatches on these variables.

The results were broadly similar across the five countries, but there were some interesting differences. It was notable that the education-job match was best in those countries where higher education was strongly geared to the labour market (Germany and the Netherlands), but that the relation between educational and skill mismatches was weakest in those countries. Furthermore, the wage effects of over-education were also relatively weak in Germany and the Netherlands. Another notable difference was that under-educated workers in Germany and Japan showed surprisingly high levels of skill shortages in contrast to the other three countries. Finally, the propensity to change jobs was strongly dependent on both educational and skills mismatches in Germany and the UK, on educational mismatches in Spain and the Netherlands, and on neither in Japan.

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