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# Right for the Job: Over-Qualified or Under-Skilled?

**Glenda Quintini**

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# RIGHT FOR THE JOB: OVER-QUALIFIED OR UNDER-SKILLED?

**Glenda Quintini**

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## SUMMARY

1. Ensuring a good match between skills acquired in education and on the job and those required in the labour market is essential to make the most of investments in human capital and promote strong and inclusive growth. Unfortunately, in the OECD on average, about one in four workers are over-qualified – *i.e.* they possess higher qualifications than those required by their job – and just over one in five are under-qualified – *i.e*. they possess lower qualifications than those required by their job. In addition, some socio-demographic groups are more likely than others to be over-qualified – notably, immigrants and new labour market entrants who take some time to sort themselves into appropriate jobs – or under-qualified – notably, experienced workers lacking a formal qualification for the skills acquired on the labour market.

2. The genuine mismatch between *skills* possessed by workers and those required in the labour market only explains a small portion of qualification mismatch. Indeed, qualifications only reflect certified skills, mostly acquired in initial education while a great deal of skill acquisition happens on the job along with some skill obsolescence. Moreover, workers with the same formal qualification level may display different degrees of competency and in different areas according to their field of study. In the European countries covered in the analysis, only about 40% of over-qualified workers feel that they have the skills to cope with more demanding tasks at work – *i.e*. the definition adopted for over-skilling. Even more strikingly, only 12% of the under-qualified report needing further training to cope well with their duties at work – *i.e*. the definition adopted for under-skilling.

3. The variation in the skills of individuals with the same qualification plays a key role in explaining qualification mismatch. First, workers' *ability* varies within qualification level, with workers of low ability for their qualification being hired in jobs that normally require lower qualifications and the inverse being true for workers of high ability for their qualification. Second, the likelihood of finding work in areas that are not directly related to one's field of studies varies across these fields and working outside one's field is an important source of over-qualification. In addition to the choices made in initial education, some labour market events may increase the likelihood of over-qualification. Workers fired or dismissed in the context of business closures are more likely to be over-qualified at re-employment than workers who quit and this effect is stronger if the job separation occurs at times of rising unemployment. Moreover, the longer the time spent out of work between two jobs, the higher the risk of over-qualification which suggests that skills may become obsolete during prolonged unemployment.

4. Another explanation for the high incidence of qualification mismatch is that occupations are a poor proxy for job requirements. While for the purposes of measuring qualification mismatch jobs are summarised by occupational codes, in practice employers can match new hires' skills to the degree of complexity and responsibility in the specific job to be filled or adapt job requirements based on the skills that workers demonstrate after hiring. Indeed, as shown in this paper, within each occupation, jobs involving a supervisory role, complex tasks, significant independence and the frequent use of computer technology are associated with a higher likelihood of over-qualification.

5. The fact that the earnings penalty/premium for qualification mismatch is small once unobserved variation across individuals is accounted for and that job requirements are adapted to workers' skills suggest that employers succeed in screening workers and predicting their marginal productivity based on skills rather than qualifications. However, the process is not without costs for employers and society. Employers incur additional costs in terms of human resource management to "see through" the

qualification "mist" and/or to adapt job requirements to candidates' skills. Moreover, over-qualification and over-skilling reduce job satisfaction and increase the likelihood of on-the-job search and these effects are likely to reduce productivity. Finally, governments spend a significant percentage of GDP on education and any mis-investment of the kind resulting in over-qualification represents a significant cost to society even if a good match, based on underlying skills, is ultimately achieved on the labour market.

6. The Recognition of Non-Formal and Informal Learning may help to reduce the wage penalty that the under-qualified face due to the lack of formal recognition of their competences. It may also help immigrants whose qualifications were acquired in their country of origin since employers in the host country may have difficulties in recognising the equivalence of foreign qualifications. However, highly qualified immigrants in low-skilled jobs would also benefit from targeted measures to help them have their qualifications recognised and, if necessary, brought in line with national standards.

7. In the context of initial education, high-quality career guidance counselling accompanied by information on the returns to education by field of study would ensure that students make informed choices. In addition, over-qualification could be tackled through measures aimed at raising the school performance of students at the bottom end of the distribution to ensure that they graduate with the *minimum* competences expected by employers of someone with their level of qualification. But skills accumulation does not end with initial education and comprehensive lifelong-learning frameworks are essential to ensure that new skills are acquired throughout one's careers and that skills are kept up to date, all this in line with rapidly evolving labour market requirements. This need for lifelong skills development calls for employer-provided on-the-job training, pathways back into the education system and cost-effective training as part of active labour market policies for the unemployed. In the context of the recent economic crisis, activation strategies involving training to counter skills obsolescence due to prolonged unemployment could play a particularly crucial role in maintaining the skills of the labour force.

## RÉSUMÉ

8. Veiller à ce que les compétences acquises au travers du système éducatif ou de l'emploi soient en adéquation avec celles requises par le marché du travail est essentiel pour tirer le meilleur parti des investissements en capital humain et promouvoir une croissance soutenue qui ne laisse personne sur le côté. Malheureusement, dans les pays de l'OCDE, en moyenne, environ un travailleur sur quatre est surqualifié (situation dans laquelle le travailleur possède un niveau de qualification supérieur à celui requis par son emploi) et un tout petit peu plus d'un travailleur sur cinq est sous-qualifié (situation dans laquelle le travailleur a un niveau de qualification inférieur à celui requis par son emploi). En outre, certaines catégories socio-démographiques sont plus susceptibles que d'autres d'être surqualifiées – notamment les immigrés et les nouveaux venus sur le marché du travail, à qui il faut un peu de temps pour frayer leur chemin vers des emplois appropriés – ou sous-qualifiées – notamment les travailleurs expérimentés dont les compétences acquises sur le marché du travail ne sont pas attestées par une qualification formelle.

Le véritable décalage entre les *compétences* que possèdent les travailleurs et celles requises sur le marché du travail n'explique que pour une petite part l'inadéquation des qualifications. Le fait est que la qualification ne reflète que les compétences certifiées, acquises pour l'essentiel lors de la formation initiale. Or, de nombreuses compétences s'acquièrent dans l'emploi et, inversement, certaines compétences acquises deviennent obsolètes. En outre, des travailleurs ayant le même niveau de qualification formel peuvent présenter différents degrés d'aptitude, dans des domaines différents, selon leur domaine d'études. Dans les pays européens couverts par cette analyse, seulement 40 % environ des travailleurs surqualifiés estiment avoir des compétences qui leur permettraient de faire face à des tâches plus exigeantes – la définition adoptée pour la surcompétence. Constat encore plus frappant, seulement 12 % des travailleurs sous-qualifiés indiquent avoir besoin d'une formation complémentaire pour bien s'acquitter des tâches qui leur sont confiées – la définition adoptée pour la sous-compétence.

La variabilité des compétences entre personnes ayant la même qualification est un facteur déterminant pour expliquer l'inadéquation des qualifications. Premièrement, à niveau de qualification identique, l'*aptitude* des travailleurs peut varier. Ainsi, les travailleurs ayant de faibles aptitudes par rapport à leur niveau de qualification sont employés à des postes qui, normalement, nécessitent un moindre niveau de qualification, et inversement pour les travailleurs ayant des aptitudes élevées par rapport à leur niveau de qualification. Deuxièmement, la probabilité de trouver du travail dans des domaines qui ne sont pas directement liés aux études qui ont été suivies varie selon les domaines d'études, et le fait de travailler dans un secteur sans rapport avec le type d'études suivies est une source importante de surqualification. En plus des choix effectués lors de la formation initiale, certains événements marquants de la vie professionnelle peuvent accroître la probabilité de surqualification. Les travailleurs victimes d'un licenciement ou d'une suppression d'emploi suite à la fermeture de leur entreprise ont une probabilité plus grande de trouver un emploi pour lequel ils seront surqualifiés que les travailleurs ayant quitté volontairement leur emploi, et cet effet est plus marqué si la cessation d'emploi intervient dans un contexte de hausse du chômage. D'autre part, plus la période d'inactivité séparant les deux emplois est longue, plus le risque de surqualification est élevé, ce qui tendrait à indiquer que les compétences peuvent devenir obsolètes au cours d'une période de chômage prolongée.

Autre explication possible du taux élevé d'inadéquation des qualifications : la profession est un indicateur médiocre des fonctions exercées dans l'emploi. Si, afin de mesurer l'inadéquation des qualifications, les emplois sont codifiés de manière synthétique sur la base de codes des professions, dans

la pratique les employeurs peuvent faire concorder les compétences des nouveaux embauchés avec le degré de complexité des tâches et les responsabilités s'attachant au poste à pourvoir ou adapter les fonctions du poste aux compétences dont aura fait montre le travailleur après avoir été embauché. De fait, comme on le verra dans ce chapitre, dans chaque profession, les travailleurs dont l'emploi implique des fonctions d'encadrement, des tâches complexes, une assez grande indépendance et une utilisation fréquente de l'informatique sont davantage susceptibles d'être surqualifiés.

Le fait que la pénalité ou l'avantage en termes de salaire associé à l'inadéquation des qualifications est faible une fois neutralisées les variations non observées entre les individus et que les fonctions à exercer sont adaptées aux compétences des travailleurs donne à penser que les employeurs parviennent à sélectionner les travailleurs et à prédire leur productivité marginale en fonction de leurs compétences plutôt que de leur qualification. Ce processus n'est toutefois pas sans coûts pour les employeurs et pour la société. Les employeurs doivent engager des coûts supplémentaires en gestion des ressources humaines pour « voir au-delà du flou de la qualification » et/ou adapter les exigences d'un emploi aux compétences des candidats. D'autre part, la surqualification et la surcompétence diminuent la satisfaction professionnelle et augmentent le risque de recherche d'emploi en cours d'emploi, autant de facteurs qui peuvent entraîner une baisse de la productivité. Enfin, les pouvoirs publics consacrent une part importante du PIB à l'éducation, et la moindre erreur d'investissement suivie d'une surqualification des travailleurs représente un coût important pour la société, même si une bonne mise en correspondance, basée sur les compétences fondamentales des individus, est finalement trouvée sur le marché du travail.

La reconnaissance des acquis non formels et informels peut être utile pour réduire la pénalité salariale que subissent les travailleurs sous-qualifiés du fait de l'absence de reconnaissance officielle de leurs compétences. Elle peut également aider les immigrés qui ont acquis leur qualification dans leur pays d'origine, étant donné la difficulté pour les employeurs du pays d'accueil de reconnaître l'équivalence de titres étrangers. Enfin, s'agissant des immigrés hautement qualifiés occupant des postes qui le sont peu, il serait judicieux de concevoir des mesures spécifiques pour les aider à faire reconnaître leurs qualifications et, le cas échéant, permettre une mise en concordance avec les normes nationales.

Dans le contexte de la formation initiale, une orientation professionnelle de qualité associée à des informations sur le rendement de l'enseignement prodigué dans chaque domaine d'études permettrait aux étudiants de faire des choix avisés. D'un autre côté, le problème de la surqualification pourrait être traité à l'aide de mesures visant à améliorer les résultats scolaires des étudiants les moins performants, afin que tous les diplômés possèdent les compétences minimales que les employeurs s'attendent à trouver chez des personnes ayant acquis ce niveau de qualification.

Toutefois, l'accumulation de compétences ne s'arrête pas à la fin de la formation initiale, et des systèmes de formation permanente exhaustifs sont nécessaires pour assurer à chacun la possibilité d'acquérir des compétences nouvelles tout au long de sa carrière et d'actualiser en permanence ses compétences, de manière à pouvoir faire face à l'évolution rapide des besoins du marché du travail. Cette nécessité de développer les compétences tout au long de la vie appelle à son tour un certain nombre de mesures : mise en place par les employeurs de formations dans l'emploi, création de passerelles de retour vers le système éducatif et organisation de formations d'un bon rapport coût-efficacité à l'intention des chômeurs dans le cadre des politiques actives du marché du travail. Dans le contexte de la crise économique récente, des stratégies d'activation destinées à éviter, grâce à la formation, l'obsolescence des compétences due aux périodes de chômage prolongées pourraient contribuer dans une mesure cruciale au maintien des compétences de la main-d'œuvre.

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# RIGHT FOR THE JOB: OVER-QUALIFIED OR UNDER-SKILLED?

## Introduction

9. Qualification mismatch – the discrepancy between the qualifications held by workers and those required by their job – has become a growing concern among policy makers. In several countries, large numbers of graduates hold jobs that do not seem to make the best use of their qualifications. As a result, many commentators point to the failure of the education system in providing youth with the skills required at work and to the inability of labour markets to sort many workers into suitable jobs.

10. These concerns call for a thorough analysis of the incidence and determinants of qualification mismatch to assess the importance of the phenomenon and determine whether policy action is needed. However, this task is complicated by the fact that several different concepts are often lumped together under the heading of qualification mismatch (see Glossary below), and by the lack of suitable data.

11. Indeed, qualification mismatch is much more complex than commonly thought. First, there is more to qualifications than just their level. At the tertiary level as well as in vocational secondary education, students choose to specialise in different fields and the demand for this specialised knowledge will affect their chances of finding a job that is well matched to their competences. Second, although commentators use the terms *qualifications* and *skills* interchangeably, qualifications are far from a perfect measure of actual individual skills. Some of the skills acquired in initial education may be lost over time – for instance, if they are not continuously used – and new skills may be acquired through on-the-job learning and labour market experience. This implies that qualification mismatch does not necessarily reflect a discrepancy between workers' skills and the skill requirements of their job.

12. The paucity of comprehensive data sources on workers' qualifications and skills and on job requirements is another key barrier to a thorough understanding of qualification mismatch. Few cross-country studies exist and country-specific incidences of qualification mismatch are seldom comparable because of methodological issues, varying time periods and focus on different population groups. Data on qualification levels are more easily available than disaggregated data on fields of study or measures of individual skills and their use at work. As a result, most of the literature has focused on qualification levels rather than investigating the role played by field of study and other factors in explaining qualification mismatch or exploring underlying skills discrepancies.

13. This paper attempts to shed light on these different facets of mismatch and the links between them by exploiting several datasets covering most OECD countries. It only focuses on mismatch among workers and thus does not address other related crucial issues such as the under-utilisation of skills implicit in unemployment and inactivity or the mismatch between the demand and supply of specific competences which can result in significant skill shortages.

14. The paper is organised as follows. Section 1 summarises the most relevant explanations for qualification mismatch and frames the analysis that follows. Section 2 presents the incidence of qualification mismatch across most OECD countries and compares qualification mismatch to skill mismatch. The determinants of qualification mismatch are explored in Section 3. This is followed by an examination of the consequences of qualification and skill mismatch and their persistence in order to identify their relevance for policy in Section 4. Section 5 discusses policy issues. The final section draws some conclusions.

## Glossary of key terms

| Mismatch concept | Definition | Measure used in this paper |
|---|---|---|
| **Qualification mismatch** | Discrepancy between the highest qualification held by a worker and the qualification required by his/her job. | Qualifications are ranked on a 5-level scale, ranging from "no qualifications" (1) to "tertiary qualifications" (5). The qualification requirement in a given occupation is measured as the modal qualification of workers – *i.e*. the most common qualification – in that occupation. |
| **Over-qualification** | Situation where a worker's highest qualification exceeds the one required by his/her job. | A worker is classified as over-qualified when the difference between his/her qualification level and the qualification level required in his/her occupation is positive. |
| **Under-qualification** | Situation where a worker's highest qualification is lower than the one required by his/her job. | A worker is classified as under-qualified when the difference between his/her qualification level and the qualification level required in his/her occupation is negative. |
| **Skill mismatch** | Discrepancy between the skills – both specific and general – possessed by a worker and the skills required by his/her job. | The discrepancy is assessed through workers' views on the use of their skills at work. |
| **Over-skilling** | Situation where a worker's skills are above those required by his/her job. | A worker is classified as over-skilled if he/she reports that he/she has "the skills to cope with more demanding duties at work". |
| **Under-skilling** | Situation where a worker's skills are below those required by his/her job. | A worker is classified as under-skilled if he/she reports that he/she "needs further training to cope well with his/her duties at work". |

## 1. What is behind qualification mismatch?

15. The underlying assumption of many papers in the literature and most articles in the media about over-*qualification* is that what is being measured is a discrepancy between the *skills* of the individual – often a young graduate – and those required by the job he/she holds. In fact, while *qualifications* are one of the closest proxies of *skills* one can think of, they are an imperfect one for several reasons: *i*. at each qualification level, student performance varies significantly and so does field of study, particularly for tertiary graduates; *ii*. qualifications only reflect skills learnt in formal education and certified training; *iii*. skills learnt on the job through labour market experience are not measured; and *iv*. some of the skills reflected in qualifications may deteriorate over time if they are not used or kept up-to-date.

16. Despite these differences between qualifications and skills, it is likely that some qualification mismatch does reflect skills mismatch. In this event, qualification mismatch is clearly inefficient and should be of serious policy concern as it implies either that there has been over- or under-investment in education and training – *e.g*. there is a discrepancy between the shares of complex jobs and highly-qualified workers – or that workers and jobs do not match efficiently along the qualification dimension or both.

17. Overall, the evidence that there are too many graduates in the labour force is refuted by a number of well-established facts. First, there is significant international evidence of skills shortages at the tertiary level.[1] Second, despite massive increases in tertiary attainment, the earnings premium for tertiary education has remained high in most OECD countries and has increased in some (OECD, 2010*a*; but also Dearden *et al*., 2002 for the UK; Deschênes, 2001, and Katz and Murphy, 1992, for the US). OECD (2010*a*) shows that in more than half of the 21 countries for which data are available, the earnings premium for workers with tertiary qualifications increased over the past decade, and in Germany, Hungary, Korea and Italy, this increase was between 25 and 40 percentage points. The returns were roughly constant in all other countries. If wages respond to market forces, an over-supply of university graduates should have driven returns down unless demand for their services expanded more.

18. On the other hand, it is possible that the jobs on offer are not matched to the most appropriate workers because of a lack of information, adjustment costs, aggregate labour market conditions or personal preferences. For instance, employers may find it difficult to upgrade job content or hire workers with more appropriate skills in the presence of labour market rigidities. Or, they may lack information to judge the actual marginal productivity of their workers and/or judge it too costly to monitor individuals, and instead opt to use signals other than the qualification level to assess it – such as whether the worker has a good attitude or has experienced a spell of unemployment – resulting in over-skilling for some. Finally, some workers may choose to accept a job for which they are over-qualified. This could occur in the context of a recession, when dismissed workers or new entrants may prefer to accept a job below their skills rather than experience prolonged unemployment. It may also occur for workers who wish to remain close to their families or to work in jobs in which it is easier to reconcile work and family life – notably, part-time jobs.

19. However, some qualification mismatch is likely to be explained by issues other than skills discrepancies, notably it could be caused by skill heterogeneity among workers with the same qualifications and/or heterogeneity in the skill requirements among jobs in the same occupation category. In fact, in the same way as qualifications are not a perfect proxy for skills, occupations, even at a fine level of disaggregation, may include jobs involving different tasks: the same occupation may include jobs with varying responsibilities, degrees of complexity, supervision requirements, etc. In the presence of individual and job heterogeneity, qualification mismatch is often defined in the literature as *apparent* because it identifies individuals who are not over-skilled or under-skilled but are mismatched to their current job by their qualification.

20. This is not to say that over-qualification and under-qualification not accompanied by skill mismatch do not warrant policy interventions. Some of the forms of heterogeneity mentioned above give rise to economically-damaging mismatch and could justify policy interventions. For instance, educational investments are made more complex by the existence of several different fields of study with varying likelihoods of qualification mismatch upon graduation – *i.e.* prospective students have to decide not only how long to study but also in what field. Also, information requirements are significantly increased by the heterogeneity among workers with the same qualification level and jobs in the same occupation. And, the fact that much human capital acquired on the job is at least partly specific to a particular firm, occupation or industry also greatly complicates investments in skill acquisition and matching process. In addition,

1 . Manpower – a global employment services agency – carries out a yearly survey of recruitment difficulties among firms in 33 countries worldwide – the so-called *Talent Shortage Survey* – and also produces a list of the top 10 jobs that employers are having difficulties filling. In 2009, several graduate-level occupations – notably, Accounting and Finance jobs, Engineers, Management Executives and Teachers – topped the list. And at least two of these – Management Executives and Accounting and Finance jobs – presumably require graduates in Economics and Commerce, one of the most popular tertiary degrees. This was true on average across the countries surveyed, but also for individual countries for which data on skills shortages are publicly available, namely Australia, France, Germany, Italy, Japan, the Netherlands, the United Kingdom and the United States.

over-qualification may represent a low-return investment in education for graduates who leave without the minimum skills required to obtain a job at their qualification level.

21. Finally, the relevance of qualification mismatch for policy makers depends on whether it is only a temporary phenomenon or it persists through the worker's career. Indeed, it is possible that school-leavers and other new entrants without work experience are hired for jobs below their competence level but that they only remain mismatched for as long as it takes them to find a more appropriate match through job—search or for their employers to realise their skill level. If this process is sufficiently smooth, policy makers may consider that it does not require policy intervention. On the other hand, specific measures are more likely to be put in place to counter qualification mismatch that is persistent. Notably, immigrants whose qualifications are not recognised in the destination country may find it impossible to move into jobs that are in line with their skills, thereby implying a loss of productivity.

22. Overall, while qualifications mismatch could be too easily dismissed as apparent or, at worst, temporary, it could also be due to imperfect matching which is not self-correcting or to systematic errors in what types of skills are acquired in initial education or to how the skills evolve after entering the labour market. These issues are explored in the following sections.

## 2. Does qualification mismatch reflect a mismatch in skills?

23. This section assesses the prevalence of over-qualification across OECD countries and for workers belonging to some key socio-demographic groups. It also attempts to shed light on the issues outlined above by assessing whether qualification mismatch is a good proxy for skill mismatch.

### *A picture of qualification mismatch across OECD countries*

24. In 2005, on average across OECD countries for which data are available, 25.3% of workers were over-qualified and 22.2% were under-qualified (Figure 1).These figures are derived by comparing workers' qualifications measured using the 1997 International Standards Classification of Education (ISCED) on a five-point scale – no qualifications, lower secondary qualifications,[2] upper secondary qualifications, post-secondary non-tertiary qualifications,[3] tertiary qualifications – to the qualifications required by their occupation coded using the 1988 International Standard Classification of Occupation (ISCO) at the two-digit level.[4] The modal qualification possessed by workers in each occupation group at the two-digit level is used as a measure of required qualification and is calculated separately for each country (see Annex A1 for a discussion of methodological issues). Workers are classified as over-qualified if they possess higher qualifications than those required by their job and under-qualified if they possess lower qualifications than those required by their job. Qualification mismatch for European countries is derived from the European Survey of Working Conditions (ESWC), while for non-European countries it is taken from the International Social Survey Programme (ISSP).

25. Across OECD countries, Australia, Mexico, the Netherlands and Turkey have the highest incidence of over-qualification[5] while the United Kingdom and a number of Central and Eastern European

2 . In most OECD countries, the end of lower secondary education coincides with the end of compulsory schooling.

3 . These are typically 1-2 year post-secondary vocational courses or certificates awarded to students who have attended some college but have not graduated.

4 . This translates into 28 occupational groups.

5 . In Australia and the United States, the high incidence of over-qualification is explained by the combination of a relatively large share of workers holding post-secondary non-tertiary qualifications (40% and 28%, respectively) and the high likelihood of over-qualification for these workers (75% and 90%, respectively).

countries stand at the other end of the spectrum. It is also noteworthy that Austria, Germany and Switzerland – countries with a long tradition of vocational training – all experience below-average incidences of over-qualification, although this is not the case for Denmark where vocational education is equally widespread. Finally, about a third of workers are over-qualified in Spain, Portugal and Greece, where the issue of over-qualification among graduates most often makes the headlines.

26. Hungarian workers are the most likely to possess fewer qualifications than required by their job[6] but under-qualification is also relatively high in New Zealand, Canada and Israel.[7] On the other hand, fewer than one in ten workers are under-qualified in Turkey, the Slovak Republic and Brazil.

27. Overall, there is little correlation across countries between over- and under-qualification. A few countries have both below average over-qualification and under-qualification. This is the case for Italy, Switzerland and several Central and Eastern European countries – notably, the Czech Republic, Poland, Slovenia and the Slovak Republic. On the other hand, Australia, Korea, Luxembourg, the Netherlands and Spain suffer from both above-average over-qualification and under-qualification. For some of these countries – notably, Korea and Spain – the significant qualification mismatches may be a reflection of the very rapid rise in average educational attainment which is likely to create both graduate over-qualification and upgrading of qualification requirements in jobs resulting in the apparent under-qualification of older workers.

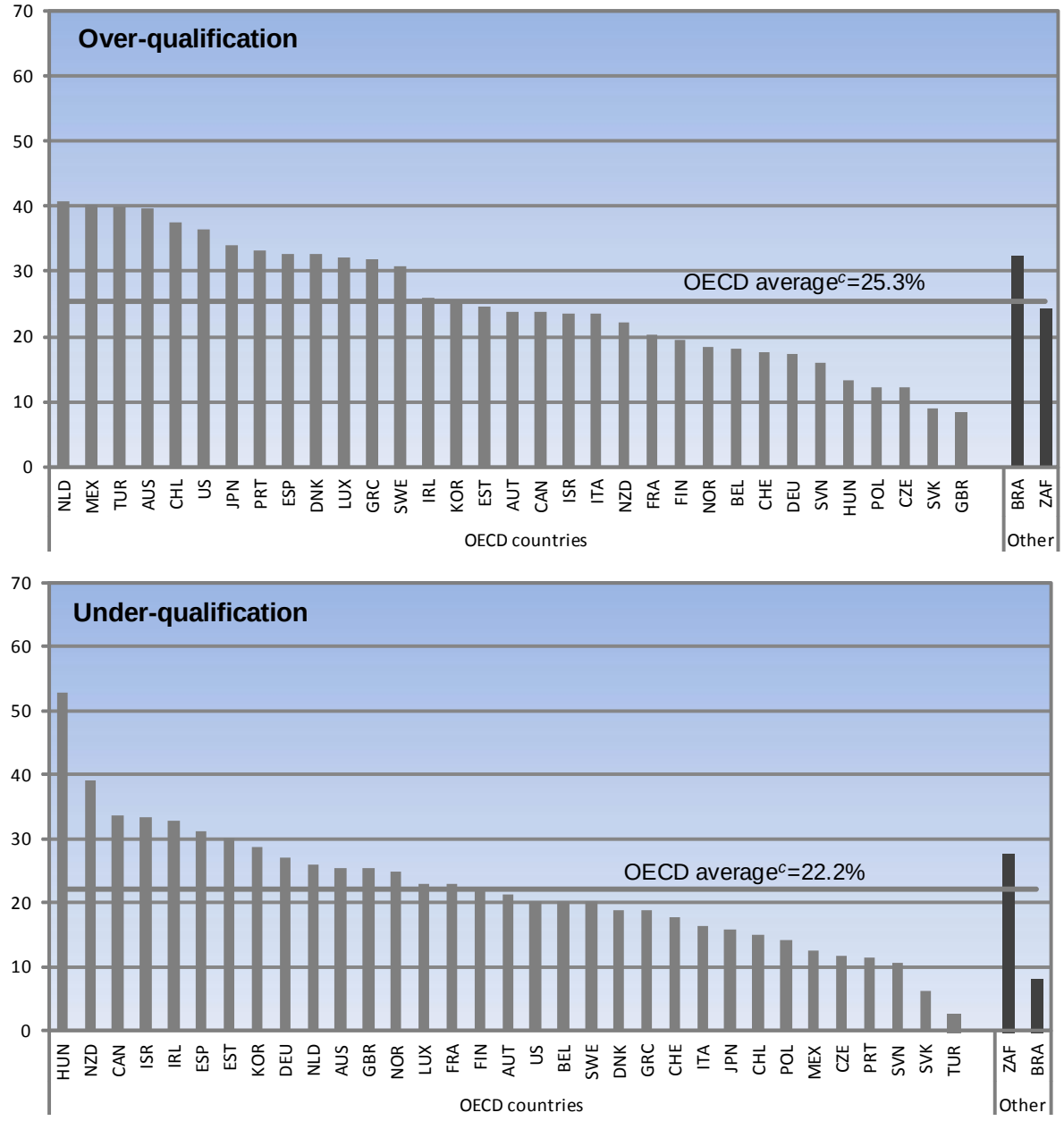
28. Finally, because qualifications are measured using ISCED on a five-point scale, individuals can be mismatched to different degrees. Figure A2.1 in Annex A2 presents the incidence of so-called "severe" qualification mismatch, whereby individuals are classified as severely mismatched if their qualification level is more than one step away from the required qualification in their job on the five-point ISCED scale. By definition, the incidences of severe over-qualification and under-qualification are smaller than those presented in Figure 1 and for some countries the ranking changes significantly. For instance, Australia and the United States which have the highest incidences of over-qualification, rank below the OECD average as far as severe over-qualification is concerned. This is largely due to the fact that post-secondary non-tertiary graduates in occupations that require upper secondary qualifications contribute significantly to the incidence of over-qualification, but this effect disappears when severe over-qualification is measured.

6 . The high incidence of under-qualification in Hungary is explained by a large share of workers with lower-secondary qualifications in craft occupations where the modal qualification is an upper secondary certificate. In fact, the under-qualification rate among craft and related trades workers and plant and machine operators is unusually high at 63%.

7 . In New Zealand and Canada, under-qualification is particularly common among workers with upper secondary qualifications – 61% and 67%, respectively – in mid-level occupations for which post-secondary non-tertiary qualifications are the mode. Although it is rare for post-secondary non-tertiary qualifications to represent the modal qualification in any occupation, both New Zealand and Canada have a very large share of workers with this level of qualifications, large enough to be reflected in qualification requirements.

Figure 1. **Indicators of qualification mismatch[a], OECD and selected countries, 2005**

Percentages of employees and self-employed[b]




The use of statistical data for Israel by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

*a)* Over-qualified workers are those whose qualifications are higher than required by their occupation. Under-qualified workers are those whose qualifications are lower than required by their occupation. The modal qualification in each occupational group at the two-digit level is used to measure qualification requirements.

*b)* Trainees and apprentices are excluded.

*c)* Unweighted average of OECD countries shown.

*Source:* International Social Survey Programme (2005) for Australia, Canada, Israel, Japan, Korea, Mexico, New Zealand, the United States and South Africa. International Social Survey Programme (2004) for Brazil and Chile. European Survey of Working Conditions (2005) for all other countries.

***Does qualification mismatch reflect genuine skill mismatch?***

29. Several researchers have argued that qualification mismatch may not reflect skill mismatch – *i.e.* a genuine discrepancy between one's competences and those required by his/her job – but hide instead skill heterogeneity (Chevalier, 2003; and McGuinness, 2006). For instance, over-qualified workers may possess different skills or abilities or motivation levels than their equally qualified counterparts who are well matched to their jobs.

30. Ideally, skill mismatch should be assessed by comparing objective measures of workers' skills to equally objective measures of the skills required in their jobs. Unfortunately, only *self-reported* data on under-skilling and over-skilling are currently available to gauge the extent of skill mismatch internationally.[8] Like all self-reported measures, these indicators are likely to suffer from some measurement bias which could downplay the role of skill mismatch in regression analysis. However, they do provide some valuable information on the match between workers and jobs. The forthcoming survey of the OECD Programme for the International Assessment of Adult Competences (PIAAC) will measure workers' competences and job requirements more precisely and allow computing a better measure of mismatch and identifying the skills for which mismatch most often arises.

31. The measure of self-reported skill mismatch used in this paper is derived from the 2005 wave of the ESWC.[9] The survey asks employees and self-employed workers to describe their skills at work by choosing among three options, namely: the need for training; the correspondence between skills and job requirements; or job requirements below the respondent's competences.

32. The top panel of Figure 2 shows the share of over-skilled workers – 33.5% on average in the 24 OECD countries included in the ESWC – based on respondents claiming that they have the skills to cope with more demanding duties than those required by their current job. The share of workers who feel their skills are underutilised exceeds 40% in 4 countries (France, Ireland, the United Kingdom and Sweden). Beyond these peak values, the incidence of over-skilling is relatively high across-the-board, falling below 25% only in Austria, the Czech Republic and Finland.

33. On the other hand, the need for training can be interpreted as pointing to a skill deficit and the share of workers answering this way is presented in the bottom panel of Figure 2.[10] On average, in the 24

8 . Self-reported skill mismatch – *i.e.* direct questions on the extent to which one's skills are used at work – has been largely used in the academic literature (Allen and van der Velden, 2001; McGuinness and Wooden, 2007; Green and McIntosh, 2007; Mavromaras *et al.*, 2007 and 2009*a*; and Green and Zhu, 2010). Alternatively, some studies have exploited detailed information on competences possessed by workers and compared them to competences needed in their job (Krahn and Lowe, 1998; and Ryan and Sinning, 2009). Both approaches have limitations. The latter method is often limited to measures of numeracy and/or literacy, hence it fails to account for the whole spectrum of skills that workers need to be productive in a job. On the other hand, while being more comprehensive, surveys enquiring about the overall use of these skills in one's job fail to detail what skills are in deficit and what are not fully exploited.

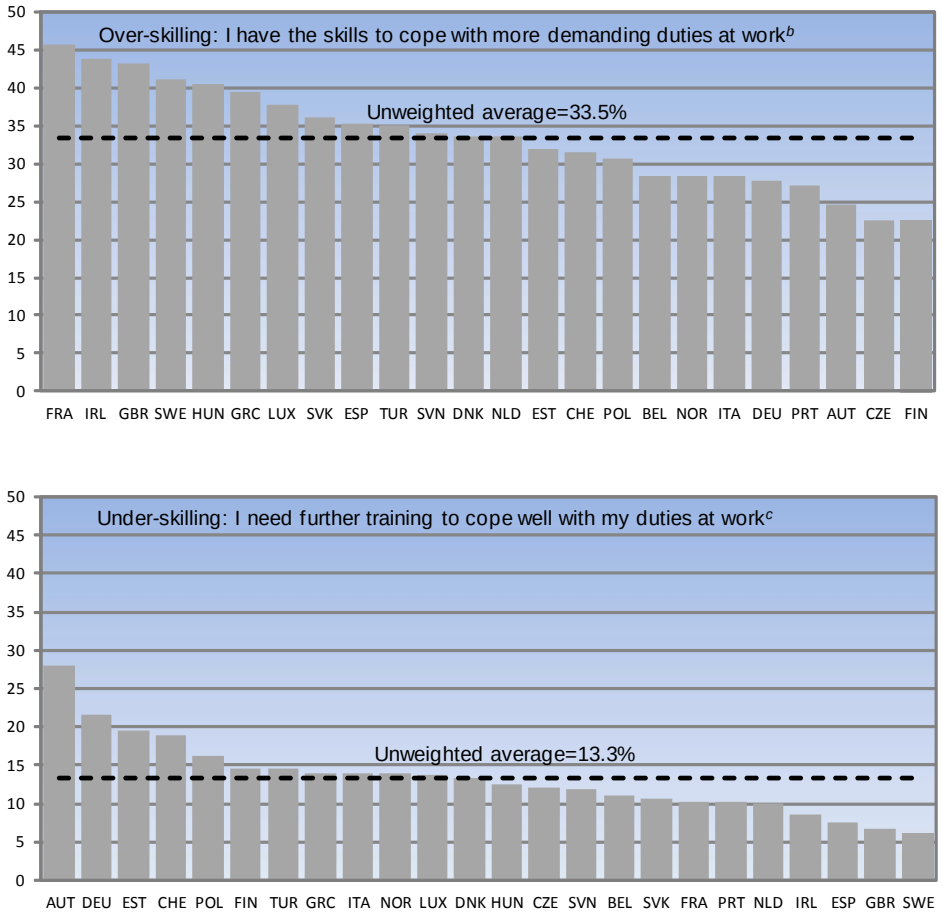
9 . Unfortunately, non-European countries cannot be included in this analysis. In fact, while the ISSP includes a question on the use of skills at work, the wording is too different to be comparable with that of the ESWC and does not allow a clear distinction between over- and under-skilling to compare with over- and under-qualification. Skill mismatch derived from the ISSP is presented separately in Annex A3 along with another measure derived from the European Community Household Panel.

10 . Similar questions have been used in other surveys to identify the under-skilled. Allen and Van der Velden, (2001) exploit workers' agreement to the following statement from survey data collected for the project Higher Education and Graduate Employment in Europe: "I would perform better in my current job if I possessed additional knowledge and skills". Workers who agree or strongly agree with the statement are

OECD countries included in the ESWC, under-skilling affects 13.3% of workers. Surprisingly, three countries with a long tradition of apprenticeship training – Austria, Germany and Switzerland – figure among those with the highest incidence of skill deficits. Estonia and Poland also suffer from significant skill deficits according to this indicator. At the other end of the spectrum, in Sweden, the United Kingdom, Spain and Ireland fewer than 10% of workers feel they need training to do their job well.

Figure 2. **Self-reported skill mismatch, EU19 countries, Estonia, Norway, Slovenia, Switzerland and Turkey, 2005**

Percentages of employees and self-employed[a]




*1)* Trainees and apprentices are excluded.
*2)* Share responding "I have the skills to cope with more demanding duties" to the question "Which of the following alternatives would best describe your skills in your own work". Alternative responses include: "My duties correspond well with my present skils" and "I need further training to cope well with my duties".
*3)* Share responding "I need further training to cope well with my duties" to the question "Which of the following alternatives would best describe your skills in your own work". Alternative responses include: "My duties correspond well with my present skills" and "I have the skills to cope with more demanding duties".
*Source*: European Survey of Working Conditions.

classified as under-skilled. Green and McIntosh (2007) use an identical question in the UK Skills Survey. In both cases, the authors concluded that this measure implied unreasonably high rates of under-skilling, possibly reflecting the tendency of workers to report even small skill deficits. The question at hand is formulated slightly differently and does not seem to suffer from the same problem. Notably, in the Netherlands and the United Kingdom – the two countries on which Allen and Van der Velden (2001) and Green and McIntosh (2007) focus on, respectively – the under-skilling rate is relatively low (Figure 2).

34. A cursory look at the data presented in Figures 2 and suggests very little correlation with the data on qualification mismatch presented in Figure 1. Indeed, the spearman's rank correlation coefficient between the incidence of over-skilling and that of over-qualification is just 0.17 and not statistically significant and the same coefficient between under-skilling and under-qualification is negative and not statistically significant.

35. Table 1 shows that only 36% of over-qualified workers are also over-skilled and only about 12% of under-qualified workers report feeling under-skilled. In fact, in most cases, under and over-qualified workers are well matched as far as their skills are concerned, suggesting that skill heterogeneity within a given qualification level may explain over-qualification to a large extent and reinforcing the idea that under-qualified workers may have acquired further skills outside the formal education sector allowing them to hold more complex jobs than their qualifications suggest. Also, only about 55% of workers who are well matched by their qualifications are also well-matched in terms of their skills. This result suggests that while a good match in terms of formal education improves the chances of using one's knowledge and skills, it is neither a necessary nor a sufficient condition for good skill utilisation.[11] It is also noteworthy that the share of the working population that is mismatched by both qualification and skill is only 11%, with 8.4% of workers being both over-qualified and over-skilled and 2.6% being under-qualified and under-skilled. Box 1 explores the incidence of joint qualification and skill mismatch by country.

Table 1. **Mismatched by qualifications and skills, EU19 countries, Estonia, Norway, Slovenia, Switzerland and Turkey, 2005**

Employees and self-employed[a]

| | Over-qualified | Under-qualified | Matched | Total |
|---|---|---|---|---|
| | Panel A. **Percentage of workers within qualification-match category** | | | |
| Over-skilled | 36.4 | 30.5 | 31.6 | |
| Under-skilled | 14.2 | 12.1 | 13.2 | |
| Matched | 49.5 | 57.4 | 55.1 | |
| **Total** | **100.0** | **100.0** | **100.0** | |
| | Panel B. **Percentage of all workers** | | | |
| Over-skilled | 8.4 | 6.5 | 17.6 | |
| Under-skilled | 3.3 | 2.6 | 7.3 | |
| Matched | 11.4 | 12.3 | 30.7 | |
| **Total** | | | | **100.0** |

*1)* Trainees and apprentices are excluded.
*Source*: European Survey of Working Conditions.

11 . Allen and van der Velden (2001) reach a similar conclusion.

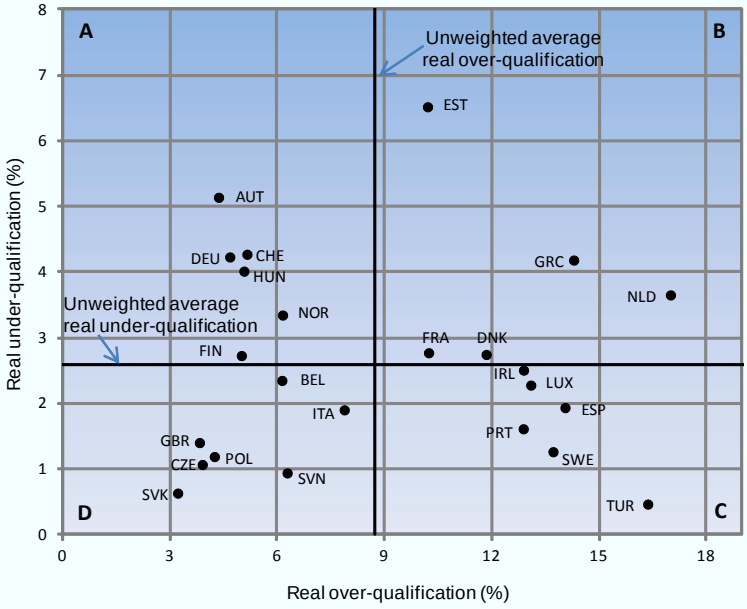
Box 1. **Making the most of two worlds: assessing the incidence of combined qualification and skill mismatch**

Qualification mismatch may hide factors other than a discrepancy between a worker's competences and those required by his/her job. At the same time, self-reported skill mismatch may be biased by individual feelings of inadequacy or of being undervalued. As a result, combining the information contained in these two measures of mismatch should help identify workers whose competences are farthest away from the requirements of their jobs.

In the academic literature, qualification and skill mismatch have been explored jointly for the United Kingdom by Green and McIntosh (2007) and Green and Zhu (2010). These authors distinguish "formal over-qualification" – which is determined based on qualifications only – from "real over-qualification" – defined by accounting for self-reported skill mismatch as well. They find that workers that are both over-qualified and over-skilled tend to be in jobs that are less demanding than their better matched counterparts, i.e. than both the over-qualified who are well matched based on their skills and the over-skilled who are well matched based on their qualifications. More specifically, real over-qualification is associated with jobs that have learning times of over two years, are in the first three major occupational groups (Managers and senior officials, Professional occupations and Associate professional and technical occupations) and require learning new things, influence and complex computing skills.

Figure. **Real under-qualification[a] and over-qualification[b], EU19 countries, Estonia, Norway, Slovenia, Switzerland and Turkey, 2005**

Percentages of employees and self-employed




*1)* Share of workers whose ISCED level is lower than the mode in their occupation and who respond "I need further training to cope well with my duties" to the question "Which of the following alternatives would best describe your skills in your own work".
*2)* Share of workers whose ISCED level is higher than the mode in their occupation and who respond "I have the skills to cope with more demanding duties" to the question "Which of the following alternatives would best describe your skills in your own work".
*Source:* European Survey of Working Conditions.

The figure above shows the share of workers who report to be over-skilled and are found to be over-qualified – hereon called "real over-qualification" – and the share of workers who are both under-skilled and under-qualified – called "real under-qualification". Of the OECD countries covered by the ESWC, the highest rates of real under-qualification are observed in Austria and Estonia while over-qualification rates are highest in the Netherlands and Turkey. Estonia, Greece and the Netherlands are faced with both above-average real over-qualification and under-qualification (Panel B). On the other hand, the United Kingdom, Italy and a number of eastern European countries do better than average on both fronts (Panel D). As is the case for skill mismatch alone, Austria, Germany and Switzerland – three countries with a long history of apprenticeship training – suffer from above-average real under-qualification but below-average real over-qualification (Panel A).

## 3. What explains qualification mismatch?

36. Evidence presented in Section 2 shows that only a small fraction of qualification mismatch reflects an underlying skill mismatch. This section explores several possible explanations of qualification mismatch: *i.* skill heterogeneity among individuals with the same qualifications; *ii.* the heterogeneity of jobs with the same occupational code; *iii.* workers' socio-demographic characteristics; and *iv.* crucial labour market events such as labour market entry or job separations.

### *The role of within-qualification skill heterogeneity*

37. Several studies show that there is significant skill heterogeneity among workers with the same qualification level, particularly in the literature focusing on returns to graduate education (Ingram and Neumann, 2006).[12] In the context of qualification mismatch, the best skilled individuals in a given qualification category may get jobs normally requiring higher formal qualifications while the least skilled in the group will only be able to get jobs requiring lower formal qualifications. Hence, individuals in the former group will appear as under-qualified despite actually possessing the competences required by their job, while those in the latter will appear as over-qualified while lacking some of the key skills needed to get and do a job with higher qualification requirements.[13]

38. The International Adult Literacy Survey includes measures of prose, document and quantitative literacy and also allows calculating qualification mismatch.[14] Figure 3 shows the difference in prose document and quantitative literacy scores between under-qualified workers and well-matched workers (top panel) and between well-matched workers and over-qualified workers (bottom panel). To control for compositional effects, the scores are corrected for socio-demographic characteristics. Under-qualified individuals have higher prose, document and quantitative scores than their well-matched counterparts – *i.e.* the differences presented in the top panel of Figure 3 are all positive. The inverse is true for over-qualified workers in most countries and most literacy domains.

39. It is noteworthy that the form of within-qualification skill heterogeneity highlighted above is not necessarily related to the performance in initial education. Some graduates may lack generic skills that the education system can foster but that are better learnt in the labour market such as communication, team-work and negotiation skills. In addition, some workers may have the competences expected of their qualification level at graduation but these competences may be lost or become obsolete over time – notably, if they are not used or for a lack of upgrading in a context of rapid technological change.

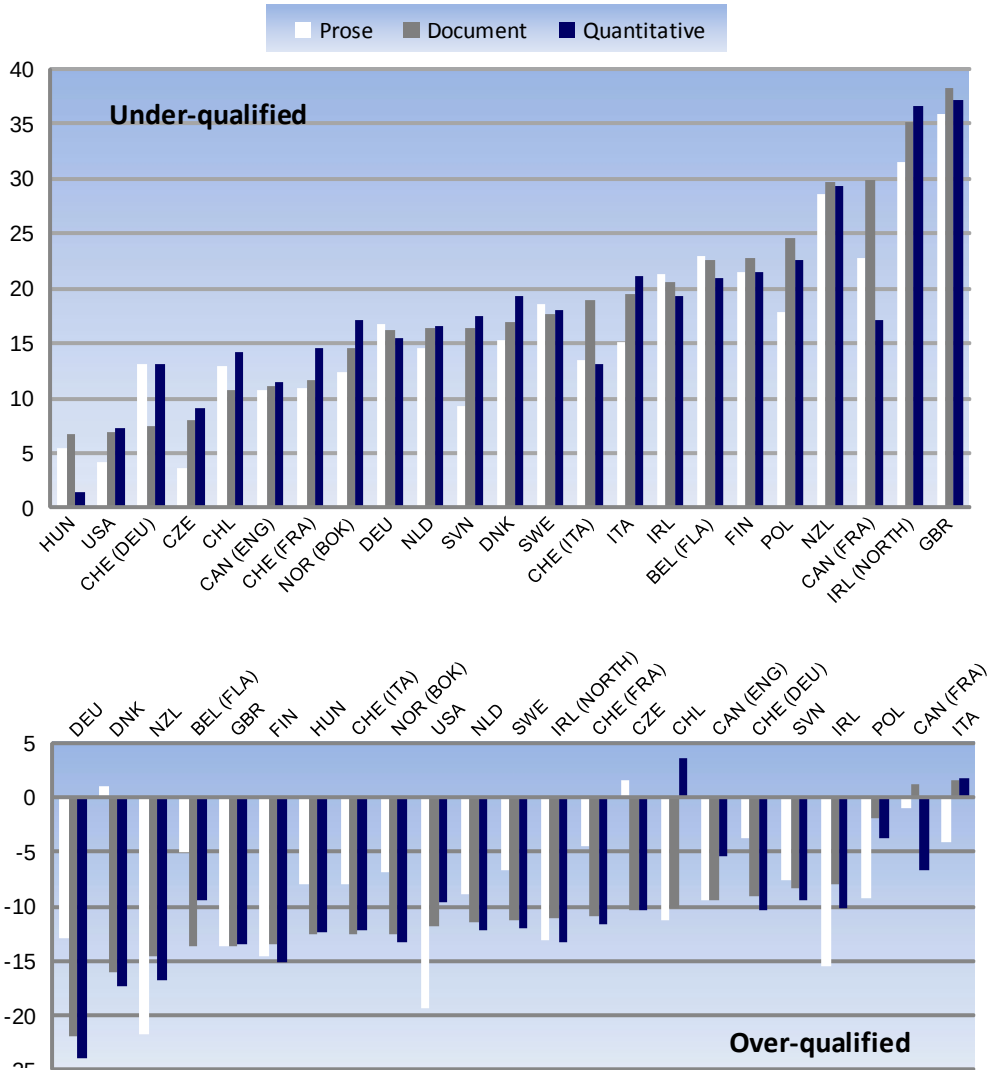
12 . Ingram and Neumann (2006) use job skills information from the US Dictionary of Occupational Titles as opposed to years of education or qualifications, to infer skill levels of workers. Applying this measure of skills to data from the United States Current Population Survey, they find significant skill heterogeneity among individuals with equivalent qualifications.

13 . There is some evidence that skill heterogeneity may have risen over time. Green and Zhu (2010) report increasing dispersion of returns to graduate education in Britain. Budría and Pereira (2005) show increases in Germany, Greece, Finland, France, Italy, Norway, Sweden and the UK.

14 . Country-specific qualification requirements are computed using one-digit occupational codes as occupation is not available at a more disaggregated level.

Figure 3. **Prose, document and quantitative literacy, by mismatch status, selected countries**[a]

Difference in adjusted scores[b] between each mismatched group and well-matched workers




*1)* Data for Canada, Ireland, Poland, the Netherlands, Switzerland and the United States refer to 1994. Data for the Flemish Community in Belgium and New Zealand refer to 1996. Data for Chile, the Czech Republic, Hungary, Italy and Slovenia refer to 1998.

*2)* Adjusted scores are residuals from regressing prose, document and quantitative literacy scores on ISCED level, gender, age, immigration status and marital status. Marital status is not included in the regressions for Germany, the Netherlands, Sweden and German and French Switzerland because the variable is not available for these countries.

*Source*: International Adult Literacy Survey, 1994, 1996 and 1998.

40. Skill heterogeneity does not refer exclusively to the skill level of the individuals holding the same qualification. Individuals with the same qualification and the same competence level may have specialised in different areas and this could lead to very different labour market outcomes as far as mismatch is concerned. Notably, students in areas where the number of graduates exceeds the number of job openings may face some downgrading. In addition, some university graduates may encounter difficulties finding work that is related to their field of study, ending up in jobs for which they appear to be over-qualified but for which, in fact, they may lack specific skills.

41. The second wave of the European Social Survey, conducted in 2004,[15] includes information on field of study as well as qualification level; hence it allows shedding light on differences in the incidence of over-qualification by field of study. Figure 4 shows that some fields of study are associated with a higher incidence of over-qualification. For instance, just over 10% of workers with qualifications in Personal Care Services and Teaching are over-qualified in their job compared with almost 30% for those with Social Studies training.[16] Figure 4 also presents the effect of field of study on over-qualification once adjustments are made for a number of socio-demographic characteristics and country effects[17]. While in most cases the predicted probabilities are very close to the unconditional ones, compositional effects appear to play a relatively big role in explaining the incidence of over-qualification for graduates in Transport and Telecommunications, Arts and Science.[18]

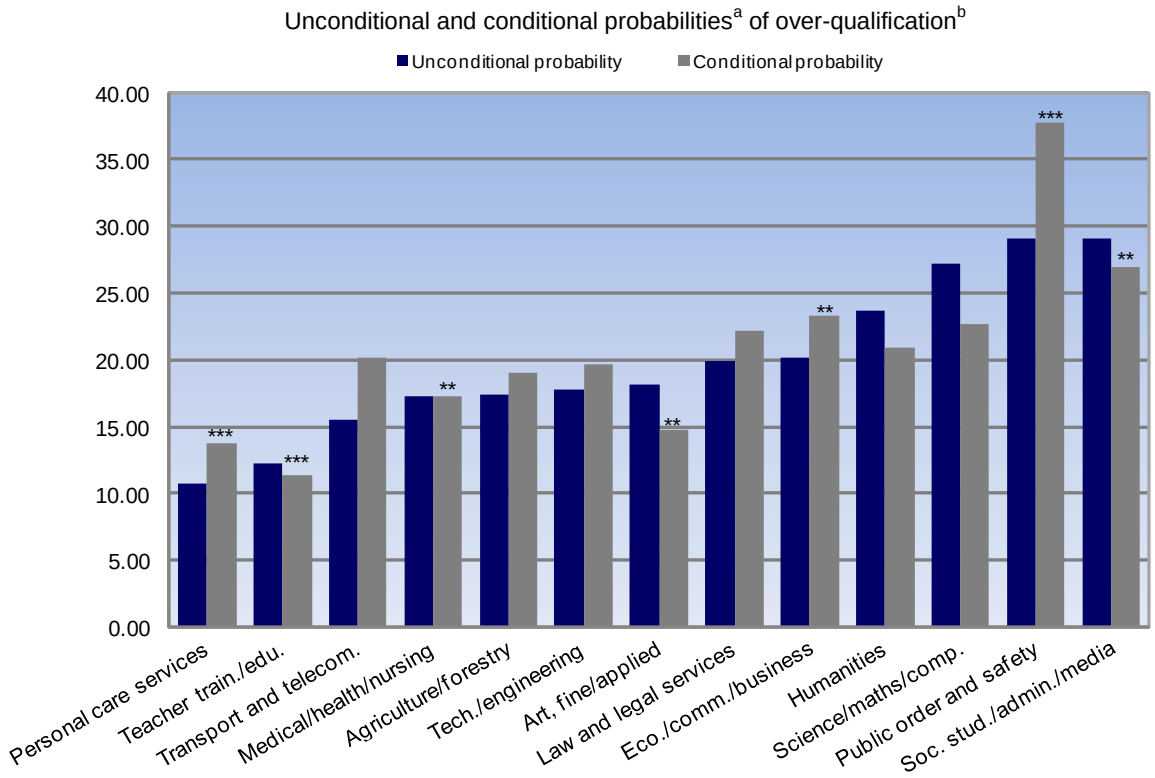
15 . Dates of data collection vary across countries, with the survey carried out mostly in 2004 but up to 2006 for a small number of countries.

16 . See also Barone and Ortiz, 2010; Boudarbat and Chernoff, 2009; Green and McIntosh, 2007; and Wolbers, 2003.

17 . These factors allow to partly control for self-selection into some fields of study by individuals who are more likely to become over-qualified in employment. For instance, some fields of study may be found mostly among older workers – if they are out of fashion – or younger workers – if they include some relatively new sub-fields. When these factors are not controlled for, they may bias the effect of field of study alone.

18 . Although the coefficient on Public Order and Safety is positive, very large and statistically significant, only about 1% of individuals in the sample have qualifications falling into this group.

Figure 4. **Field of study and the likelihood of over-qualification, 2004**




***, **: Statistically significant at 1%, 5% levels, respectively. The significance level is that of the marginal effects on fields of study estimated from a probit regression where the "Technical and Engineering category" is omitted.

*a)* The dependent variable is the probability of being over-qualified as opposed to well-matched (under-qualified individuals are excluded). By definition, individuals with no qualifications cannot be over-qualified; hence they are excluded from the regression. The omitted field of study is "Technical and Engineering". In addition to field of study, the probit model includes controls for: gender, age, immigration status, marital status, firm size, contract type, full-time status, supervisory functions, job complexity, opportunities for advancement, job latitude, tenure, unemployment experience over the previous three months and country dummies. Predicted probabilities of over-qualification for each field of study are obtained at mean values of all other variables.

*b)* Includes Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

*Source:* European Social Survey, 2004.

42. The ESWC can also be exploited to assess how many workers hold jobs in areas that are not related to their field of study and how this contributes to qualification mismatch.[19] This analysis requires identifying what occupations are suitable for each field of study. For this purpose, a correspondence between three-digit occupational codes and required/suitable field of study is developed drawing largely from Wolbers (2003) and is reported in Annex A4.

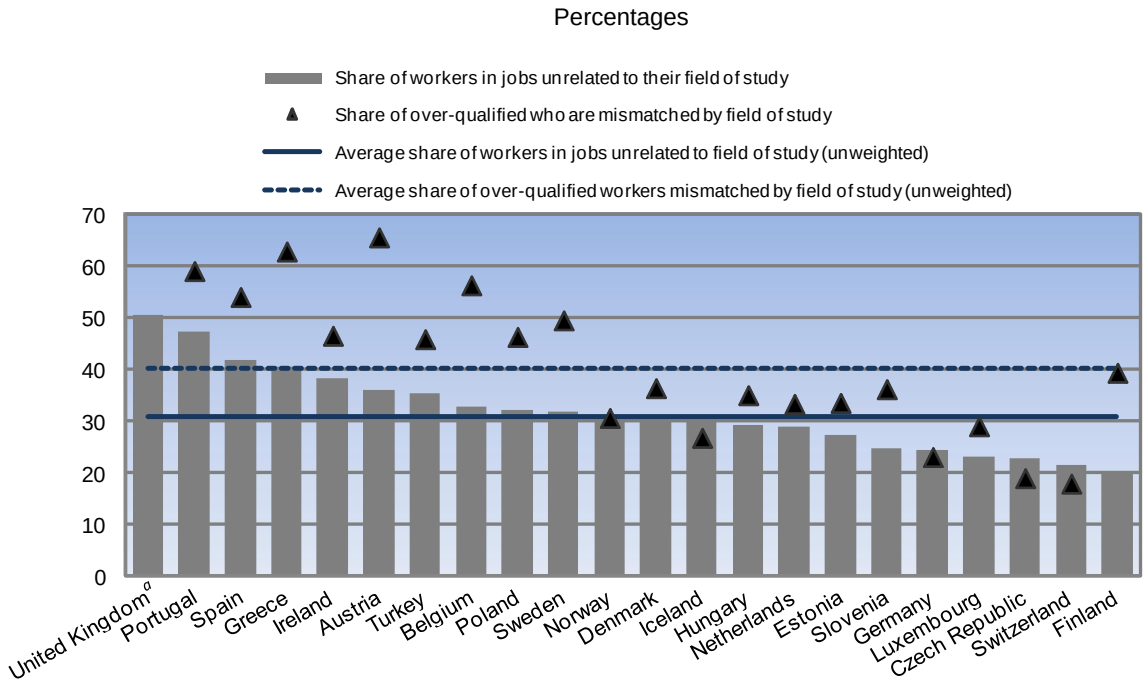
43. Figure 5 shows that, on average, across the 22 OECD countries covered by the ESS, 31% of workers hold jobs in areas that are unrelated to their field of study[20] and this is the case for 40% of the

19 . Unfortunately, the data do not allow deriving a measure of skill mismatch.

20 . Workers for whom the field of study is reported as "general" or is missing as well as those in occupations that do not require a specific field of study – elementary occupations (ISCO major group 9) – are excluded from this calculation. Note that 97% of workers for which the field of study is reported as "general" hold qualifications at ISCED level 3 or below - i.e. they hold primary or secondary (presumably non-vocational) qualifications.

over-qualified.[21] However, these values vary significantly across countries. Interestingly, some workers who are mismatched by their field of study are under-qualified in their job (not shown). As it is the case for under-qualification in general, this may be due to the fact that these workers have acquired job-specific skills through training which did not translate into a further qualification.

Figure 5. **Work outside one's field of study and over-qualification, 2004**




*1)* Qualification mismatch cannot be computed for the United Kingdom. As a result, for consistency, the United Kingdom is excluded from both averages reported in the figure.

*Source*: European Social Survey, 2004.

44. Finally, an interesting issue in the context of within-qualification skill heterogeneity is whether individuals with vocational qualifications are more likely to be well matched to their job than individuals with general qualifications. Unfortunately, individual data that allow discriminating between vocational and academic qualifications are very hard to find and the limited literature provides only inconclusive evidence (Box 2).

21. Restricting the analysis to tertiary graduates only makes a minor difference to these results.

Box 2. **Vocational education and mismatch**

Understanding whether vocational education affects the likelihood of various forms of mismatch is a key issue with significant policy implications. In most countries, qualifications at the secondary level can be either general or vocational and this is also true at the tertiary level. A priori, it could be argued that workers with vocational skills are more likely to possess work-specific competences required by the labour market than workers with an academic background and are therefore more likely to be well-matched to their job. On the other hand, in most OECD countries, vocational courses tend to put much less emphasis on numeracy and literacy and deficits in these basic skills may put vocational graduates at a higher risk of under-qualification.

Data that allow distinguishing vocational and academic graduates are very rarely available. The distinction is possible in some OECD countries for which the ISSP includes country-specific qualification titles. At the secondary level, the two pathways can be separately identified in Belgium (Flanders), the Czech Republic, Denmark, France, Hungary, Israel and Norway. At the tertiary level, this is possible in Finland, Mexico, New Zealand and Switzerland. The probability of being over-qualified is estimated on a number of independent variables including an over-skilling dummy, some demographic characteristics, job characteristics, country dummies and a dummy indicating whether the worker holds a vocational qualification. Two separate regressions are run for upper secondary graduates and tertiary graduates. Holding a vocational qualification is found to have no effect on the likelihood of over-qualification among upper secondary graduates but it reduces by 12% the likelihood that a tertiary graduate is over-qualified as opposed to well-matched and this is statistically significant at the 1% level. It is noteworthy that vocational education does not affect the likelihood of over-skilling. However, this evidence should be taken with care as it refers to a very limited number of countries.

The literature on this subject is very limited, with studies referring to different concepts of mismatch and giving mixed results. Only Mavromaras *et al*. (2009*b*) look at post secondary vocational qualifications and find that they reduce the likelihood and persistence of being *over-skilled* at work in Australia compared with secondary and university education. Findings by Ryan and Sinning (2011) for Australian youth confirm that vocational education graduates report higher use of skills at work than youth without any post-secondary qualification. However, Ryan and Sinning (2011) find that the wage penalty from over-qualification is bigger for vocational graduates than for youth with academic degrees and that vocational graduates may find themselves *trapped* in jobs which do not make the best use of their skills. At the secondary level, Wolbers (2003) finds that the incidence of *field-of-study* mismatch among school-leavers is higher in countries with a high share of students in school-based vocational education but lower in countries with a large share of youth in apprenticeship-type vocational education. This latter finding is in line with the evidence presented in Box 1 that Austria, Germany, Switzerland have a below-average incidence of real over-skilling – over-skilling combined with over-qualification.

On a different note, Buchel and Pollman-Shult (2001) show that among individuals with similar levels of vocational education in West Germany, there are large differences in the likelihood of being over-qualified, and these are related mostly to individual skill endowments. Indeed, differences in the incidence of over-qualification based on the quality of the vocational course attended disappear once school achievement prior to vocational education is controlled for. In other words, the authors find evidence of significant self-selection in vocational education.

### *The role of job heterogeneity*

45. Several studies have found that workers' heterogeneity alone cannot account for the extent of qualification mismatch in the labour market. As suggested in Section 1, jobs also differ widely, even when they carry the same occupational code. Hence, workers who are over-qualified could hold jobs involving more complex tasks, more decision-making and more responsibilities than workers who are well-matched by their qualifications and work in the same occupation while the inverse could be true for under-qualified workers.

46. The ESWC includes considerable information on job tasks which can be summarised in eight job characteristics as described in Annex A5. Table 2 shows the marginal effects of these job characteristics on

the probability of being mismatched.[22] The coefficients in column 1 confirm that workers in supervisory roles, in complex jobs, in jobs that allow significant independence and in jobs that require the frequent use of computing skills are more likely to be over-qualified while workers in jobs where physical working conditions are poor are less likely to be over-qualified – *i.e*. the over-qualified are in more demanding jobs, *ceteris paribus*. Results are less clear-cut for under-qualification (column 4) but job complexity, job-related stress and computer use do reduce the likelihood of under-qualification – *i.e*. the under-qualified are in less demanding jobs, *ceteris paribus*. These results are unchanged if controls for over-skilling and under-skilling are included (columns 2 and 5).[23]

47. Finally, columns 3 and 6 of Table 2 show the marginal effects of individual and job characteristics on the likelihood of over-skilling and under-skilling. Because over-skilling and under-skilling are based on individuals' judgement of their skills and their job requirements, one would expect workers who feel over-skilled to be in less demanding jobs and those who feel under-skilled to be in more demanding jobs. This is confirmed for under-skilling as far as complexity and the use of computing skills are concerned while the results for overskilling are less clear-cut.

***Socio-demographic characteristics and mismatch***

48. Table 2 also summarises the role of several socio-demographic characteristics on the likelihood of mismatch. No difference across gender in the likelihood of over-qualification is found but women are more likely to be under-qualified than men.[24] Marital status and the presence of children are not found to play a role for over-qualification. However, working full-time reduces the likelihood of under-qualification and having young children increases it. Hence, the compound effect of gender, part-time work and the presence of young children in the household would increase the likelihood of under-qualification sizeably. Overall, these results lend little support to the idea that women may choose a job for which they are over-qualified to improve their work-life balance.[25] This is consistent with the academic literature which has provided very mixed results concerning the role played by gender and family status in explaining qualification mismatch (Quintini, 2011).[26]

22 . These coefficients come from probit models where the over-qualified and under-qualified are compared, in turns, with well-matched workers. Using multinomial logit or ordered probit models does not change the sign or significance of the coefficients. However, using standard probit models allows excluding the lowest qualified from the over-qualification regressions – because, by definition, they cannot be over-qualified – and the highest qualified from the under-qualification regressions – because, by definition, they cannot be under-qualified.

23 . As shown in Section 2, skill mismatch (measured as self-reported over-skilling and under-skilling) does play a role in explaining over-qualification and under-qualification, albeit a small one. As expected, being over-skilled reduced the likelihood of being under-qualified and being under-skilled increases it, although this latter result is not statistically significant (column 5). On the other hand, being over-skilled does increase the likelihood of being over-qualified but so does being under-skilled (column 2).

24 . It is noteworthy that women are less likely to report being over-skilled or under-skilled than their male counterparts.

25 . In an alternative specification to that presented in Table 2, the interactions of gender and marital status or the presence of children under 15 in the household are all insignificant in explaining over-qualification.

26 . According to spatial models of job search, husbands tend to optimise their individual job search while their wives' job search is undertaken under the condition that the job search of their husband is optimised. Also, some researchers have argued that women with children may be more likely to be over-qualified because of the constraints on job choice imposed by child-rearing, but no empirical evidence is available to support this claim.

Table 2. **Determinants of qualification and skill mismatch, 2005**[a]

Probit regression,[b] marginal effects[c] of independent variables

| Explanatory variables | | Over-qualification(1) | Over-qualification(2) | Over-skilling (3) | Under-qualification(4) | Under-qualification(5) | Under-skilling (6) |
|---|---|---|---|---|---|---|---|
| Over-skilled | | | 0.015 | | | -0.026 | |
| Under-skilled | | | 0.054 *** | | | 0.029 | |
| Age | | 0.008 *** | 0.008 *** | -0.001 | -0.004 *** | -0.004 *** | -0.001 |
| Female | | -0.016 | -0.016 | -0.025 ** | 0.041 ** | 0.040 ** | -0.019 ** |
| Upper secondary qualification | | | | 0.058 *** | | | -0.008 |
| Tertiary qualification | | | | 0.105 *** | | | -0.010 |
| Non-Citizen | | 0.133 *** | 0.132 *** | 0.084 *** | 0.049 | 0.052 | -0.013 |
| Single | | 0.005 | 0.005 | 0.014 | -0.018 | -0.020 | 0.005 |
| With children under 15 living in household | | -0.007 | -0.007 | 0.002 | 0.035 * | 0.037 * | 0.013 |
| Tenure | 2-5 years | -0.037 ** | -0.033 * | -0.021 | 0.016 | 0.021 | -0.052 *** |
| | 6-10 years | -0.078 *** | -0.075 *** | -0.042 *** | -0.011 | -0.009 | -0.073 *** |
| | 11-20 years | -0.041 ** | -0.040 * | -0.065 *** | 0.018 | 0.020 | -0.052 *** |
| | 21+ years | -0.086 *** | -0.083 *** | -0.094 *** | 0.018 | 0.016 | -0.054 *** |
| Experience | | -0.008 *** | -0.008 *** | 0.000 | 0.010 *** | 0.010 *** | -0.002 *** |
| Firm size | 1-9 employees | -0.149 *** | -0.148 *** | -0.051 | -0.044 | -0.042 | -0.050 |
| | 10-49 employees | -0.137 *** | -0.135 *** | -0.056 | -0.099 | -0.099 | -0.061 |
| | 50-499 employees | -0.136 *** | -0.135 *** | -0.047 | -0.096 | -0.092 | -0.059 |
| | 500+ employees | -0.114 ** | -0.110 ** | -0.043 | -0.098 | -0.092 | -0.048 |
| Private sector | | -0.027 * | -0.022 | -0.001 | 0.054 ** | 0.051 ** | -0.014 |
| Contract type | Fixed-term | 0.009 | 0.007 | 0.032 ** | 0.033 | 0.029 | 0.036 ** |
| | TWA | -0.025 | -0.028 | 0.008 | 0.020 | 0.027 | -0.085 *** |
| Full-time | | 0.014 | 0.014 | -0.019 | -0.041 * | -0.044 * | 0.010 |
| Supervisor | 1-9 employees | 0.091 *** | 0.091 *** | 0.006 | -0.020 | -0.018 | 0.003 |
| | 10+ employees | 0.117 *** | 0.113 *** | 0.030 | -0.022 | -0.019 | 0.014 |
| Job complexity[d] | | 0.053 *** | 0.052 *** | 0.010 | -0.068 *** | -0.068 *** | 0.072 *** |
| Job latitude[d] | | 0.012 * | 0.012 | 0.018 *** | -0.012 | -0.012 | 0.001 |
| Working conditions[f] | | -0.051 *** | -0.052 *** | 0.024 ** | 0.119 *** | 0.120 *** | 0.016 * |
| Job stress[g] | | 0.003 | -0.001 | 0.069 *** | -0.092 *** | -0.092 *** | 0.058 *** |
| Computer use | Medium | 0.086 *** | 0.081 *** | -0.024 * | -0.178 *** | -0.177 *** | 0.060 *** |
| | High | 0.138 *** | 0.133 *** | 0.001 | -0.180 *** | -0.179 *** | 0.047 *** |
| Interpersonal tasks | Medium | 0.039 *** | 0.040 *** | 0.003 | -0.070 *** | -0.067 *** | 0.007 |
| | High | -0.009 | -0.008 | 0.005 | 0.005 | 0.010 | -0.012 |
| Team-work | | 0.007 | 0.006 | -0.021 ** | 0.008 | 0.006 | 0.006 |
| *Number of observations* | | *9,305* | *9,175* | *13,177* | *6,076* | *6,011* | *10,305* |

***, **, *: Statistically significant at 1%, 5%, 10% levels, respectively.

*a)* Includes: Austria, Belgium, the Czech Republic, Denmark, Germany, Greece, Estonia, Finland, France, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

*b)* The dependent variables are defined as follows: the probability of being over-qualified as opposed to well-matched by qualifications (under-qualified individuals are excluded as well as individuals with no qualifications); the probability of being under-qualified as opposed to well-matched by qualifications (over-qualified individuals are excluded as well as individuals with tertiary qualifications); the probability of being over-skilled as opposed to well-matched by skills (under-skilled individuals are excluded); and the probability of being under-skilled as opposed to well-matched by skills (over-skilled individuals are excluded). Control variables not reported in the table include: country dummies, occupation dummies, industry dummies. Data include employees and the self-employed but exclude trainees and apprentices.

*c)* Marginal effects calculated at the variable mean for continuous variables and for discrete changes of categorical variables.

*d)* The degree of job complexity is obtained by applying Cronbach's Alpha technique to individual responses of whether the job involves: complex tasks, assessing the quality of one's own work, solving unforeseen problems and learning new things.

*e)* The degree of job latitude is obtained by applying Cronbach's Alpha technique to individual responses of whether the worker is free to choose method and speed of work and order of tasks.

*f)* Working conditions refers to an index obtained by applying Cronbach's Alpha technique to individual responses of whether the job involves: heavy loads, repetitive movements, painful positions, vibrations, noise, breathing or handling dangerous substances, radiations, wearing protective clothes, high temperature, low temperature or health and safety risks.

*g)* Job stress refers to an index obtained by applying Cronbach's Alpha technique to individual responses of whether: *i*. the job involves high speed, tight deadlines, not enough time, shift work, night work, Sunday work, Saturday work; *ii.* the job requires unforeseen tasks, interruptions, or conforming to the pace of colleagues, production targets or machines; and *iii*. the job causes stress, fatigue, headaches or anxiety.

*Source:* European Survey of Working Conditions, 2005.

49. Consistent with the findings of a rich empirical literature, Table 2 shows that non-citizens are more likely to be over-qualified than citizens. Although this definition does not allow separating the native-born from the foreign-born, it is nevertheless a good approximation.[27] Immigrants could be at higher risk of over-qualification for a number of reasons including poor language proficiency, the fact that they often hold qualifications acquired in their home country or racial discrimination.[28,29]

50. Table 2 shows that both over-skilling and under-skilling decline with labour market experience, suggesting that workers' skills and/or job requirements adjust over time to achieve a better match. [30] On the other hand, under-qualification is higher for more experienced workers, supporting the theory that the under-qualified may have acquired further skills on the labour market which are not reflected in their qualifications but allow them to do more complex jobs than their qualifications suggest. Over-qualification is found to decline with experience, suggesting that it may be more frequent among new labour market entrants who may lack job-specific skills despite their qualifications. .

51. Workers in private firms are found to be less likely to be over-qualified but more likely to be under-qualified than their public sector counterparts. This could be explained by the fact that public-sector workers may be willing to trade job content for more job security or by the fact that public sector job openings often include explicit qualification requirements. Also, qualification mismatch is found to decline with firm size, possibly because larger firms offer more opportunities for highly-qualified workers compared with SMEs. Nevertheless, due to personal or institutional barriers to geographical mobility, some workers may choose to work in areas where firms are predominantly small and accept jobs for which they are over-qualified. Finally, contrary to the common discourse that over-qualification is more often found among workers on temporary contracts, no significant different in qualification mismatch is observed between permanent workers and workers on fixed-term of temporary work agency contracts. On

27 . To the extent that some foreign-born citizens may face similar employment barriers to immigrants without citizenship, the positive effect of non-citizenship on the probability of being over-qualified is likely to be a lower bound of the true effect.

28 . OECD (2007*a*) finds a clear association between the proficiency in the host-country language and the incidence of over-qualification and shows that literacy can explain a significant portion of the increased risk of over-qualification for immigrants. Focusing on foreign schooling, Støren and Wiers-Jenssen (2010) find that, in Norway, education from abroad increases the risk of over-qualification for both native-born and foreign-born tertiary graduates. This could be due to a lack of information about or formal recognition of foreign qualifications. However, it could also derive from actual differences in schooling quality. In this regard, Chiswick and Miller (2010) show that the quality of schooling in the home country – as measured by PISA scores – is strongly positively related to the payoffs to schooling for immigrants. Finally, Støren and Wiers-Jenssen (2010) also find that Non-Western immigrants in Norway have a higher risk of over-qualification irrespective of the origin of their education, suggesting the existence of discrimination against Non-Western immigrants.

29 . Some, but not all, of these factors may become less important with time spent working in the host country but this cannot be tested as the ESWC does not contain information on when immigrants arrived in the country of current work. A recent paper by Poot and Stillman (2010) finds that New Zealand immigrants are more likely to be over-qualified than their native counterparts but over-qualification declines with years of residence in the country. Similarly, OECD (2007*a*) documents an improvement in the incidence of over-qualification with length of stay among immigrants in several OECD countries.

30 . Tenure is also found to reduce over-skilling and over-qualification. Because, by definition, over-qualification cannot vary with tenure unless the worker acquires further qualifications and/or changes job, the results presented in Table 2 are better interpreted as a simple association between long tenure and a good worker-job match. In fact, an endogeneity issue may arise with tenure as over-qualified and over-skilled workers may be more inclined to move jobs while well-matched workers may accumulate longer tenures.

the other hand, it appears that workers on fixed-term contracts are more likely to be over-skilled at work than those on other contract types.

***Labour market factors***

52. Some labour market events – such as losing one's job – may increase the likelihood of over-qualification at re-employment or subsequently. First, as individuals struggle to find another job after an involuntary job separation, they may prefer to accept a job for which they are over-skilled than remain unemployed or they may be forced to accept it under the threat of suffering a cut in their unemployment benefit if they refuse the job offer. On the other hand, it is also possible that an involuntary job loss may carry a scar as perspective employers cannot verify the individual's competences directly and may interpret the fact that they have been laid off as a negative signal, particularly if this resulted in a spell of unemployment. Finally, a long spell of unemployment after a job separation may result in skill obsolescence and/or atrophy, leading to under-skilling and/or over-qualification.

53. Table 3 shows the effect of different types of job separations on the likelihood of qualification mismatch and over-skilling using the European Community Household Panel (ECHP).[31] Individuals who have lost their job following business closure and those who have been fired are significantly more likely to find work in a job for which they are over-qualified than workers who have quit their previous job voluntarily. In addition, the likelihood of over-qualification increases with the time between jobs. Over-skilling is also higher among workers who have been fired or laid-off as a result of business closure, suggesting that both the negative signal sent by an involuntary separation and the pressure to find a job could explain these effects. On the other hand, workers who change job voluntarily are among the most likely to be under-qualified in their following job, *i.e.* involuntary separations reduce the likelihood that their uncertified skills are recognised by prospective employers.

54. The way a job is found also affects the likelihood of mismatch. Family and friends do not seem to help in finding work that is well matched to one's skills and qualifications. Answering job ads or relying on employment and vocational guidance agencies also increases the likelihood of over-skilling compared with direct applications. Finally, the coefficients on mismatch status in the previous job confirm that all three forms of mismatch presented in Table 3 are rather persistent.

55. The specification underlying the results presented in Table 3 allows exploring the effect on mismatch of involuntary separations at different points in the business cycle. Indeed, the model includes the logarithm of the ratio of the unemployment rate at the time of hiring[32] and the average unemployment rate in the five previous years –hereon called the relative unemployment rate – as a stand-alone term and interacted with the reason for job separation. While Table 3 reports the marginal effects of involuntary separations at the mean relative unemployment rate, Figure 6 shows how these marginal effects vary with the business cycle. Job separations are found to have a stronger effect when the log of the relative unemployment rate is greater than zero – i.e. during a recession. Indeed, when the unemployment rate is in line with its medium-term average – *i.e.* the relative unemployment rate takes the value of one – losing one's job because of business closure increases the likelihood of over-qualification by 15% compared to quitting while if hiring happens at a time when the unemployment rate is twice the five-year average rate, this effect increases to almost 35%. On the other hand, if growth accelerates and the unemployment rate falls to two-thirds of the five-year average rate, this effect declines to just 5%. A similar pattern is observed for the marginal effects of being fired. Results for over-skilling are very similar while those for under-qualification are less clear-cut.

31 . The ECHP does not include a measure of self-reported under-skilling (see Annex A3).

32 . The results are unchanged when the unemployment rate at the time of separation is used.

Table 3. **Likelihood of mismatch following a job separation**[a]

Probit regression,[b] marginal effects[c] of independent variables

| Explanatory variables | Over-qualification | Over-skilling | Under-qualification |
|---|---|---|---|
| **Way work found**[d] | | | |
| Answered job ads | 0.003 | 0.042 *** | 0.043 *** |
| Employment or vocational guidance agency | -0.008 | 0.064 *** | 0.009 |
| Family and friends | 0.031 ** | 0.027 *** | -0.012 * |
| Own family business | 0.043 | -0.055 ** | 0.060 * |
| Other | -0.072 *** | -0.015 | 0.101 *** |
| **Reason for job separation**[e] **at mean relative unemployment rate at hiring** | | | |
| Fired | 0.032 ** | 0.042 *** | -0.062 *** |
| End of temporary contract | 0.019 | -0.006 | -0.039 *** |
| Business closure | 0.121 *** | 0.040 * | -0.042 ** |
| Personal/family reasons | -0.008 | 0.010 | -0.034 ** |
| Health or military service | 0.026 | 0.052 ** | 0.017 |
| **Relative unemployment rate at hiring**[f] | -0.052 | 0.012 | 0.041 |
| **Previous job** | | | |
| Over-qualification | 0.692 *** | | |
| Over-skilling | -0.019 | 0.546 *** | |
| Under-qualification | | | 0.696 *** |
| **Time between jobs** | 0.041 *** | -0.009 | 0.007 |
| *Number of observations* | *15,599* | *30,928* | *20,235* |

***, **, *: statistically significant at 1%, 5%, 10% levels, respectively.

*a)* Includes: Austria, Belgium, Denmark, Greece, Finland, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and the United Kingdom.

*b)* The dependent variables are defined as follows: the probability of being over-qualified as opposed to well-matched by qualifications (under-qualified individuals are excluded as well as individuals with no qualifications); the probability of being under-qualified as opposed to well-matched by qualifications (over-qualified individuals are excluded as well as individuals with tertiary qualifications); the probability of being over-skilled as opposed to under-skilled or well-matched by skills (under-skilled individuals cannot be identified in the ECHP). Control variables not reported in the table include: country dummies and year dummies). Data includes employees and self-employed but excludes trainees and apprentices. Only workers who have had a previous job are included. Survey years are pooled.

*c)* Marginal effects calculated at the variable mean for continuous variables and for discrete changes of categorical variables.

*d)* The omitted category is “Direct application”.

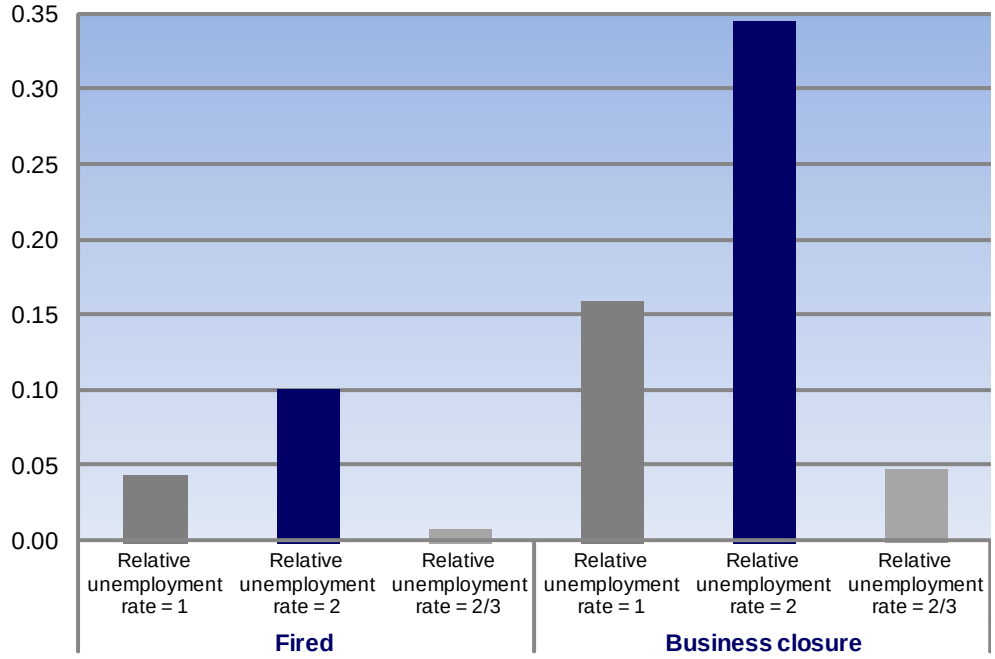
*e)* The omitted category is “Quit voluntarily”. Because the model includes an interaction between the reason for job separation and the relative unemployment rate of hiring (see note *f.*), these marginal effects are measured at the mean relative unemployment rate at hiring.

*f)* Natural logarithm of the relative unemployment rate where the relative unemployment rate is equal to the ratio of the unemployment rate in the year of hiring to the average unemployment rate in the previous 5 years – *i.e.* the natural log of the relative unemployment rate takes the value of zero if the unemployment rate is in line with the 5-year average.

*Source:* European Community Household Panel, all waves, 1994-2001. See Table A6.1 in Annex A6 for full regression results.

Figure 6. **Likelihood of over-qualification and the business cycle**[a]

Marginal effects of involuntary separations at selected values of the relative unemployment rate at hiring[b]




*1)* See notes to Table 3.
*2)* The relative unemployment rate is equal to the ratio of the unemployment rate in the year of hiring to the average unemployment rate in the previous 5 years A relative unemployment rate of 1 (2, 2/3) indicates that the unemployment rate is in line with (twice, 2/3 of) its 5-year average.
*Source*: European Community Household Panel, (all waves, 1994-2001).

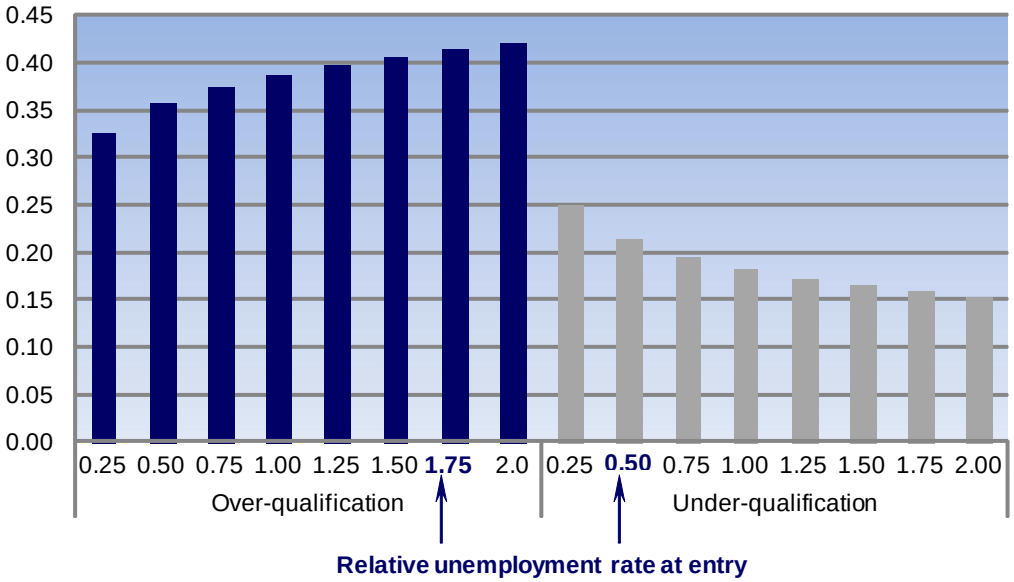
56. In the context of the recent global economic crisis, analysts and policy makers have expressed worries that the current generation of school leavers may be permanently scarred in terms of their labour market outcomes. To explore this issue, Figure 7 shows how the likelihood of over-qualification in the first job varies with the relative unemployment rate and Table A6.2 in Annex A6 presents full regression results. The relative unemployment rate is defined similarly to Table 3 but refers to the rate at the time of leaving initial education. The probability of being over-qualified in the first job increases with the relative unemployment rate at leaving education: it is 39% when leaving education at times of constant unemployment – *i.e.* a relative unemployment rate of 1 but 42% if the unemployment rate at leaving education is twice as high as its five-year average will increase the likelihood of over-qualification by approximately 3 percentage points.

57. It is worth noting that the year of leaving education[33] is likely to be endogenous to labour market conditions. However, because students would choose to leave when labour market conditions are least unfavourable, the marginal effects presented in Table A6.2 are likely to represent lower bounds of the effect of the time of labour market entry on the likelihood of over-qualification.

33 . Using the year of obtaining the highest educational qualification gives somewhat similar results but the coefficients' interpretation is less clear-cut as some youth may decide to stay on in further education until the labour market conditions improve.

Figure 7. **Likelihood of mismatch in the first job and the business cycle at labour market entry**[a]

Estimated probability at selected values of the relative unemployment rate at leaving education[b]




*1)* See Table A6.2 in Annex A6 for full regression results and notes.
*2)* The relative unemployment rate is equal to the ratio of the unemployment rate in the year of hiring to the average unemployment rate in the previous 5 years. For instance, a relative unemployment rate of 1 indicates that the unemployment rate is in line with its 5-year average.
*Source*: European Community Household Panel, (all waves, 1994-2001).

## 4. What is the relevance of qualification mismatch for policy makers?

58. The extent to which policy makers ought to take measures to reduce qualification mismatch depends crucially on the consequence of mismatch for workers and their employers. The measurement of the effect of mismatch on worker's wages, job satisfaction and on-the-job search is a key issue in the literature on qualification mismatch and several meta-analyses have been carried out so far (Groot and Maasen van den Brink, 2000; Rubb, 2003; Verhaest and Omey, 2006; and Quintini, 2011). On the other hand, few studies have looked at the separate role played by qualification and skill mismatch in determining wages, job satisfaction, turnover and productivity (Allen and van der Velden, 2001; and Green and McIntosh, 2007) and, to the best of our knowledge, only Bauer (2002), Lindley and McIntosh (2008), Tsai (2010) and Mavromaras *et al.* (2010) exploit panel data to control for unobserved individual heterogeneity. These issues are explored in this section which also assesses the role of unobserved individual heterogeneity. The latter may provide further evidence on the extent to which qualification mismatch only reflects an apparent – rather than actual – discrepancy between workers' competences and job requirements.

### *To what extent do qualification and skill mismatch affect wages?*

59. The relevant literature is unanimous[34] in finding that the qualification mismatch affects wages. To confirm this, Figure 8 presents estimates of the effect of mismatch – over-qualification, under-qualification and over-skilling – on the logarithm of gross monthly wages, after controlling for a number of other individual and job characteristics. The analysis is conducted using the ECHP. In order to assess the role played by unobserved

34 . Irrespective of the measure used for qualification mismatch.

individual heterogeneity in the relationship between mismatch and wages, both pooled estimates[35] and panel estimates are presented.

60. Models 1 and 2 show estimates of the effect of over-qualification, under-qualification and over-skilling that are comparable with those obtained in the literature. The over-qualified – *e.g.* tertiary graduates in jobs requiring upper secondary qualifications – earn 20% less than workers who hold their same qualifications but have found a job that matches such qualifications – *e.g.* tertiary graduates in jobs requiring tertiary qualifications (Model 2). Conversely, the under-qualified – *e.g.* upper secondary graduates in jobs requiring tertiary qualifications – earn 15% more than workers with their same qualifications who are well-matched to their job – *e.g.* upper secondary graduates in jobs requiring upper secondary qualifications (Model 2). Using the same method, the penalty for over-skilling is significantly smaller, at approximately 0.5%. On the other hand, when workers are compared with their colleagues in similar jobs who hold just the qualifications required by the job, the over-qualified are found to earn 14% more and the under-qualified 16% less while the coefficient on over-skilling is unchanged (Model 1).[36]

61. The magnitude of the coefficients on over-qualification and under-qualification is significantly reduced when controls for unobserved individual heterogeneity are included. The fixed-effect model (Model 3) shows a penalty of 3% for over-qualification and a return of 2-3% to under-qualification. The coefficient on over-skilling doubles but remains small at about 1%. The latter result is in line with the findings of some other researchers (Allen and van der Velden, 2001) and suggests that it is the level of education, not the level of skills, that determines workers' remuneration.[37]

62. Overall, the fact that qualification mismatch has a much smaller effect on wages when panel data are exploited provides support for the hypothesis that qualification mismatch mainly reflects heterogeneity among individuals with the same qualifications. Further evidence of the role played by individual heterogeneity is provided by Table A6.3 in Annex A6. This table presents additional results exploiting the ESS and controlling for the likelihood of holding a job in an area unrelated to his studies. The results suggest that working outside one's field of study has a negative effect on wages only as long as it causes over-qualification and that the effects vary across field of study.

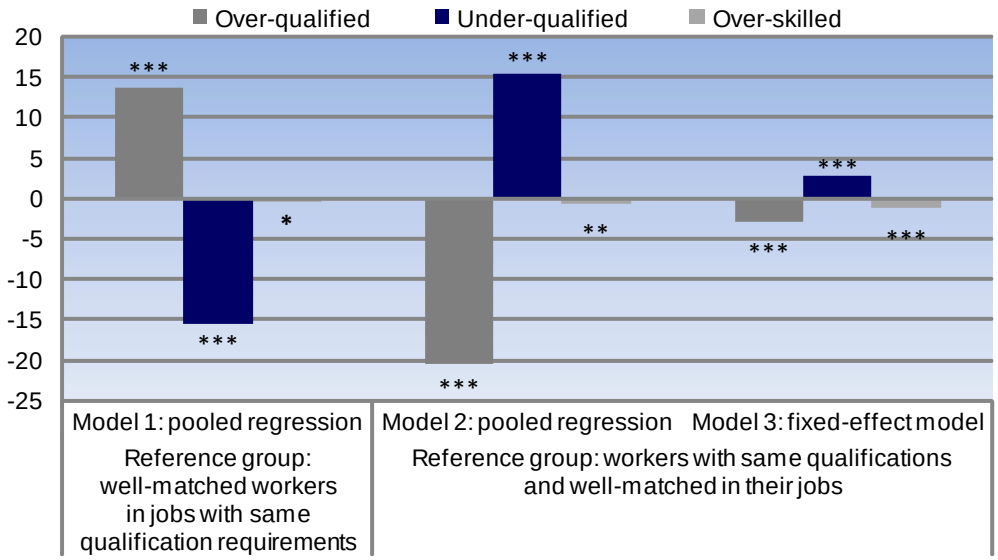
35 . For the pooled estimates, standard errors are corrected to control for clustering.

36 . It is worth noting that these are instantaneous returns and penalties to qualification mismatch. Taking a lifetime perspective may change things somewhat as the over-qualified will have "lost" years in education that have not fully paid off while the under-qualified will have "gained" time on the labour market despite suffering a small penalty for not possessing formal qualifications.

37 . Mavromaras *et al.* (2010) exploit the HILDA panel survey to study qualification and skill mismatch in Australia. They find that neither over-qualification nor over-skilling alone affects the wages of graduate males but over-skilling in conjunction with over-qualification does. The results for graduate women are more similar to those presented in Figure 8, with over-qualification and over-skilling affecting wages both separately and jointly.

Figure 8. **The impact of qualification and skill mismatch on wages**[a]

OLS regression coefficients, using log of gross monthly wages as dependent variable[b]




***, **, *: Statistically significant at 1%, 5%, 10% levels, respectively.

*a)* Includes: Austria, Belgium, Denmark, Greece, France, Ireland, Italy, the Netherlands, Portugal, Spain, and the United Kingdom. Pooled OLS regressions, with standard errors corrected for clustering.

*b)* Models include controls for: a quadratic in age, gender, immigration status, marital status, job qualification requirements (Model 1 only), worker's qualifications (Models 2 and 3), full-time status, contract type, tenure and firm size.

*Source:* European Community Household Panel, (all waves, 1994-2001). See Table A6.3 in Annex A6 for full regression results.

### *Is job satisfaction influenced by qualification and skill mismatch?*

63. Several researchers have explored the impact of mismatch on job satisfaction in order to discriminate between genuine and apparent mismatch in skills, arguing that only the types of mismatch that decrease job satisfaction should be regarded as a problem.[38] Indeed, through a reduction in job satisfaction, mismatch could increase absenteeism and/or lower productivity.

64. Figure 9 presents estimates of the impact of mismatch on job satisfaction using ECHP data. Similarly to the wage regressions presented above, both pooled and panel estimates[39] are presented. Because pay is a critical determinant of job satisfaction, gross monthly pay is included in all three models as a control. As a result, the coefficients on the mismatch variables presented in Figure 9 are to be interpreted as *net* of the effect that operates via the impact of mismatch on pay. Model 2 finds that being over-qualified reduces job satisfaction and being under-qualified increases it compared with well-matched workers with the same level of qualification. Both coefficients are halved when unobserved individual

38 . Chevalier (2003) defines genuinely mismatched individuals as those who possess more education than is required to perform their job and report a low level of job satisfaction. Mavromaras *et al*. (2010) argue that mismatch may arise out of choice as workers compensate lower wages for other intrinsic aspects of the job that increase satisfaction, for example enhanced work-life balance or increased social responsibility.

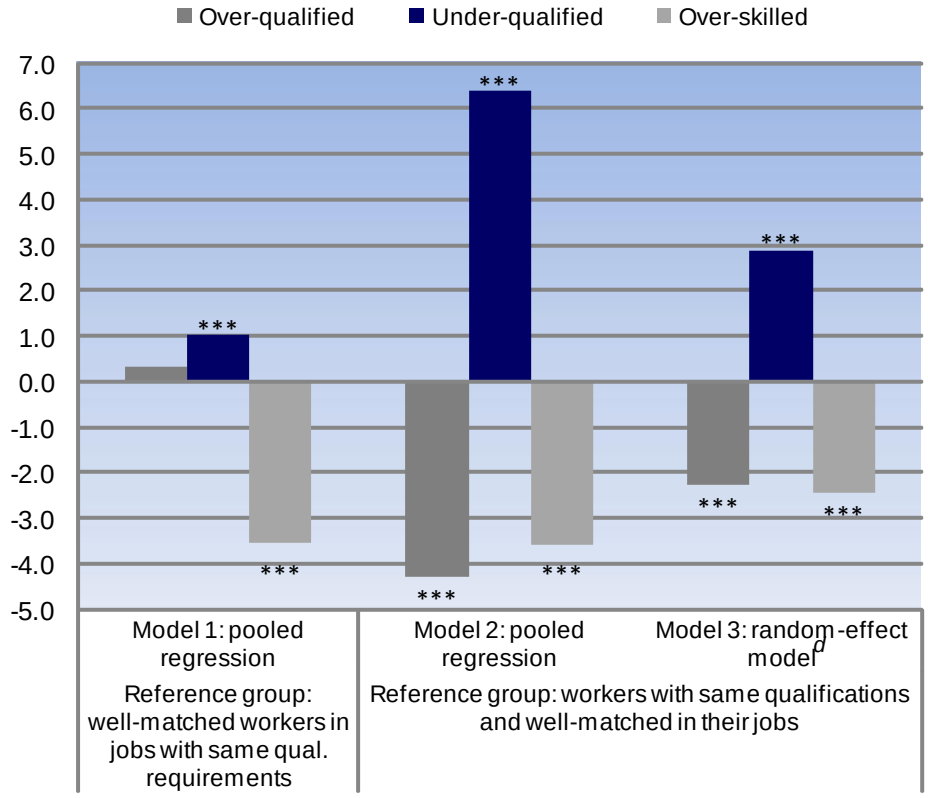
39 . Panel estimates are obtained from a random-effect model augmented with a Mundlak correction. The correction consists in adding the value of each explanatory variable averaged over time for each worker. This allows controlling for unobserved time-invariant individual heterogeneity. Unlike the fixed-effect model, the random-effect model with Mundlak correction allows the inclusion of variables with little or no time variation.

heterogeneity is controlled for (Model 3). The effect of qualification mismatch is much smaller and not always significant when the comparison group is made up of workers in a similar job holding the qualifications required by the job (Model 1). Over-skilling reduces the likelihood of being satisfied with one's job by 3.6% in a cross-section setting and 2.5% in the panel regression.

Figure 9. **Job satisfaction and qualification and skill mismatch[a]**

Probit regressions, marginal effects[b] of independent variables

Satisfaction measure: "How satisfied are you with your present job in terms of the type of work?[c]"




***: statistically significant at 1% level.

*a)* Includes: Austria, Belgium, Denmark, Greece, France, Ireland, Italy, the Netherlands, Portugal, Spain, and the United Kingdom. Pooled OLS regressions, with standard errors corrected for clustering.

*b)* Marginal effects calculated at the variable mean for continuous variables and for discrete changes of categorical variables.

*c)* The dependent variable takes value 1 if the worker is fully satisfied with the type of work they do and value 0 otherwise. The following explanatory variables are also included in all three models: age, age squared, gender, immigration status, marital status, part-time status, contract type, job tenure and firm size, log of gross monthly pay. Model 1 also includes required qualifications while Models 2 and 3 control for workers' qualifications.

*d)* Random-effect model with Mundlak correction – i.e. the regression includes averages by individual over time of each explanatory variable – to control for unobserved time-invariant individual heterogeneity.

*Source:* European Community Household Panel, (all waves, 1994-2001). See Table A6.4 in Annex A6 for full regression results.

### *Are mismatched workers more likely to move on?*

65. The effect of qualification mismatch on wages and job satisfaction may have implications for the mobility behaviour of workers.[40] To shed light on this relationship, this section investigates the effect of

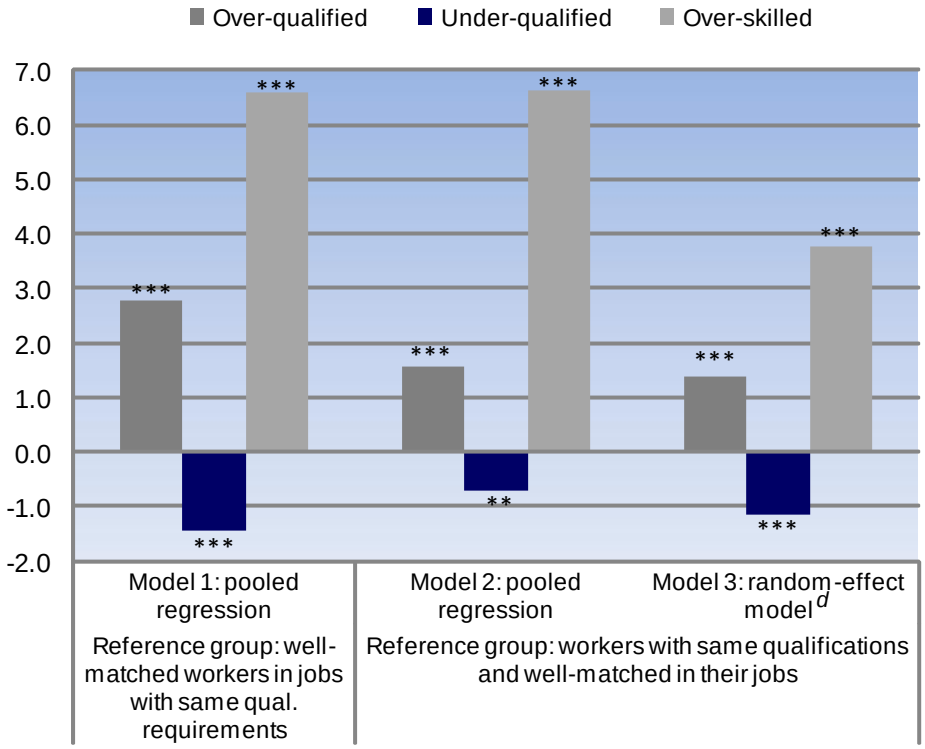
40 . Several researchers have found evidence in support of this claim using a number of different measures to assess mismatched workers' propensity to change jobs (Quintini, 2011). Hersch (1991), Robst (1995) and Allen and van der Velden (2001) use a similar approach to the one adopted in this paper and proxy

qualification mismatch and over-skilling on the likelihood of on-the-job search using ECHP data. As for job satisfaction, all models control for gross monthly pay, hence the coefficients on the mismatch variables are to be interpreted as *net* of the effect that operates via the impact of mismatch on pay. Both over-skilled and over-qualified workers are found to be more likely to engage in on-the-job search, controlling for socio-demographic characteristics, job attributes and monthly pay (Figure 10), with the effect of over-skilling being much larger than that of over-qualification. This is true whether workers are compared with their well-matched counterparts with similar qualifications or with their well-matched peers in the same job. It is noteworthy that controlling for unobserved individual heterogeneity reduces the coefficients somewhat. Also, under-qualified individuals are less likely to be searching on the job but the coefficient is small.

Figure 10. **On-the-job search and qualification and skill mismatch[a]**

Probit regressions, marginal effects[b] of independent variables[c]

On-the-job search measure: "Are you currently looking for a job?"




***, ** statistically significant at 1% and 5% levels, respectively.

*a)* Includes: Austria, Belgium, Denmark, Greece, France, Ireland, Italy, the Netherlands, Portugal, Spain, and the United Kingdom. Pooled OLS regressions, with standard errors corrected for clustering.
*b)* Marginal effects calculated at the variable mean for continuous variables and for discrete changes of categorical variables.
*c)* The following explanatory variables are also included in all three models: age, age squared, gender, immigration status, marital status, part-time status, contract type, job tenure and firm size. Model 1 also includes required qualifications while Models 2 and 3 control for workers' qualifications.
*d)* Random-effect model with Mundlak correction – *i.e.* the regression include averages by individual over time of each explanatory variable – to control for unobserved time-invariant individual heterogeneity.

*Source:* European Community Household Panel, (all waves, 1994-2001). See Table A6.5 in Annex A6 for full regression results.

mobility with on-the-job search. However, other studies have looked at the effect of qualification mismatch on job/firm/occupation changes, tenure and quit intentions.

***Persistence of mismatch***

66. The extent to which qualification and skill mismatch are *temporary* situations from which workers exit by changing jobs of acquiring further skills is key for policy makers. Unfortunately, current evidence is mixed, with opinions split between significant persistence (see Dolton and Vignoles, 2000, for the United Kingdom; and Rubb, 2003, for the United States, among others) and considerable progression through job changes or developments in job content (see Dorn and Sousa-Poza, 2005; and Wasmer *et al*., 2007 among the most recent studies).

67. Figure 11 shows the year-on-year *exit rate* from over-qualification alone,[41] under-qualification and over-skilling derived from the ECHP. It also presents the *recurrence rate – i.e.* the share of mismatched workers at *t* who become well-matched at *t+1* but become mismatched again at *t+2*. Year-on-year exit rates vary across countries and mismatch type. In Belgium, Ireland, Portugal and Spain, approximately one in five youth leaves over-qualification to become well-matched in a given year. At the other extreme, just one in ten Italian workers makes this transition each year. Similar differences are observed for exit rates from over-skilling and from under-qualification but countries rankings vary somewhat. Only in Ireland, Portugal, Spain and Italy are exit rates across mismatch type very similar, ranging between 20% and 25% for the first three countries and 10-12% for Italy. In most other countries, exit rates from under-qualification are lower than exit rates from over-qualification alone and over-skilling.

68. Recurrence rates are lowest for under-qualification – below 5% in most countries – and highest for over-skilling – 7.5% and above in Austria, Finland, the Netherlands and Spain. Figure 11 suggests no discernible link between exit rates and recurrence rates.

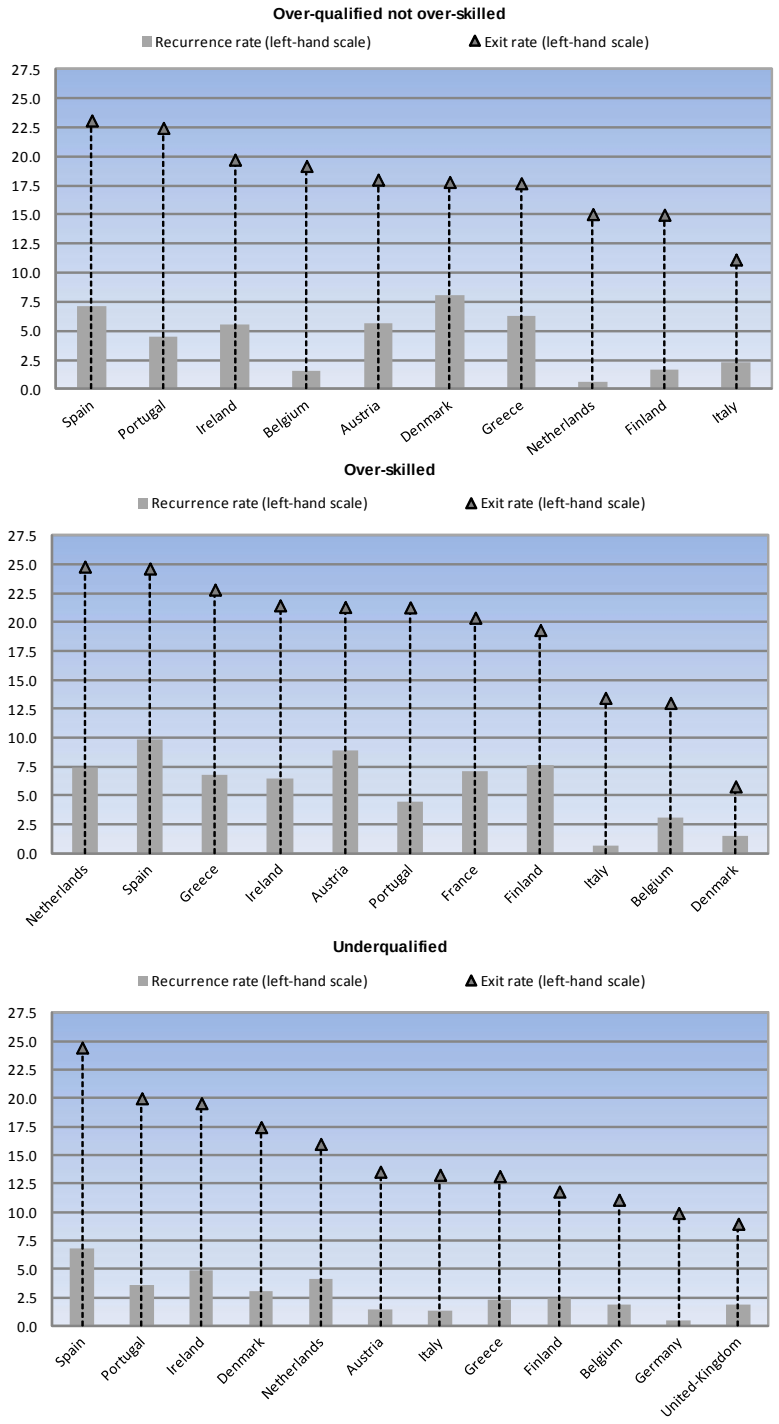
69. Given the evidence presented above, exits from over-skilling most likely derive from improvements in the match between workers and jobs. This could be achieved through a job change or job upgrading – *e.g.* the employer could attribute more responsibilities to the over-skilled employee. On the other hand, by definition, over-qualified individuals can only become well-matched by changing jobs.[42] Exit rates from over-qualification alone could be explained by the acquisition of work experience, hence of some work-related skills that the over-qualified may have originally lacked compared with their well-matched counterparts.

41 . Over-qualification not associated with over-skilling.

42 . More generally, it is possible that job upgrading on a large scale, affecting a large share of workers in the same occupation, increases job requirements measured by the modal qualification in each occupation. As a result, some workers who were previously over-qualified may become well-matched despite staying in the same job. However, this is unlikely to happen over just one year.

Figure 11. **Dynamics of qualification and skill mismatch: exit rates[a] and recurrence rates[b]**

Percentages[c]




*a)* The exit rate is the share of the mismatched at time t who are well-matched at time t+1. The weighted average across waves is reported in the figure.
*b)* The recurrence rate is the share of workers who are mismatched at time t and well-matched at time t+1 who become mismatched again at t+2. The weighted average across waves is reported in the figure.
*c)* The sample is restricted to persons continuously employed over 5 or more waves.
*Source:* European Community Household Panel, all waves, 1994-2001.

## 5. Which labour market, education and training policies can ensure that available skills and competences are not under-utilised?

70. The analysis conducted in Sections 2 to 4 suggests that, although skill mismatch is neither necessary nor sufficient to explain qualification mismatch, the two phenomena overlap to some extent, particularly for over-qualified and over-skilled workers. Hence, over-qualification can partly be explained by genuine mismatch between workers' competences and job requirements. However, the analysis also confirms that a significant share of qualification mismatch is explained by individual heterogeneity, with qualifications being poor signals of workers' skills.

71. These findings suggest various motives for government intervention, including: the waste of resources implied by mis-investment in education; the additional efforts required of employers to select the best candidates in the absence of useful information conveyed by qualifications; the need for additional training or adjustment in job requirements to adapt skills supply to skills demand; and the need for action targeted on some at-risk groups, notably immigrants and the unemployed.

***Under-qualification: why and how should it be reduced?***

72. The findings presented above paint a consistent picture of the under-qualified as a group of workers who do possess the competences and skills required by their job but do not have formal qualifications to show it. For instance, under-qualification increases with labour market experience and is particularly high among older workers and immigrants. In addition, nearly 90% of the under-qualified report feeling well-matched or over-skilled for their job. Finally, evidence suggests that the under-qualified tend to be of high ability for their qualification.

73. These findings are not surprising as employers are unlikely to retain workers who are persistently unable to perform the tasks required in their jobs – a genuine lack of skills required by business is more likely to result in skills shortages or in remedial training provided by employers at hiring. However, to the extent that under-qualified individuals earn less than better-qualified workers in the same occupation, even once job tasks and characteristics are controlled for, under-qualification might warrant policy intervention.[43] The recognition of non-formal and informal learning (RNFIL) – *i.e.* learning that takes place outside formal education institutions – could play a key role in ensuring that appropriately-skilled workers are not penalised by a lack of formal qualifications.

74. OECD work in the area recognises the potential benefits of RNFIL for workers and employers (OECD, 2010*b* and 2010*c*). In the context of under-qualification, recognition can provide greater visibility and therefore add value to the competences of people in the labour market. It can also facilitate structural adjustment by enabling competences of displaced workers to be recognised and reapplied in other parts of the labour market. In their study on Canada, Bloom and Grant (2001) estimate that eliminating the learning recognition gap which affects just over 2% of the Canadian adult population would give Canadians CAD 4.1-5.9 billion in additional income annually – between 0.4 and 0.5% of GDP. This gain would come from increased earnings among the unemployed (CAD 2.2-2.5 billion) and the underemployed (CAD 2 to 3.4 billion).[44]

43 . One possibility is that these wage penalties result from collective bargaining systems where wages are mostly based on formal qualifications. Alternatively, because some skills and competences may be hard to assess at interviews, employers may choose to use qualifications as a signal.

44 . These gains do not include the private and public savings obtained through the shortening of the formal education process – *i.e.* the reduction in the direct costs of learning and opportunity costs for individuals. In fact, most workers seeking to obtain the recognition of their non-formal and informal learning do so in view of obtaining credits towards a higher education qualification.

75. Unfortunately, although many OECD countries have established RNFIL systems, recognition processes are often small-scale, too complex and costly to be used more broadly and have a relatively low profile which reduces their value to employers. In addition, good RNFIL systems require well-established and well-functioning competency-based qualification frameworks and reliable assessment procedures and many OECD countries are only starting to work on these basic requirements. Finally, most OECD countries with RNFIL systems have put the accent on facilitating entry to further formal learning[45] rather than on the potential benefits of recognition for employers and employees.[46] Given most existing RNFIL systems, recognition should not be seen as a solution applicable to all under-qualified workers but could, instead, be helpful for specific groups. For instance, recognition could play an especially useful role for older, long-tenured displaced workers, to improve signalling of the competencies they possess on the job market. Similarly, nearly half of the under-qualified in the countries included in the ESWC have lower-secondary qualifications and they too could be the object of focused programmes.[47] Finally, immigrants are a group for which recognition processes may yield particularly high returns, especially when traditional equivalence procedures are not possible – *e.g.* when professions have different regulations in the host country and the country of origin.

***Over-qualification***

76. The analysis presented above shows that over-qualification often reflects skills heterogeneity among workers. This can result from the fact that some graduates lack the skills expected of someone with their qualification level[48] – they are of low ability for their qualification – or are skilled in areas that are not in demand on the labour market –there is a quantitative mismatch between demand and supply at the field-of-study level. Secondly, involuntary job separations or labour market entry during a recession are found to increase the likelihood of over-qualification at re-employment.

*The role of guidance in reducing field-of-study mismatch*

77. The analysis conducted in this paper shows that about 2 in 5 over-qualified workers are employed in a job that is unrelated to their field of study. Evidence suggests that this is likely to be the result of significant discrepancies between the supply and demand of workers by field of study. Although efforts are ongoing in several countries to link provision to labour market needs, in most OECD countries student preference remains the key driver of education provision.[49] As a result, better career guidance in support of

45 . For example, through the exemption from certain coursework or parts of a formal study programme. In this context, recognition can lead to significant individual and public savings.

46 . Countries that have highlighted the benefits of RNFIL for the labour market include: Australia, Spain, Norway, Italy and Chile. The accent has been put primarily on the role played by RNFIL in facilitating and encouraging upward job mobility.

47 . While half of these workers are 35-54-year olds, the share of 25-34-year olds is not negligible at close to 20%. Indeed, this group could include school drop-outs who have succeeded in entering the labour market and have accumulated competences and skills through work experience or programmes that do not lead to formal qualifications (OECD, 2010*d*).

48 . This may not be entirely a reflection of the quality of the education system as some of the skills in shortage may not be acquired in school.

49 . This is not to say that prospective students always make bad choices. In fact, there is some evidence from the United States and Canada that expected earnings play a prominent role in the choice of field of study by post-secondary students, but that students respond differently to wage signals. Boudarbat (2004) finds that the field of study chosen by Canadian university graduates shifted in response to changing relative wages and employment prospects but males, those with prior work experience, and those in Business and Commerce-related fields were more sensitive to wage changes than others. Along the same lines, Usher

individual choices could play an important role in reducing the existing discrepancies in the supply and demand of workers by field of study.

78. Unfortunately, current guidance provision is often limited and of poor quality (OECD, 2004 and OECD, 2010d). First, staff providing career guidance are sometimes inadequately prepared for dealing with labour market issues. When they are not teachers, they are often trained in the context of psychological counselling and, while this background may be appropriate for supporting students at-risk of dropping out of school, it does not equip them to deliver sound advice on jobs and career prospects. Second, most counsellors are based in education and have primarily an education background. As a result, they lack direct knowledge of other work environments and their skill requirements and tend to be biased towards general education and university pathways. Third, relevant labour market information, essential to provide good-quality guidance, is not always available. Ideally, professional career guidance systems should be managed from outside schools by guidance professionals who are dispatched to schools to deliver guidance services (Box 3).

**Box 3. Guidance services in New Zealand**

The main provider of career guidance services in New Zealand is Career Services (CS) – a body independent of the education system. CS provide services directly to students to help them make informed work and training choices. These services include the provision of labour market information (e.g. job profiles and industry outlooks) and tertiary and trade training information. In addition to directly providing information and advice, CS also develop guidance modules for schools. Notably, the Creating Pathways and Building Lives (CPaBL) programme assists schools in the development of effective career advice.

The quality of career guidance is supported by wide-ranging information on career paths and training opportunities. The New Zealand Qualification Authority provides information about qualifications and the quality of learning institutions. The New Zealand Register of Quality Assured Qualifications provides a comprehensive list of all quality-assured qualifications in New Zealand. In addition, most tertiary education institutions conduct surveys of graduates to inform the organisation of their programmes. The Department of Labour collects and analyses information about the skills needed in the labour market and about how the tertiary education system interacts with the labour market. Merging this information with that from other sources, the Tertiary Education Commission – the body supervising the New Zealand tertiary education system – produces annual "portraits" of tertiary education and training in New Zealand, including indicators of possible under- and over-supply in provision.

*Addressing heterogeneous educational outcomes*

79. Findings presented in Section 3 above suggest that, for a given qualification level, skill heterogeneity contributes to qualification mismatch, with the over-qualified being of low ability and the under-qualified of high ability for their qualification. While studies focusing specifically on this issue are few, there is a growing body of literature studying the heterogeneity of returns to tertiary education to which qualification mismatch contributes.[50] Among the most recent studies, Schneider (2010) exploits a new source of information on the returns on investment in tertiary education in the United States and highlights their heterogeneity across institutions. Walker and Zhu (2010) and Bratti *et al.* (2008) find that, in the United Kingdom, returns to tertiary education vary significantly by class of degree awarded – *i.e.* the UK grading scheme for undergraduate degrees.

(2006) shows that in the United States those from lower socio-economic groups have shorter-term decision-making horizons, hence they do not give appropriate weight to medium-term returns.

50 . In this strand of literature, returns to investments in education and their heterogeneity are studied in light of the rising cost of attending university. This explains the focus on tertiary education.

80. Variation in the quality of education provided by tertiary institutions has been addressed, in several OECD countries, with the introduction of Quality Assurance Systems. More specifically, assurance systems aimed at quality improvement exist in several OECD countries, such as Australia, the Czech Republic, Finland, Iceland, New Zealand, Norway, Portugal, Sweden and the United Kingdom (OECD, 2008*a* and 2008*b*). In the United Kingdom, the quality assurance system has been developed after a series of external reviews over the period 1992-2000 and allows for *ad-hoc* reviews should the need arise. In addition, standardised performance data are published to assist students' in their choice of tertiary institution.

81. However, over-qualification is not limited to tertiary graduates and skills heterogeneity is also evident at lower levels. The dispersion is already visible among 15-year-olds, as shown by the 2006 survey of the OECD Programme for International Student Assessment (PISA). Although both between and within-school variance contribute to explain the overall score dispersion in PISA science, reading and mathematics scores, OECD (2007*b*) shows that, in most countries, the within-school variance is larger in all three areas of knowledge. Finally, as mentioned above, whether students attend vocational or general education is another source of significant dispersion in scores at the secondary level (OECD 2010*e*).[51]

82. For the purpose of matching workers to jobs, it is important that graduates with a given qualification possess the set of competences required to obtain a job at that qualification level. Many OECD countries have introduced policies to improve educational outcomes for the weakest students, particularly at the upper secondary level, putting the accent on achieving numeracy and literacy proficiency.[52] In the United States, the No Child Left Behind (NCLB) programme aims at ensuring that every upper secondary graduate attains literacy and numeracy levels deemed necessary for labour market access and career progression (Box 4). Although NCLB has achieved some progress towards 100% proficiency in reading and mathematics in the United States by 2013, some limitations have emerged and some changes to improve the original system have been proposed.

**Box 4. Initiatives to improve numeracy and literacy in upper secondary education**

*The US No Child Left Behind (NCLB) Act*

NCLB was enacted in 2002 with the aim of improving literacy, numeracy and school performance more generally across the country. In exchange for federal funding, NCLB holds states and schools accountable for making progress towards the goal of 100% of students being proficient in reading and mathematics by 2013-14, according to state standards and assessment.

NCLB requires schools to achieve Adequate Yearly Progress (AYP) towards specific state-set academic standards measured by performance on literacy and numeracy tests administered sometime between 10th and 12th grade. Schools need to meet test score requirements for all students and for each of the following subgroups: economically disadvantaged students, students from major racial or ethnic groups, students with disabilities, and low English proficiency students. Schools that do not meet their AYP targets face increasing sanctions. In school year 2005-06, 10% of schools across the country had underperformed for at least two years and about 3% were being restructured.

51 . Figure 2.2 in OECD (2010*e*) is based on the 2006 PISA survey and shows the difference in performance between vocational and academic students, on average across knowledge areas after controlling for a number of socio-demographic characteristics in order to isolate institutional effects. Vocational students tend to perform less well than general education students and the difference in performance is particularly large in the Netherlands, Greece, Belgium, Korea and Japan.

52 . Most of the policies aim to reduce the share of youth who leave education before acquiring an upper secondary qualification which experts consider to be the minimum requirement to successfully enter the labour market and participate in life-long learning.

NCLB appears to have had some positive repercussions on school performance across the country. Schools are paying more attention to achievement gaps and the learning needs of particular groups of students, making efforts to better align curriculum and instruction and there is evidence that progress is not being achieved at the expense of high-performing students. But some weaknesses of the legislation have emerged. Performance measurement through reading and mathematics tests has had some undesirable effects. For instance, there is some evidence that NCLB only improves the performance of students who are under the proficiency threshold but have the potential to reach it in the near future. In addition, schools are spending more time on reading and mathematics in order to meet the test requirements, sometimes at the expense of other subjects. Recently, the federal government has put forward plans to re-authorise NCLB albeit with some changes aimed at strengthening its role in raising literacy and numeracy. Proposals so far include the improvement of the assessment tools used to track students' progress and the measurement of readiness for college and the workplace.

*Achieving good matches for unemployed new entrants to avoid long-term scarring*

83. Evidence presented in Figure 7 shows that young people leaving education at a time of rising unemployment face an increased risk of over-qualification but not of over-skilling. One explanation for this is that the *best* students would choose to stay in education longer rather than enter the labour market in the midst of a recession so the share of school leavers who are of low ability based on their qualification is larger than in normal times. Alternatively, certain skills – such as those acquired with work experience – may be more highly valued by firms when they re-start hiring, with youth facing significant competition from experienced workers who have been dismissed.[53] Finally, as it is the case for displaced adults, a long period of unemployment following graduation may cause skills obsolescence, particularly in countries where youth are not entitled to unemployment benefits and may distance themselves from the labour force.

84. ALMPs targeted to unemployed school leavers may help in these situations, with emphasis put on work-experience programmes and job-search training (OECD, 2010*f*). For the youngest, to the extent possible, staying in education longer may be a win-win solution.

***Skill mismatch***

*The role of on-the-job training in preventing under-skilling*

85. As mentioned in Section 2, existing self-reported measures of under-skilling are rather imperfect and could be capturing the desire rather than the need to participate in further training to perform on the job. Indeed, employers are unlikely to take on under-skilled workers without a plan for remedial training at hiring. However, while under-skilling at hiring is difficult to justify from the economic point of view, some workers who are well matched to their job may become under-skilled because of the lack of upgrade training. Skill obsolescence is particularly relevant in the context of technological change when *old* skills become obsolete and *new* skills are acquired slowly. In this situation, training can narrow the gap between skills acquired at schools and skills required on the job (Arulampalam *et al*., 2004) and contribute to the resolution of skill mismatch (van Smoorenburg and van der Velden, 2000). Indeed, contrary to the disappointing evidence on the effectiveness of public training, there is consistent evidence that adult learning has a positive effect on the earnings of participants, although researchers are not unanimous on the size of the premium (OECD, 2005).

53 . In good times, these youth would have been under-skilled based on these work-related competences but well-matched by their qualifications. However, as argued here, the lack of experience may become more penalising in times of labour market slack.

*Life-long learning as an instrument to reduce skills mismatch*

86. In the context of rapidly changing labour market demand and imprecise occupational projections, upgrade training alone is not sufficient to ensure that workers' skills fit well with job requirements. In many instances, opportunities for retraining in high-growth occupations and pathways back into the education system could play a crucial role in addressing skill mismatch and shortages. The availability of accessible retraining options would also allow workers who have qualified in fields in which labour demand is limited and who face the prospect of over-qualification to retrain in a different area. Some features could make the return to learning easier for adults: *i*. a modular structure allowing learners to take only the parts of a course they need to re-qualify; *ii*. high-quality RNFIL systems to provide learning credits for skills that are transferable between two fields/occupation; and *iii*. part-time learning opportunities for those wanting to continue working.

***Immigrants***

87. The analysis conducted in this paper supports the widespread finding that immigrants are substantially more likely to be mismatched based on their qualifications and skills than natives. While the general policy issues mentioned above apply, immigrants are likely to face additional challenges such as low proficiency in the language of the host country, qualifications acquired in their home country which are not recognised in the host country and, in some instances, racial discrimination.

88. In the context of supply-driven immigration whereby immigrants do not hold a work contract before arriving in the country, the lack of recognition or equivalency of foreign qualifications could lead to over-skilling, particularly among high-skilled immigrants.[54]

89. Currently, only few countries assess educational qualifications prior to entry (OECD, 2009). Sometimes the assessment is a prerequisite for immigration, like in Australia, where persons expecting to apply in the country's skilled migration scheme must have their qualifications assessed and recognised before their application is accepted. New Zealand and the United Kingdom identify specific educational institutions and specify how many points are awarded in their points-based system for qualifications from these institutions. Qualifications not specifically identified must be assessed separately by national agencies mandated to do this. Canada encourages potential immigrants to enquire about the recognition of their qualifications in the Canadian labour market and organises information sessions in a number of overseas locations for individuals selected under the national skilled-worker category.

90. The above systems ensure some form of pre-arrival assessment or information on the recognition of qualifications acquired in the home country. In addition, for immigrants who arrive without jobs, some countries provide assessment services at reasonable cost where information on the status of home-country qualifications and any additional education and training required for recognition can be acquired. Besides, some programmes offer subsidised or unpaid work-placements, often linked with job-specific vocational skills and language training. Some of these services are geared very specifically to high-skilled immigrants employed in low-skilled jobs, *i.e.* over-qualified immigrants (Box 5).

54 . Different issues are likely to arise when immigrants arrive with a job offer in hand – notably, in the context of temporary migration schemes. In this case, immigrants may choose to temporarily accept jobs below their qualification level in exchange of higher wages than in their home country.

Box 5. **Over-qualified immigrants: examples of targeted programmes**

In Australia, some states have established programmes to overcome the problem of over-qualification among recent skilled independent migrants. In Victoria, for example, the Overseas Qualified Professionals Program (OQPP) provides recently arrived professionals who acquired their skills abroad with a work-experience placement to enhance their opportunities for employment in their field of study. The participants must be either unemployed or employed in low-skilled jobs. The programme consists of an initial six-week training period to develop job-search skills, followed by a four to six-week work-experience placement in the participant's field or in a closely related occupation. The work-placement component is generally not remunerated. The programme includes mentoring elements and industry-specific networking sessions with employers and professional associations to provide further orientation and networking opportunities. Six months after completing the programme, more than 60% of participants were in paid employment in a field corresponding to their qualifications and experience.

Following a different approach, in 2004, Denmark established regional knowledge centres for the assessment of the skills and qualifications of immigrants – a joint project by the Ministry of Employment and the social partners. The assessment is generally done in workplace situations at companies and participants obtain "competence cards" relating immigrants' skills to labour market needs. The centres also assist in finding employment that matches the immigrants' skills (OECD, 2007*c*).

In other countries, programmes have focused on over-qualification in specific occupations. In Portugal, two non-governmental organisations (the Gulbenkian Foundation and the Jesuit Refugee Service) developed, jointly with universities and various ministries (Health, Interior and Foreign Affairs), a programme for foreign-trained doctors who were found to be working in low-skilled occupations such as in construction or cleaning. The programme provided for the translation of documents, bridging courses at medical faculties, as well as comprehensive preparation material, internships in teaching hospitals, and vocation-specific language training. Participants had to pass a final assessment examination. At the end of the pilot project, about 90% of the participants were employed as doctors. Participants were followed for one year after completion of the programme to ensure a lasting integration. The programme has now been mainstreamed. In Sweden, the Government has recently assigned a number of universities and colleges to arrange supplementary courses for immigrants with a foreign university degree in law, education, health and public administration. The programme was introduced to provide an opportunity to adjust foreign credentials to the Swedish labour market, thereby helping high-skilled immigrants obtain employment in their field of study.

Finally, one group that is particularly affected by skill underutilisation is that of refugees, who are often highly qualified but whose primary objective for migration is not employment. The Netherlands has set up several specific training programmes for highly-qualified refugees (OECD, 2008*c*).

## 6. Conclusions

91. Only about 40% of over-qualified workers report feeling mismatched based on their skills and the relationship between under-qualification and under-skilling is even weaker. In fact, to a significant extent, over-qualification is explained by heterogeneity across workers with the same qualification level – due to their performance in the education system, to variation in generic skills including those not learnt in education, to different fields of study and/or to skills obsolescence – and by heterogeneity across jobs identified by the same occupational code – such as varying levels of complexity or responsibility. On the other hand, under-qualification is found to affect workers who do have the skills required by their job but lack formal qualifications to show it. Qualification mismatch and skill mismatch affect wages, job satisfaction and incentives to engage in on-the-job search. However, the effect of qualification mismatch on wages is significantly reduced when unobserved individual heterogeneity is accounted for, confirming that within-qualification heterogeneity plays a key role in explaining mismatch.

92. Despite the significant role played by individual skill heterogeneity in explaining qualification mismatch and its repercussions on wages, policy intervention may be warranted to address a number of issues. These include, notably: the mis-investment in education implicit in large numbers of youth leaving school without the skills that employers require; the costs incurred by firms to sort candidates into jobs

when qualifications provide bad signals for skills; and the difficulties faced by some specific groups such as job losers and immigrants.

93. Above all, policy interventions designed to reduce mismatches require the co-operation of the many different actors involved in generating jobs, imparting and acquiring skills and bringing jobs and workers together: employers, educators, individual workers, central and local governments, public employment services and the social partners. Furthermore, it is important to recognise that skill formation, skill demand and their matching process are undergoing long-term changes somewhat independently of each other – *e.g.* population ageing affects skill supply while globalisation, technical change and other long-term trends drive the evolution of the occupational structure (Handel, 2011) – hence policy interventions need to be sensitive to these trends in order to be effective.

94. The analysis conducted in this paper provides some policy directions in the current post-crisis environment. The evidence suggests that workers who are fired or are victims of business closures at times of rising unemployment are particularly vulnerable to both over-qualification and over-skilling at re-employment. For workers who were well-matched to their job before job loss, skill obsolescence due to protracted unemployment is likely to be behind the higher risk of over-qualification. But workers who started off as under-qualified – *e.g.* older, long-tenured workers, victims of mass layoffs – may also be affected as they lose jobs in which their uncertified competences were recognised, only to become over-skilled at re-employment. The higher likelihood of mismatch could also result from the trade-off between moving back to employment quickly and waiting for a suitable match, affected both by individual preferences and unemployment insurance rules. A number of activation measures may help address these challenges. Notably, upgrade training may help counter skill obsolescence while re-training for a different occupation may be the best solution for workers displaced from declining sectors. In addition, measures towards the recognition of non-formal and informal learning would benefit older, highly-skilled displaced workers with low qualifications. More generally, policies aimed at keeping the unemployed in touch with the labour market until job creation resumes – such as training and work guarantees (particularly in the third sector) – implemented in several OECD countries in the context of the recent crisis can help keep skills obsolescence at bay.

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# ANNEX A1 – DATA SOURCES AND METHODOLOGICAL ISSUES

## Data sources

95. Qualification mismatch has received significant attention over the past several decades, with most research focusing on the Netherlands, Spain, the United Kingdom and the United States (Quintini, 2011). However, despite the extensive literature, international comparisons are rare due to data comparability issues. For the purpose of this paper, no single database contains the information required to produce consistent statistics on the incidence of qualification mismatch in all OECD countries and carry out an in-depth analysis. As a result, several data sources are exploited. Together, the 2005 wave of the European Survey of Working Conditions (ESWC) and the 2005 International Social Survey Programme database (ISSP) cover most OECD countries including two enhanced engagement countries (Brazil and South Africa). These two datasets are used to assess the incidence of qualification mismatch across countries using consistent methodologies. The ESWC also contains information on skill mismatch, hence it allows exploring the relationship between qualification and skill mismatch. In addition, a few other data sources are exploited to study specific issues. The European Social Survey (ESS) contains information on workers' field of study, hence it is used to assess the incidence of field-of-study mismatch and its contribution to qualification mismatch. Finally, the longitudinal dimension of the European Community Household Panel (ECHP) is exploited to study the labour market determinants of mismatch and the effect of mismatch on wages, job satisfaction and on-the-job search.

## Measuring qualification mismatch

96. Although qualification mismatch is based on widely available information – namely, educational attainment and occupation – several measurement issues must be addressed when deriving what qualifications are required by each occupation, including: *i)* what method to use to derive *required qualifications*; *ii)* what level of disaggregation to use for the qualification classification; *iii)* what level of disaggregation to use for the occupational classification; and *iv)* whether it is necessary and possible to calculate country-specific requirements.

97. As far as methodology is concerned, required qualifications have been measured in several different ways in the literature and the incidence of qualification mismatch has been found to be sensitive to the method used. [1] The so-called "statistical" method uses the mean or modal educational attainment of workers in each occupation.[2] Alternatively, the "normative" method exploits experts' assessment of required qualifications[3] while "self-declared" measures use workers' views of what qualifications one requires to do or be hired for their job.[4] Groot and Maassen van den Brink (2000) carry out a cross-country meta analysis of 25 studies of over-qualification and find that studies using a "statistical" method to assess required qualifications tend to yield lower estimates of over/under qualification than studies using the two alternative definitions.[5] In this paper, the *modal qualification level* of workers in each occupation is retained as a measure of required qualification for that occupation.[6] The statistical method is chosen over the other two methods for two reasons. First, both experts' assessments and workers' judgements are subjective. Second, experts' assessments are not readily available in the literature, particularly when using occupational codes at more disaggregated level than just one digit,[7] and few surveys ask workers about their view on the qualifications required in their current job.[8]

98. The other three measurement issues are related. The highest the level of disaggregation the more precise educational requirements are. However, depending on the data used, sample size in each occupation may be too small to estimate the modal qualification reliably when a high level of disaggregation is used. Similarly, country-specific educational requirements are preferable, particularly when cross-survey comparisons are needed and surveys include countries at different levels of economic development, but are subject to the same sample size limitation. This paper uses country-specific qualification requirements for occupations defined at the two-digit level, with qualifications measured on

the following five-level scale: no qualifications, lower secondary qualifications, upper secondary qualifications, post-secondary non-tertiary qualifications and tertiary qualifications.

99. Aggregating occupations at the two-digit level makes little difference to the incidence of qualification mismatch compared with using three digit occupational codes.[9] Given the small sample size of the databases used in this paper, where possible, qualification requirements are derived from larger external sources to improve data reliability. Hence, the European Labour Force Survey is used for EU countries, the survey of Household, Income and Labour Dynamics in Australia is used for Australia, the Korean Labour Income Panel Survey for Korea and the Current Population Survey for the United States.[10] For the remaining non-European countries, country–specific qualification requirements at the two-digit level are derived by pooling waves 2000-2005 of the ISSP in order to increase sample size.[11]

100. Using ISCED on a five-level scale – as opposed to a three-point scale focusing on tertiary, upper secondary and no or low qualifications – affects the extent of qualification mismatch captured and does so differently across countries. The difference between using ISCED at five or three levels is larger in countries with very large proportions of workers with post-secondary non-tertiary qualifications. Notably, post-secondary non-tertiary qualifications rarely turn up in occupation-specific qualification requirements, hence workers with these qualifications are either over-qualified – if they work in occupations requiring an upper secondary qualification – or under-qualified – if they are employed in occupations requiring a tertiary qualification. Notably, this is the case in Australia and the United States. On the other hand, in countries where workers with post-secondary non-tertiary qualifications are sufficiently numerous to affect qualification requirements in mid-level occupations – notably Canada and New Zealand – most workers with upper secondary qualifications are classified as under-qualified. Using ISCED at three levels would miss the extent of mismatch and the cross-country differences related to the varying degree of importance of post-secondary non-tertiary qualifications.

101. Finally, it is important to note that the modal method of deriving qualification requirements provides a lower bound for the incidence of over-qualification and an upper bound for the incidence of under-qualification. In fact, the mode is affected by increases in educational attainment and by qualification mismatch itself in countries where it is very widespread. This is particularly noticeable in sales and service elementary occupations where higher average educational attainment in some countries has caused a rise in the modal qualification – as fewer workers have lower secondary or no qualifications, upper secondary graduates are becoming increasingly common in some of these occupations and this, in turn, affects the incidence of under-qualification among the remaining (mostly older) low-educated workers.

1. The effect of qualification mismatch on wages, on the other hand, is significantly less affected by this methodological issue..

2. The mode has the advantage of being less sensitive to outliers and changes in educational attainment.

3. See, for instance, Chevalier (2003) and Vaisey (2006). The correspondence is generally set based on expert opinion about what qualifications are required to carry out the tasks involved with a given occupation – e.g. being a judge requires a tertiary education qualification. Studies of mismatch in the United States have also exploited the Dictionary of Occupational Titles which details the skills required in each occupation.

4. See for instance Sicherman (1991); Sloane *et al*. (1999); Battu *et al*. (2000); and Dorn and Sousa-Poza, (2005).

5. In addition to the method used to measure over-qualification, the authors control for country, time period and socio-demographic group – notably, graduates or immigrants as opposed to the entire working-age population.

6. Although comparing the incidence of qualification mismatch across methodologies is an interesting exercise, the aim of this paper is to understand the determinants of qualification mismatch.

7. OECD (2007*a*) applied the "normative" method to assess the incidence of over-qualification among immigrants in OECD countries. In this study, required qualifications were apriori defined for occupation groups at one-digit level, although managers of small enterprises (identifiable with occupation at the two digit level) were separated from the overall managers and legislators group and set to require only an upper secondary qualification as opposed to a tertiary one. For the purpose of an in-depth analysis of qualification mismatch, educational requirements at a more disaggregated level of the occupation classification are needed.

8. Additionally, the phrasing of the question can make a significant difference when measuring required qualifications through workers' own assessment. Notably, some surveys ask about the qualifications required to *carry out* one's job while others focus on the qualifications required to be *hired* for one's job.

9. On average, in the 31 countries included in the 2005 wave of the European Labour Force Survey, the incidence of over-qualification using two-digit occupational codes is 0.3 percentage points higher than that obtained when using three-digit ISCO codes. In 15 of the 31 countries, the difference between using two-digit and three-digit occupational codes (the incidence using two-digit ISCO minus the incidence using three-digit ISCO) was between -1 and +1 percentage points and in 24 countries it was between -2 and +2 percentage points. The largest differences were observed in Iceland (5.1), the United Kingdom (-4.4), Norway (-3.9) and Cyprus (-3.5). In 13 of the 31 countries the difference was negative. Similar differences are observed in the incidence of under-qualification. Using European Labour Force Data it is not possible to identify individuals that are over-qualified using two-digit occupational codes but not over-qualified using three-digit codes or viceversa. This robustness check can be carried out using the 2005 wave of the International Social Survey Programme. On average, in the countries included in the survey, 85% of workers are attributed the same mismatch status (over-qualified, under-qualified or well-matched) using two-digit or three-digit occupational codes. The least over-lap is observed in the Czech Republic (77%) while the largest is found in New Zealand (91%).

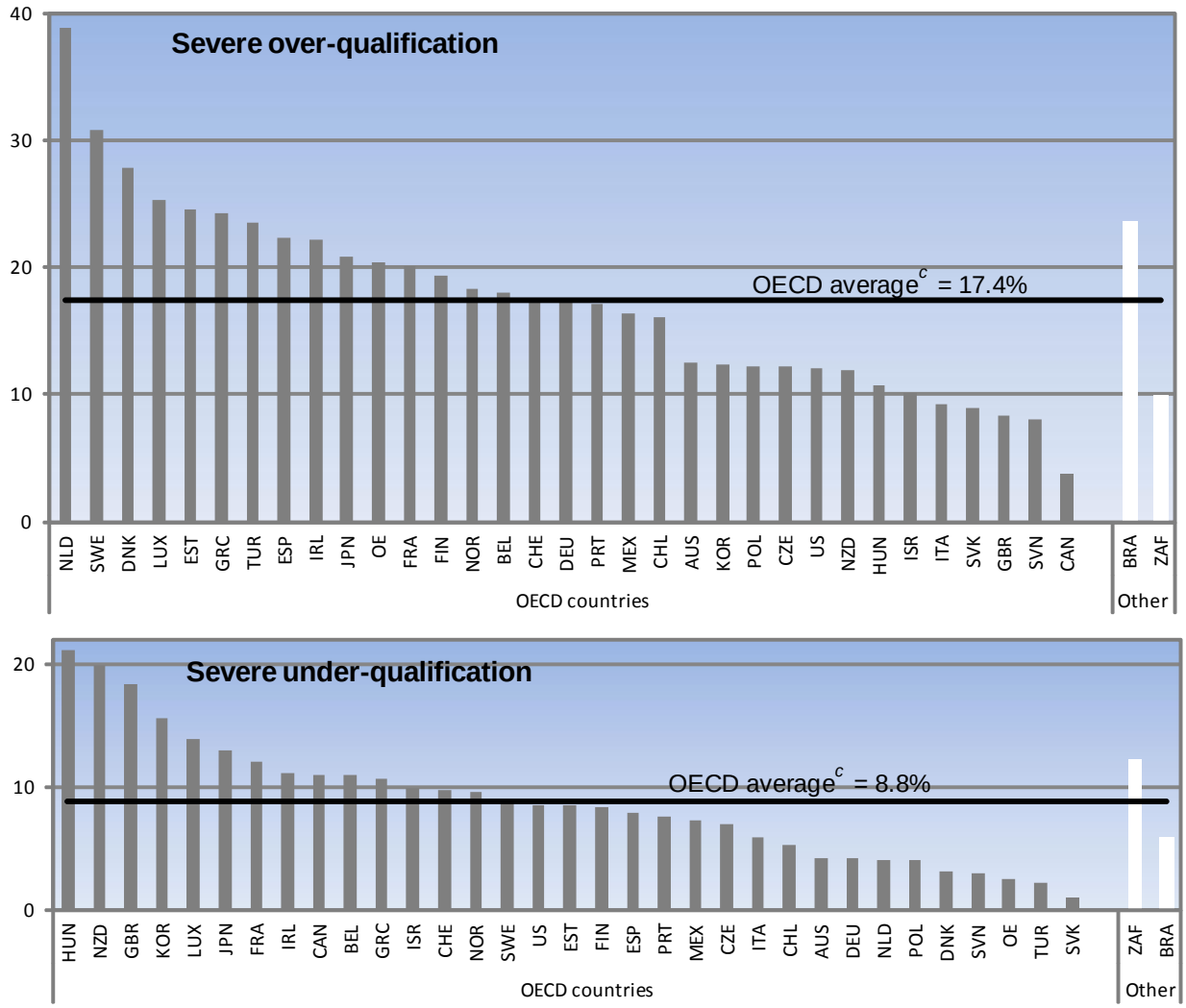
10. Requirements were derived from these outside sources using the closest available year to the year or the survey used in the analysis (2005 for the ESWC and the ISSP; 2001 for the ECHP; and 2004 for the ESS).

11. Except for Chile (only included in waves 2000 to 2004 of ISSP) and Brazil (only included in waves 2001, 2002 and 2004 of ISSP).

## ANNEX A2 – SEVERE OVER-QUALIFICATION AND UNDER-QUALIFICATION

Figure A2.1. **Indicators of severe qualification mismatch,[a] OECD and selected countries, 2005**

Percentages of employees and self-employed[b]




The use of statistical data for Israel by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

*a)* Severely over-qualified workers are those whose qualifications are more than one ISCED step higher than required by their occupation – *e.g.* a tertiary graduate (ISCED code 5) is classified as severely over-qualified is he/she holds a job that requires upper secondary qualifications or less (ISCED code 3); on the other hand someone holding a tertiary qualification (ISCED 5) but working in a job where the modal qualification is a post-secondary non-tertiary qualification (ISCED 4) will not be classified as severely over-qualified. Severely under-qualified workers are those whose qualifications are more than one ISCED step lower than required by their occupation – *e.g.* an upper secondary graduate (ISCED code 3) is classified as severely under-qualified is he/she holds a job that requires a tertiary qualification (ISCED code 5) on the other hand someone holding a post-secondary non-tertiary qualification (ISCED 4) but working in a job where the modal qualification is a tertiary degree (ISCED 5) will not be classified as severely over-qualified. The modal qualification in each occupational group at the two-digit level is used to measure qualification requirements.

*b)* Trainees and apprentices are excluded.

*c)* Unweighted average of OECD countries shown.

*Source:* International Social Survey Programme (2005) for Australia, Canada, Israel, Japan, Korea, Mexico, New Zealand, the United States and South Africa. International Social Survey Programme (2004) for Brazil and Chile. European Survey of Working Conditions (2005) for all other countries.

## ANNEX A3 – ALTERNATIVE MEASURES OF SKILL MISMATCH: DOES THE QUESTION MATTER?

102. The ESWC is not the only dataset containing cross-country self-assessment measures of skill mismatch, as well as the information required to assess qualification mismatch. The European Community Household Panel (ECHP) which stopped in 2001 asked working respondents whether they thought they had skills and qualifications to do a more demanding job that the one they held. Also, the work-orientation module of the International Social Survey Programme (ISSP), the latest wave of which was conducted in 2005, questioned respondents on the use of past experience and job skills in their current job.

103. While qualification mismatch can be calculated using the same methodology across the three surveys mentioned above, the questions concerning skill mismatch are formulated differently and may be capturing different concepts of mismatch. In particular, while the indicators derived from the ECHP and the ESWC can be interpreted as measuring over-skilling, this is less clear for the mismatch measure calculated from the ISSP. The question ISSP respondents are asked refers specifically to unused skills *from previous work experience*. Hence, it is not obvious that the workers responding that they are using little or none of their previously acquired skills hold a job that is less demanding than they could manage. Indeed, the current job may just use different skills from the one they held previously, hence not only could the workers be well-matched to their current job based on their skills but they may even be under-skilled. Also, the question asked in the ECHP makes explicit reference to qualifications while those of the ESWC and ISSP focus on skills. As a result, it is likely that the mismatch concept measured by the ECHP encompasses both actual competences and educational qualifications.

104. The top panel of Figure A3.1 shows the incidence of over-skilling derived from the ISSP. According to this measure, Japan and Spain suffer from the largest incidence of over-skilling – exceeding 50% – among the OECD countries included in the survey, followed by Korea, France and Hungary where the incidence of over-skilling stands at about 45%. At the other hand of the spectrum, in Sweden, Denmark and Germany the incidence of over-skilling is 25% or less. For a limited number of countries, the figure also shows the change in the incidence of over-skilling between 1997 and 2005. Hungary, the Czech Republic, Switzerland and Germany experienced significant rises in this type of mismatch over this time period. Only in Spain, Israel and Denmark did over-skilling decline.

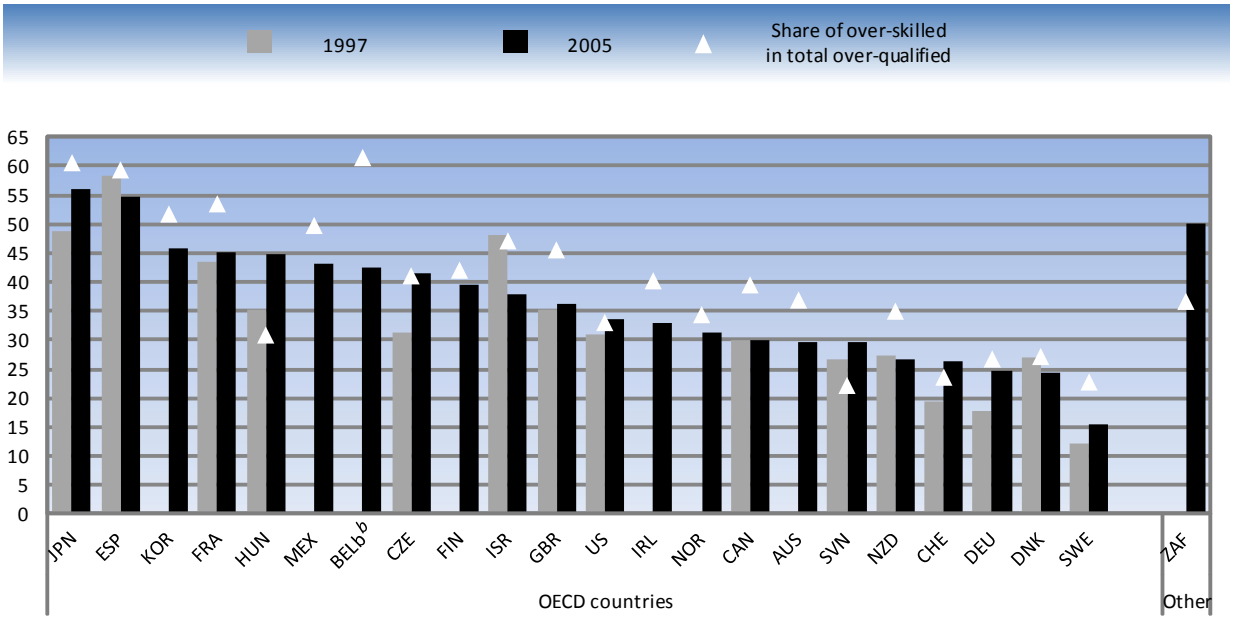
105. The incidences of over-skilling calculated from the ECHP are higher than those derived from the ISSP (bottom panel of Figure A3.1) for the countries included in both surveys. In addition, the ranking of countries differs significantly. For instance, judging by the ISSP question, Denmark is among the countries with the lowest incidence of over-skilling – approximately 25% – while the inverse is true by the ECHP question according to which 60% of Danish workers are over-skilled. The differences between the two surveys and between the two surveys and the ESWC (Figure 2) confirm that the phrasing of the question plays a key role when measuring skill mismatch through workers' reports.

106. Finally, for the most recent year available, Figure A3.1 also reports the share of over-qualified individuals who are over-skilled. Based on the ISSP definition of over-skilling, this share varies between 60% in Japan and 23% in Sweden and tends to decline with the incidence of over-skilling, suggesting a low correlation between over-skilling and over-qualification. Using ECHP data, over-skilling explains a much larger share of over-qualification – possibly because of the fact that *qualifications* are mentioned in the question. On the other hand, a decline in the share of over-qualification explained by over-skilling with the incidence of over-skilling is also visible across ECHP countries.

Figure A3.1. **Alternative measures of self-reported over-skilling**

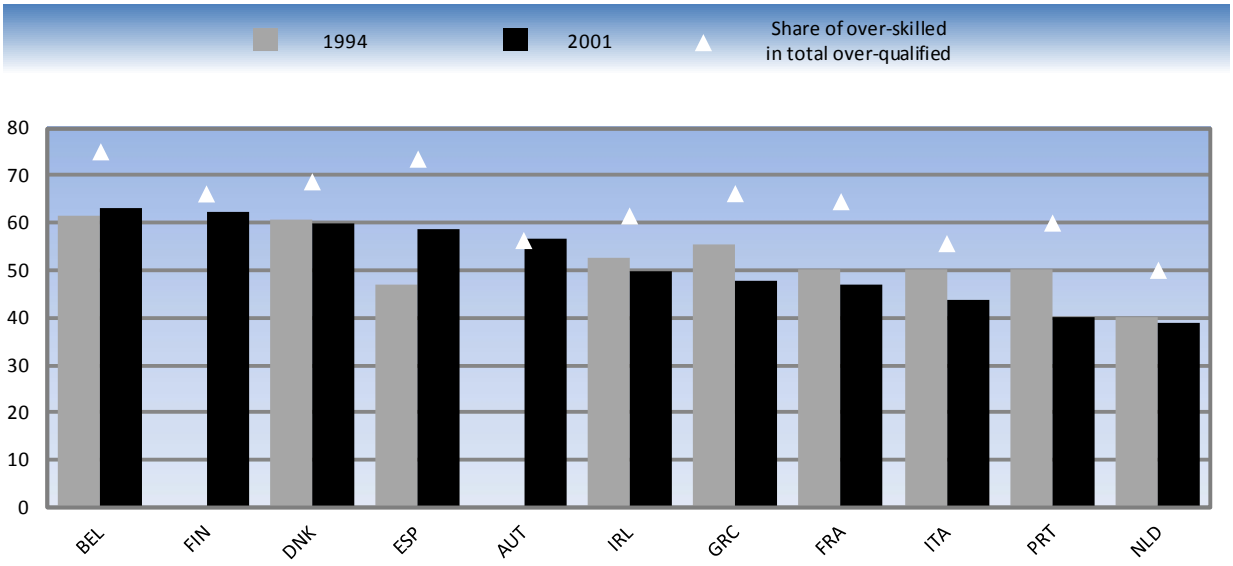
**International Social Survey Programme**

**"How much of your past work experience and/or job skills can you make use of in your present job?"[a]**




**European Community Household Panel**

**"Do you think you have skills or qualifications to do a more demanding job than the one you have now?"[c]**




*Note:* Countries are rank from left to right by decreasing incidence of over-skilling in the most recent year available.

*a)* Workers answering "none" or "very little" to this question are classified as over-skilled.
*b)* Data for Belgium refer to Flanders only.
*c)* Workers answering "yes" to this question are classified as over-skilled.
*Source:* International Social Survey Programme and European Community Household Panel.

## ANNEX A4 – CORRESPONDENCE USED TO ESTABLISH FIELD-OF-STUDY MISMATCH

107. The following correspondence defines well matched individuals based on their field of study:

- *Teacher training/education*: teaching professional (ISCO 231-235); and teaching associate professionals (ISCO 331-334);

- *Art, fine/applied* and *Humanities*: college, university and higher education teaching professionals (ISCO 231); secondary education teaching professionals (ISCO 232); archivists, librarians and related information professionals (ISCO 243); writers and creative or performing artists (ISCO 245); artistic, entertainment and sports associate professionals (ISCO 347); religious associate professionals (ISCO 348); fashion and other models (ISCO 521); shop salespersons and demonstrators (ISCO 522);

- *Economics/commerce/business administration*, *Social studies/administration/media/culture* and *Law and legal services*: legislators (ISCO 111); directors and chief executives (ISCO 121-123); general managers (ISCO 131); college, university and higher education teaching professionals (ISCO 231); secondary education teaching professionals (ISCO 232); business professionals (ISCO 241); legal professionals (ISCO 242); archivists, librarians and related information professionals (ISCO 243); social science and related professionals (ISCO 244); writers and creative or performing artists (ISCO 245); finance and sales associate professionals (ISCO 341); business services agents and trade brokers (ISCO 342); administrative associate professionals (ISCO 343); customs, tax and related government associate professionals (ISCO 344); social work associate professionals (ISCO 346); offices clerks (ISCO 411-419); customer service clerks (ISCO 421 and 422);

- *Science/mathematics/computing*: physicists, chemists and related professionals (ISCO 211); mathematicians, statisticians and related professionals (ISCO 212); computing professionals (ISCO 213); life science professionals (ISCO 221); college, university and higher education teaching professionals (ISCO 231); secondary education teaching professionals (ISCO 232); physical and engineering science technicians (ISCO 311); computer associate professionals (ISCO 312); optical and electronic equipment operators (ISCO 313); life science technicians and related associate professionals (ISCO 321);

- *Technical and engineering*: computing professionals (ISCO 213); architects, engineers and related professionals (ISCO 214); physical and engineering science associate professionals (ISCO 311-315); extraction and building trades workers (ISCO 711-714); metal, machinery and related trade workers (ISCO 721-724); precision workers in metal and related materials (ISCO 731-734); other craft and related trades workers (ISCO 741-744); stationary-planet and related operators (ISCO 811-817); machine operators and assemblers (ISCO 821-829); drivers and mobile-plant operators (ISCO 831-834);

- *Agriculture and forestry*: life science professionals (ISCO 221); health professionals (ISCO 222); life science technicians and related associate professionals (ISCO 321); modern health associate professionals (ISCO 322); market-oriented skilled agricultural and fishery workers (ISCO 611-615); agricultural and other mobile-plant operators (ISCO 833);

- *Medical/health services/nursing*: life science and health professionals (ISCO 221-223); social science and related professionals (ISCO 244); life science technicians and related associate professionals (ISCO 321); modern health associate professionals (ISCO 322); nursing and midwifery associate professionals (ISCO 323); pre-primary education teaching associate professionals (ISCO 332); social work associate professionals (ISCO 346); personal care and related workers (ISCO 513);

- *Personal care services*: office clerks (ISCO 411-419); customer service clerks (ISCO 421 and 422); personal and protective services workers (ISCO 511-514); shop salespersons and demonstrators (ISCO 522); drivers and mobile-plant operators (ISCO 831-834);

- *Transport and telecommunications*: office clerks (ISCO 411-419); customer service clerks (ISCO 421 and 422); travel attendants and related workers (ISCO 511); shop salespersons and demonstrators (ISCO 522); drivers and mobile-plant operators (ISCO 831-834);

- *Public order and safety*: police inspectors and detectives (ISCO 345); protective services workers (ISCO 516); drivers and mobile-plant operators (ISCO 831-834).

## ANNEX A5 – JOB CHARACTERISTICS DERIVED FROM THE EUROPEAN SURVEY OF WORKING CONDITIONS

108. Below is a list of job characteristics used in this paper and the variables from which they are derived. With the exception of the first and the last three, all have been obtained using Cronbach's alpha technique. The technique allows deriving a single continuous index from a set of separate items. The term *Cronbach's alpha* refers to the coefficient of reliability used to measure the internal consistency of the set of items. In the literature, an *alpha* value of at least 0.6 is considered sufficient evidence that the underlying variables are related and can be aggregated to obtain a summary index.

| Job characteristics | Variables used |
|---|---|
| *Supervisory role* | Number of people supervised by the worker. |
| *Job complexity* | Job involves: complex tasks; assessing the quality of one's own work; solving unforeseen problems; learning new things. |
| *Job latitude* | The worker is free to choose: method of work; speed of work; order of tasks. |
| *Working conditions* | Based on a number of items referring to physical tasks and risks such as carrying heavy loads, doing repetitive movements, being in painful positions etc. |
| *Job stress* | Based on job characteristics suggesting stress at work such as the pace of work, working outside normal hours and a number of health manifestations of stress such as work-related fatigue, headaches and anxiety. |
| *Computer use* | Based on whether workers use a computer at work almost never or around ¼ of the time (low), around half the time or around ¾ of the time (medium), almost all the time or all the time (high). |
| *Interpersonal tasks* | Based on whether the job involves contact with external people. |
| *Team work* | Based on whether the job involves team work. |

# ANNEX A6 – FULL REGRESSION RESULTS OF SELECTED TABLES AND FIGURES

Table A6.1. **Likelihood of mismatch following a job separation[a]**

Probit regression,[b] marginal effects[c] of independent variables

| Explanatory variables | | Over-qualification | Over-skilling | Under-qualification |
|---|---|---|---|---|
| Over-skilled | | 0.028 ** | | |
| Female | | -0.084 *** | -0.016 ** | 0.040 *** |
| Age | | -0.007 *** | -0.002 *** | 0.002 *** |
| Foreign-born | | -0.002 | 0.019 | -0.009 |
| Marital status | Separate/Divorced/Widowed | 0.121 *** | 0.049 *** | 0.036 ** |
| | Never married | -0.008 | 0.003 | 0.014 |
| Upper secondary qualification[d] | | | 0.103 *** | -0.166 *** |
| Tertiary qualification | | 0.138 *** | 0.129 *** | |
| Full-time | | -0.034 * | 0.043 *** | 0.024 * |
| Contract type | Fixed-term | 0.023 * | 0.007 | -0.003 |
| | Casual or no contract | -0.024 | 0.005 | -0.015 |
| Tenure | | 0.004 | -0.017 *** | 0.013 *** |
| Firm size | 1-4 employees | -0.065 | -0.030 | 0.001 |
| | 5-19 employees | -0.105 | -0.062 * | 0.015 |
| | 20-49 employees | -0.111 * | -0.056 | 0.046 |
| | 50-99 employees | -0.102 | -0.055 | 0.049 |
| | 100-499 employees | -0.090 | -0.044 | 0.057 * |
| | 500+ employees | -0.119 * | -0.055 | 0.055 * |
| Way work found[e] | Answered ad. | 0.003 | 0.042 *** | 0.043 *** |
| | Emp. or voc. guidance agency | -0.008 | 0.064 *** | 0.009 |
| | Family and friends | 0.031 ** | 0.027 *** | -0.012 * |
| | Own family business | 0.043 | -0.055 ** | 0.060 * |
| | Other | -0.072 *** | -0.015 | 0.101 *** |
| Reason for job separation[f] at mean relative unemployment at hiring | | | | |
| | Fired | 0.032 ** | 0.042 *** | -0.062 *** |
| | End of temp. contract | 0.019 | -0.006 | -0.039 *** |
| | Business closure | 0.121 *** | 0.040 * | -0.042 ** |
| | Personal/family reasons | -0.008 | 0.010 | -0.034 ** |
| | Health or military service | 0.026 | 0.052 ** | 0.017 |
| Relative unemployment at hiring[g] | | -0.052 | 0.012 | 0.041 |
| Previous job | Over-qualification | 0.692 *** | | |
| | Over-skilling | -0.019 | 0.546 *** | |
| | Under-qualification | | | 0.696 *** |
| Time between jobs | | 0.041 *** | -0.009 | 0.007 |
| | | | | |
| Reason for job separation at relative unemployment=1 | | | | |
| | Fired | 0.044 | 0.039 | -0.063 |
| | End of temp. contract | 0.031 | -0.005 | -0.041 |
| | Business closure | 0.159 | 0.056 | -0.027 |
| | Personal/family reasons | -0.011 | 0.004 | -0.037 |
| | Health or military service | 0.027 | 0.054 | 0.037 |
| Reason for job separation at relative unemployment=2 | | | | |
| | Fired | 0.101 | 0.019 | -0.063 |
| | End of temp. contract | 0.089 | 0.007 | -0.054 |
| | Business closure | 0.345 | 0.148 | 0.103 |
| | Personal/family reasons | -0.021 | -0.035 | -0.060 |
| | Health or military service | 0.031 | 0.067 | 0.196 |
| Reason for job separation at relative unemployment=2/3 | | | | |
| | Fired | 0.007 | 0.050 | -0.061 |
| | End of temp. contract | -0.006 | -0.011 | -0.034 |
| | Business closure | 0.048 | -0.004 | -0.074 |
| | Personal/family reasons | -0.003 | 0.026 | -0.025 |
| | Health or military service | 0.024 | 0.046 | -0.030 |
| *Number of observations* | | *15,599* | *30,928* | *20,235* |

***, **, *: statistically significant at 1%, 5%, 10% levels, respectively.

*a)* Includes: Austria, Belgium, Denmark, Greece, Finland, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and the United Kingdom.

*b)* The dependent variables are defined as follows: the probability of being over-qualified as opposed to well-matched by qualifications (under-qualified individuals are excluded as well as individuals with no qualifications); the probability of being under-qualified as opposed to well-matched by qualifications (over-qualified individuals are excluded as well individuals in with tertiary qualifications); the probability of being over-skilled to under-skilled or well-matched by skills (under-skilled individuals cannot be identified in the ECHP). Control variables not reported in the table include: country dummies and year dummies). Data includes employees and self-employed but excludes trainees and apprentices. Only workers who have had a previous job are included. Survey years are pooled.

*c)* Marginal effects calculated at the variable mean for continuous variables and for discrete changes of categorical variables.

*d)* The omitted category is “tertiary qualifications” when over-qualification is the dependent variable and “no qualification” when over-skilling or under-qualification are studied.

*e)* The omitted category is “Direct application”.

*f)* The omitted category is “Quit voluntarily”.

*g)* The relative unemployment rate is equal to the log of the ratio of the unemployment rate in the year of hiring to the average unemployment rate in the previous five years – *i.e.* the relative unemployment rate takes the value of zero if the unemployment rate is in line with the 5-year average.

*h)* Interaction of the relative unemployment rate (see note *f*) and the reason for job separation. These variables assess the differential effect of reasons for job separation along the cycle.

*Source:* European Community Household Panel, all waves, 1994-2001.

Table A6.2. **Likelihood of mismatch in the first job and the business cycle at labour market entry**[a]

Probit regression,[b] marginal effects[c] of independent variables[c]

| Explanatory variables | | Over-qualification | Over-skilling | Under-qualification |
|---|---|---|---|---|
| Over-skilled | | 0.075 *** | | |
| Female | | -0.101 *** | -0.027 *** | 0.051 *** |
| Age | | -0.011 *** | -0.001 ** | 0.008 *** |
| Foreign-born | | 0.022 | 0.038 *** | -0.024 * |
| Marital status | Separate/Divorced/Widowed | 0.065 *** | 0.073 *** | -0.014 |
| | Never married | -0.012 | 0.007 | 0.029 *** |
| Upper secondary qualification[d] | | *** | 0.162 *** | -0.201 *** |
| Tertiary qualification | | 0.162 | 0.180 *** | |
| Full-time | | -0.071 *** | 0.033 *** | 0.022 * |
| Contract type | Fixed-term | 0.001 | 0.010 | -0.010 |
| | Casual or no contract | -0.040 * | -0.039 ** | -0.033 ** |
| Firm size | 1-4 employees | -0.092 ** | 0.075 ** | 0.083 ** |
| | 5-19 employees | -0.152 *** | 0.050 * | 0.110 *** |
| | 20-49 employees | -0.206 *** | 0.035 | 0.129 *** |
| | 50-99 employees | -0.175 *** | 0.057 * | 0.125 *** |
| | 100-499 employees | -0.200 *** | 0.077 ** | 0.119 *** |
| | 500+ employees | -0.217 *** | 0.063 ** | 0.140 *** |
| Way work found[e] | Answered ad. | 0.003 | 0.043 *** | 0.055 *** |
| | Emp. or voc. guidance agency | 0.005 | 0.050 *** | 0.000 |
| | Family and friends | 0.043 *** | 0.024 *** | 0.011 * |
| | Own family business | 0.123 *** | -0.042 ** | 0.082 *** |
| | Other | -0.126 *** | -0.016 * | 0.150 *** |
| Tenure | | -0.005 *** | -0.002 *** | 0.001 * |
| Relative unemployment at leaving education[e] | | 0.052 *** | -0.001 | -0.045 *** |
| *Number of observations* | | *25,853* | *41,706* | *22,778* |

***, **, *: statistically significant at 1%, 5%, 10% levels, respectively.

*a)* Includes: Austria, Belgium, Denmark, Finland, Greece, Ireland, Italy, Portugal and Spain. The year of leaving general education is not available in the other ECHP countries.

*b)* The dependent variables are defined as follows: the probability of being over-qualified as opposed to well-matched by qualifications (under-qualified individuals are excluded as well as individuals with no qualifications); the probability of being under-qualified as opposed to well-matched by qualifications (over-qualified individuals are excluded as well individuals in with tertiary qualifications); the probability of being over-skilled to under-skilled or well-matched by skills (under-skilled individuals cannot be identified in the ECHP). Control variables not reported in the table include: country dummies and year dummies). Data includes employees and self-employed but excludes trainees and apprentices. Only workers who have had a previous job are included. Survey years are pooled.

*c)* Marginal effects calculated at the variable mean for continuous variables and for discrete changes of categorical variables.

*d)* The relative unemployment rate is equal to the log of the ratio of the unemployment rate in the year of hiring to the average unemployment rate in the previous five years – *i.e.* the relative unemployment rate takes the value of zero if the unemployment rate is in line with the 5-year average.

*e)* Interaction of the relative unemployment rate (see note *f*) and a time trend and its squared. This allows assessing how the effect of entering the labour market at a specific point in the business cycle changes over time.

*Source:* European Community Household Panel, all waves, 1994-2001.

Table A6.3. **The impact of qualification and skill mismatch on wages**[a]

OLS regression coefficients, using log of gross monthly wages as dependent variable

| | | ECHP pooled (1) | ECHP pooled (2) | ECHP Fixed Effects (3) | ECHP Random Effects[b] (4) | ESS 2004 (5) | ESS 2004 (6) | ESS 2004 (7) |
|---|---|---|---|---|---|---|---|---|
| Age | | 0.035 *** | 0.036 *** | | 0.068 *** | 0.037 *** | 0.036 *** | 0.036 *** |
| Age$^2$/100 | | -0.039 *** | -0.040 *** | | -0.069 *** | -0.045 *** | -0.044 *** | -0.044 *** |
| Female | | -0.244 *** | -0.245 *** | | -0.233 *** | -0.269 *** | -0.262 *** | -0.262 *** |
| Immigrant | | -0.006 | -0.008 | | -0.034 | -0.100 *** | -0.095 *** | -0.094 *** |
| Marital status | Separated/Divorced/Widow | -0.030 *** | -0.031 *** | -0.007 | -0.007 | -0.013 | -0.009 | -0.009 |
| | Never Married | -0.054 *** | -0.054 *** | -0.044 *** | -0.017 *** | -0.033 ** | -0.030 ** | -0.029 * |
| Worker's qualifications | Lower secondary | | | | | -0.050 | -0.048 | -0.002 |
| | Upper secondary | | 0.271 *** | 0.034 *** | 0.034 *** | 0.115 ** | 0.194 *** | 0.236 *** |
| | Post-secondary non-tertiary | | | | | 0.223 *** | 0.384 *** | 0.373 *** |
| | Tertiary | | 0.621 *** | 0.089 *** | 0.106 *** | 0.374 *** | 0.520 *** | 0.582 *** |
| Required qualifications | Lower secondary | | | | | | | |
| | Upper secondary | 0.266 *** | | | | | | |
| | Post-secondary non-tertiary | | | | | | | |
| | Tertiary | 0.631 *** | | | | | | |
| Full-time | | 0.606 *** | 0.606 *** | 0.380 *** | 0.383 *** | 0.366 *** | 0.368 *** | 0.370 *** |
| Contract type | Fixed-term | -0.132 *** | -0.131 *** | -0.067 *** | -0.058 *** | -0.129 *** | -0.130 *** | -0.131 *** |
| | Casual or no contract | -0.153 *** | -0.151 *** | -0.056 *** | -0.043 *** | -0.174 *** | -0.166 *** | -0.161 *** |
| Tenure | | 0.008 *** | 0.008 *** | -0.002 *** | -0.001 ** | 0.003 *** | 0.003 *** | 0.003 *** |
| Experience | | | | | | 0.003 ** | 0.004 *** | 0.004 *** |
| Firm size[c] | 20/25-99 employees | 0.094 *** | 0.095 *** | 0.034 *** | 0.037 *** | 0.081 *** | 0.076 *** | 0.074 *** |
| | 100-499 employees | 0.160 *** | 0.161 *** | 0.060 *** | 0.061 *** | 0.160 *** | 0.156 *** | 0.153 *** |
| | 500+ employees | 0.198 *** | 0.200 *** | 0.061 *** | 0.060 *** | 0.188 *** | 0.179 *** | 0.178 *** |
| Job complexity[d] | | | | | | 0.073 *** | 0.066 *** | 0.063 *** |
| Job latitude[e] | | | | | | 0.078 *** | 0.074 *** | 0.072 *** |
| Over-qualified | | 0.138 *** | -0.204 *** | -0.029 *** | -0.033 *** | | -0.127 *** | |
| Under-qualified | | -0.156 *** | 0.154 *** | 0.027 *** | 0.023 *** | | 0.090 *** | |
| Over-skilled | | -0.005 * | -0.006 ** | -0.013 *** | -0.010 *** | | | |
| Over-qual. level[d] | 1 | | | | | | | -0.029 |
| | 2 | | | | | | | -0.154 *** |
| | 3 | | | | | | | -0.239 ** |
| | 4 | | | | | | | -0.352 * |
| Under-qual. level[d] | 1 | | | | | | | 0.079 |
| | 2 | | | | | | | 0.133 *** |
| | 3 | | | | | | | 0.245 *** |
| | 4 | | | | | | | 0.349 |
| *Number of obs. (individuals)* | | *128132* | *128132* | *147904 (47424)* | *128132 (41327)* | *5239* | *5239* | *5239* |

***, **, *: statistically significant at 1%, 5%, 10% levels, respectively.

*a)* ECHP includes: Austria, Belgium, Denmark, Greece, France, Ireland, Italy, the Netherlands, Portugal, Spain, and the United Kingdom. Pooled OLS regressions, with standard errors corrected for clustering. ESS includes: Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Iceland, Ireland, Luxembourg, the Netherland, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

*b)* Random effect model with Mundlak correction – *i.e.* the regression include averages by individual over time of each explanatory variable – to control for unobserved time-invariant individual heterogeneity.

*c)* The omitted category is firm size of fewer than 20 employees for ECHP regressions and fewer than 25 employees for ESS regressions.

*d)* The degree of job complexity is obtained by applying Cronbach's Alpha technique to individual responses of whether the job involves learning new things and on the time needed for someone to learn how to do the job well.

*e)* The degree of job latitude is obtained by applying Cronbach's Alpha technique to individual responses of whether the worker is free to organise his/her daily work, he/she can influence policy decisions in the organisation and/or he/she is allowed to choose the pace of work.

*f)* This is the difference between the qualification possessed by the worker – measured using a 5-level ISCED classification – and the qualification required by the job – measured in the same way. For instance, a value of two on the over-qualification variable indicates that the worker's qualification level is two levels above that required by his/her job – *e.g.* he/she has a post-secondary non-tertiary qualification but is carrying out a job that only requires lower secondary studies.

*Source:* European Community Household Panel, (all waves, 1994-2001) and European Social Survey (2004).

Table A6.3. **The impact of qualification and skill mismatch on wages** *(cont.)*

OLS regression coefficients, using log of gross monthly wages as dependent variable

| | | ESS 2004 (5) | ESS 2004 (6) | ESS 2004 (7) |
|---|---|---|---|---|
| Field of study | Art, fine/applied | -0.068 | -0.031 | -0.031 |
| | Humanities | 0.039 | 0.027 | 0.023 |
| | Agriculture and forestry | -0.289 *** | -0.139 *** | -0.138 *** |
| | Teacher training/education | 0.017 | -0.017 | -0.023 |
| | Sciences, maths, computing | 0.084 * | 0.051 * | 0.050 |
| | Medical, health services, nurs | 0.000 | 0.004 | 0.001 |
| | Economics, commerce, busin | 0.151 *** | 0.085 *** | 0.083 *** |
| | Social studies, admin, media | 0.029 | -0.008 | -0.009 |
| | Law and legal services | 0.268 *** | 0.195 *** | 0.192 *** |
| | Personal care services | -0.074 *** | -0.064 *** | -0.062 ** |
| | Public order and safety | 0.018 | 0.032 | 0.033 |
| | Transport and telecom | 0.105 ** | 0.126 *** | 0.125 *** |
| | | | | |
| Job unrelated to field of study | | -0.076 | -0.021 | -0.018 |
| Job unrelated to field of study interactions | | | | |
| | Art, fine/applied | 0.126 | | |
| | Humanities | 0.076 | | |
| | Agriculture and forestry | 0.268 *** | | |
| | Teacher training/education | 0.118 * | | |
| | Sciences, maths, computing | 0.041 | | |
| | Medical, health services, nurs | 0.110 * | | |
| | Economics, commerce, busin | -0.104 * | | |
| | Social studies, admin, media | -0.048 | | |
| | Law and legal services | -0.363 ** | | |
| | Personal care services | 0.085 | | |
| | Public order and safety | -0.103 | | |
| | Transport and telecom | 0.109 | | |

109. The ESS regressions presented in Table A6.3 are based on a cross-section of workers. Unlike the ECHP analysis (columns 1-4), they do not control for over-skilling as the ESS does not contain any information on the use of skills at work. However, they include additional controls for job attributes such as complexity and latitude, for field of study and for working in a job unrelated to one's field-of-study. The coefficients on over-qualification and under-qualification have the same sign as those obtained with pooled ECHP data but different magnitudes, mostly due to the inclusion of additional controls (columns 6 and 7).[1] In addition, the penalty associated with qualification mismatch is found to increase with the degree of mismatch (columns 6 and 7).[2]

110. Finally, the effect of working outside one's field of study on monthly pay varies by field of study (column 5). Workers with training in Agriculture, Teaching and Medicine but working in an unrelated field are found to earn more than their counterparts working in their field of study. On the other hand, workers with Economics and Law degree who work outside their field of study suffer the largest wage penalties. Holding a job unrelated to one's field of study has no effect on wages once qualification mismatch is controlled for, suggesting that wage penalties come from over-qualification rather than from working outside one's field *per-se* (columns 6 and 7).

1 . This is particularly the case for the coefficients on over-qualification which are very similar to the estimates obtained with pooled ECHP data when the additional controls are omitted.

2 . The degree of qualification mismatch is measured as the difference between the qualification level and required qualification measured with five-level ISCED codes. Because the ECHP includes only three-level ISCED codes, this difference would not be as meaningful.

Table A6.4. **Job satisfaction and qualification and skill mismatch**[a]

Probit regressions, marginal effects[b] of independent variables

| | Satisfaction measure | "How satisfied are you with your present job in terms of the type of work?" | | |
|---|---|---|---|---|
| Explanatory variables | | ECHP pooled (1) | ECHP pooled (2) | ECHP Random Effects[c] (3) |
| Age | | -0.001 *** | -0.001 *** | -0.004 *** |
| Female | | 0.019 *** | 0.019 *** | 0.016 *** |
| Foreign-born | | -0.031 *** | -0.031 *** | -0.098 ** |
| Marital status | Separated/Divorced/Widow | 0.016 *** | 0.016 *** | 0.026 *** |
| | Never Married | -0.010 *** | -0.010 *** | 0.008 |
| Worker's qualifications | Upper secondary | 0.046 | | 0.030 |
| | Tertiary | 0.091 *** | | 0.052 *** |
| Required qualifications | Upper secondary | | 0.047 | |
| | Tertiary | | 0.095 *** | |
| Log of gross monthly pay | | 0.044 *** | 0.042 *** | 0.027 *** |
| Full-time | | 0.031 *** | 0.030 *** | 0.007 |
| Contract type | Fixed-term | -0.028 *** | -0.028 *** | -0.023 *** |
| | Casual or no contract | -0.005 | -0.005 | -0.006 |
| Tenure | | 0.000 | 0.000 | -0.004 *** |
| Firm size | 20-99 employees | -0.021 *** | -0.021 *** | -0.007 ** |
| | 100-499 employees | -0.042 *** | -0.042 *** | -0.011 *** |
| | 500+ employees | -0.040 *** | -0.040 *** | -0.002 |
| Over-qualified | | -0.043 *** | 0.003 | -0.023 *** |
| Under-qualified | | 0.064 *** | 0.010 *** | 0.029 *** |
| Over-skilled | | -0.036 *** | -0.036 *** | -0.025 *** |
| *Number of observations (individuals)* | | *125991* | *125991* | *125991 (40841)* |

***, **, *: statistically significant at 1%, 5%, 10% levels, respectively.

*a)* Includes: Austria, Belgium, Denmark, Greece, France, Ireland, Italy, the Netherlands, Portugal, Spain, and the United Kingdom. Pooled OLS regressions, with standard errors corrected for clustering.

*b)* Marginal effects calculated at the variable mean for continuous variables and for discrete changes of categorical variables.

*c)* Random effect model with Mundlak correction – *i.e.* the regression include averages by individual over time of each explanatory variable – to control for unobserved time-invariant individual heterogeneity.

*Source:* European Community Household Panel, (all waves, 1994-2001).

Table A6.5. **On-the-job search and qualification and skill mismatch**[a]

Probit regressions, marginal effects[b] of independent variables

| | On-the-job search measure | "Are you currently looking for a job?" | | |
|---|---|---|---|---|
| Explanatory variables | | ECHP pooled (1) | ECHP pooled (2) | ECHP Random Effects[c] (3) |
| Age | | 0.000 | 0.000 | 0.010 *** |
| Female | | -0.019 *** | -0.019 *** | -0.012 *** |
| Foreign-born | | 0.024 *** | 0.024 *** | -0.028 |
| Marital status | Separated/Divorced/Widow | 0.041 *** | 0.041 *** | 0.031 *** |
| | Never Married | 0.017 *** | 0.017 *** | 0.017 *** |
| Worker's qualifications | Upper secondary | 0.002 | | -0.013 |
| | Tertiary | 0.020 *** | | -0.015 ** |
| Required qualifications | Upper secondary | | 0.003 | |
| | Tertiary | | 0.020 *** | |
| Log of gross monthly pay | | -0.049 *** | -0.049 *** | -0.057 *** |
| Full-time | | 0.035 *** | 0.034 *** | 0.042 *** |
| Contract type | Fixed-term | 0.085 *** | 0.085 *** | 0.051 *** |
| | Casual or no contract | 0.046 *** | 0.046 *** | 0.010 ** |
| Tenure | | -0.005 *** | -0.005 *** | 0.007 *** |
| Firm size | 20-99 employees | -0.002 | -0.002 | -0.002 |
| | 100-499 employees | 0.004 | 0.004 | 0.003 |
| | 500+ employees | -0.004 | -0.004 | -0.003 |
| Over-qualified | | 0.016 *** | 0.028 *** | 0.014 *** |
| Under-qualified | | -0.007 ** | -0.014 *** | -0.012 *** |
| Over-skilled | | 0.066 *** | 0.066 *** | 0.038 *** |
| *Number of observations (individuals)* | | *126725* | *126725* | *126725 (40804)* |

***, **, *: statistically significant at 1%, 5%, 10% levels, respectively.

*a)* Includes: Austria, Belgium, Denmark, Greece, France, Ireland, Italy, the Netherlands, Portugal, Spain, and the United Kingdom. Pooled OLS regressions, with standard errors corrected for clustering.

*b)* Marginal effects calculated at the variable mean for continuous variables and for discrete changes of categorical variables.

*c)* Random effect model with Mundlak correction – *i.e.* the regression include averages by individual over time of each explanatory variable – to control for unobserved time-invariant individual heterogeneity.

*Source:* European Community Household Panel, (all waves, 1994-2001).