OECD Social, Employment and Migration Working Papers
No. 121

Over-Qualified or Under-Skilled: A Review of Existing Literature

Glenda Quintini

https://dx.doi.org/10.1787/5kg58j9d7b6d-en

OECD

Unclassified **DELSA/ELSA/WD/SEM(2011)6**

Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development

English - Or. English

DIRECTORATE FOR EMPLOYMENT, LABOUR AND SOCIAL AFFAIRS
EMPLOYMENT, LABOUR AND SOCIAL AFFAIRS COMMITTEE

DELSA/ELSA/WD/SEM(2011)6
Unclassified

OECD SOCIAL, EMPLOYMENT AND MIGRATION WORKING PAPERS No. 121

OVER-QUALIFIED OR UNDER-SKILLED: A REVIEW OF EXISTING LITERATURE

Glenda Quintini

Please contact Glenda Quintini (glenda.quintini@oecd.org, +33 1 45 24 91 94) All Social, Employment and Migration Working Papers are available on www.oecd.org/els/workingpapers.

English - Or. English

Document complet disponible sur OLIS dans son format d'origine
Complete document available on OLIS in its original format

DIRECTORATE FOR EMPLOYMENT, LABOUR AND SOCIAL AFFAIRS

www.oecd.org/els

OECD SOCIAL, EMPLOYMENT AND MIGRATION WORKING PAPERS

www.oecd.org/els/workingpapers

This series is designed to make available to a wider readership selected labour market, social policy and migration studies prepared for use within the OECD. Authorship is usually collective, but principal writers are named. The papers are generally available only in their original language – English or French – with a summary in the other.

Comment on the series is welcome, and should be sent to the Directorate for Employment, Labour and Social Affairs, 2, rue André-Pascal, 75775 PARIS CEDEX 16, France.

The opinions expressed and arguments employed here are the responsibility of the author(s) and do not necessarily reflect those of the OECD.

Applications for permission to reproduce or translate all or part of this material should be made to:

Head of Publications Service
OECD
2, rue André-Pascal
75775 Paris, CEDEX 16
France

Copyright OECD 2011

ACKNOWLEDGEMENTS

Glenda Quintini is an economist in the Employment Analysis and Policy Division at the OECD Directorate for Employment, Labour and Social Affairs. Comments, suggestions and advice from Stefano Scarpetta and Mark Keese are gratefully acknowledged.

This literature review has been carried out in the context of the *New Skills for New Jobs* project funded by the European Commission. It precedes a broader analytical study on skills mismatch and constitutes background material for the work on skills that the OECD is undertaking as part of its *Skills Strategy*. The views expressed in this paper are those of the author and do not necessarily reflect those of the OECD or its member countries.

SUMMARY

1. Mismatches between workers' competences and what is required by their job are widespread in OECD countries. Studies that use qualifications as proxies for competences suggest that as many as one in four workers could be over-qualified and as many as one in three could be under-qualified for their job. However, there is significant variation across countries and socio-demographic groups. Our meta-analysis of country studies suggests that over 35% of workers are over-qualified in Sweden compared with just 10% in Finland, with most other OECD countries located between these two extremes. There is also extensive evidence that youth are more likely to be over-qualified than their older counterparts and the same is found to be true for immigrant workers compared with a country's nationals. On the other hand, no definitive evidence has been found of the persistence of qualification mismatch, with some papers showing that over-qualification is just a temporary phenomenon that most workers overcome through career mobility and others finding infrequent trantisions between over-qualification and good job matches. Across the board, over-qualified workers are found to earn less than their equally-qualified and well-matched counterparts but more than appropriately-qualified workers doing the same job. Under-qualified workers are found to earn more than their equally-qualified and well-matched counterparts but less than appropriately-qualified workers doing the same job. Over-qualified workers are also found to be less satisfied about their job and more likely to leave their work than well-matched workers with the same qualifications.

2. In addition to studies focusing on qualification mismatch, some authors have studied skill mismatch more directly by exploiting self-reported discrepancies between workers' overall skill level and the skills used at work. These papers find only a weak link between qualification and skill mismatch suggesting that qualification mismatch may be due primarily to skill heterogeneity within qualification groups. They also suggest that skill underutilisation and skill deficits do exist and have important consequences on job satisfaction, turnover and wages and account for some of the effects of qualification mismatch on these outcome variables.

3. Very few studies in the rich mismatch literature discuss policy initiatives to tackle the discrepancies between the demand and supply of skills. Most analysts call for better guidance services and for a better match between what the education system delivers and what the labour market needs. Adult learning, work-based training and training in the context of active labour market policies for the unemployed are also deemed important to prevent skill obsolescence and upgrade skills in light of new requirements driven by technological change. Finally, rigid wage setting institutions may prevent wages from adjusting in response to mismatch and stringent regulations on the firing of permanent workers could make it more difficult for firms to resolve mismatch by adapting the workforce structure.

RÉSUMÉ

4. Les inadéquations entre les compétences des travailleurs et ce qu'exige leur emploi sont fréquentes dans les pays de l'OCDE. Les études qui utilisent les qualifications comme indicateur supplétif des compétences donnent à penser que non moins d'un travailleur sur quatre pourrait être surqualifié et non moins d'un sur trois sous-qualifié par rapport à son emploi. Cependant, il existe une grande diversité de situations au niveau des pays et des catégories sociodémographiques. Notre méta-analyse des études nationales tend à indiquer que plus de 35 % des travailleurs sont surqualifiés en Suède alors qu'ils ne sont que 10 % en Finlande, la plupart des autres pays de l'OCDE se situant entre ces deux extrêmes. Il existe aussi de nombreux éléments qui tendent à indiquer que les jeunes sont davantage susceptibles d'être surqualifiés que leurs homologues plus âgés, et l'on peut faire la même remarque à propos des travailleurs immigrés par rapport aux natifs du pays. Par contre, les données ne sont pas concluantes en ce qui concerne la persistance du déséquilibre de qualifications : certaines études montrent que la surqualification n'est qu'un phénomène temporaire que la plupart des travailleurs dépassent grâce à la mobilité professionnelle, tandis que d'autres estiment que les transitions entre surqualification et bonne adéquation à l'emploi sont rares. De façon générale, on constate que les travailleurs surqualifiés gagnent moins que leurs homologues ayant un même niveau de qualifications et en bonne adéquation avec leur emploi, mais plus que des travailleurs convenablement qualifiés occupant le même emploi. En ce qui concerne les travailleurs sous-qualifiés, on constate qu'ils gagnent plus que leurs homologues ayant un même niveau de qualifications et en bonne adéquation avec leur emploi, mais moins que les travailleurs convenablement qualifiés occupant le même emploi. Par ailleurs, les travailleurs surqualifiés sont moins satisfaits de leur emploi et davantage susceptibles de le quitter que les travailleurs en bonne adéquation avec leur emploi, à même niveau de qualifications.

5. Par delà les études centrées sur les déséquilibres de qualifications, certains auteurs ont étudié plus directement les déséquilibres au niveau des compétences en exploitant les décalages dont les intéressés eux-mêmes font état entre leur niveau général de compétences et les compétences utilisées dans leur emploi. Ces études ne font apparaître qu'un lien ténu entre les déséquilibres dans les qualifications et l'inadéquation des compétences, ce qui tendrait à indiquer que les déséquilibres de qualifications sont peut-être dus avant tout à l'hétérogénéité des compétences au sein même des groupes de qualifications. Elles tendent aussi à montrer que la sous-utilisation des compétences et le déficit de compétences existent effectivement et ont des conséquences importantes en termes de satisfaction dans l'emploi, de rotation des effectifs et de salaires, et expliquent pour partie les effets des inadéquations de qualifications sur ces variables de résultats.

6. Très peu d'études, dans la vaste littérature consacrée à cette question des inadéquations, traitent des initiatives prises par les pouvoirs publics pour corriger les décalages entre l'offre et la demande de compétences. La plupart des analystes préconisent une amélioration des services d'orientation, ainsi qu'une meilleure adéquation entre ce que le système éducatif produit et ce dont le marché du travail a besoin. La formation des adultes, la formation dans l'emploi et la formation dans le contexte des politiques actives du marché du travail à l'intention des chômeurs sont également des éléments très importants pour éviter l'obsolescence des compétences et permettre une remise à niveau à la lumière des nouveaux besoins induits par le changement technologique. Enfin, des institutions rigides de fixation des salaires pourraient empêcher les salaires de s'ajuster face aux inadéquations, et des règlementations contraignantes en matière de licenciement des travailleurs permanents pourraient faire qu'il soit plus difficile encore pour les entreprises de corriger les déséquilibres en adaptant leur structure de main-d'œuvre.

TABLE OF CONTENTS

Acknowledgements 2

Summary 4

Résumé 5

Introduction 7

1. Getting the context right: types of mismatch and theoretical background 7
2. Qualification mismatch 12
   - Measuring qualification mismatch 13
   - The incidence of qualification mismatch 14
   - The persistence of qualification mismatch 16
   - The effect of qualification mismatch on earnings 17
3. Skill deficits and skill underutilisation 17
   - Direct measurement of workers' skills and their use in the workplace 18
   - Self-reported skill underutilisation and skill deficits 19
4. The consequences of mismatch on workers, firms and the economy 21
5. The causes of skill mismatch 23
6. What can be done to tackle mismatch 25
   - The role of initial education and adult education and training 26
   - Labour market institutions 27
   - Work-based training 28
7. Conclusions 28

Bibliography 29

ANNEX 1. *Over-qualification literature review tables* 39

OVER-QUALIFIED OR UNDER-SKILLED: A REVIEW OF EXISTING LITERATURE

Introduction

7. Skill mismatch has become a growing concern among policy makers. A core element of the current debate is that to adapt to rapid change, matching skills to jobs is crucial. In fact, skill mismatch has important economic implications at various levels. At the individual level, it affects job satisfaction and wages. At the firm level, it reduces productivity and increases on-the-job search and turnover. At the macroeconomic level, it increases equilibrium unemployment and reduces GDP growth via the loss in human capital and/or the reduction in productivity it generates. To limit these negative effects, it is important to identify the main causes of skill mismatch and design a comprehensive policy strategy to address them.

8. The OECD is currently undertaking a study of skill mismatch in the context of the European Commission (EC) *New Skills for New Jobs* project. This literature review constitutes preparatory work for a thorough analysis of skill mismatch to be carried out in the coming months. It reviews academic studies on the incidence, causes and consequences of skill mismatch and provides some preliminary discussion of policies that may help reduce it.

9. Measuring skill mismatch between workers and jobs is no easy task. Few databases contain detailed information on the skills possessed by workers and those required by their jobs and those that do often cover only literacy and numeracy. Even self-reported overall assessments of skill mismatch are uncommon. As a result, the vast majority of the academic literature reviewed in this paper focuses on qualification mismatch, *i.e.* the discrepancy between the qualifications possessed by workers and those required by their jobs. While schooling is undoubtedly a good candidate to proxy competences, a small body of literature has developed to analyse the difference between qualification and skill mismatch.

10. Qualification ad skill mismatch are not the only forms of skill imbalances to have drawn the attention of academics. Skill deficits at the individual level may reflect difficulties in filling vacancies with adequately skilled employees. The incidence of these skill shortages as well as their causes and consequences has been widely analysed. However, the OECD-EC project will not address the topic of skill shortages. As a result, this issue is only briefly covered in this paper.

11. The paper is organised as follows. Section 1 attempts to classify types of skill imbalances and explores the theoretical explanations behind them. Sections 2 and 3 discuss the academic literature on qualification and skill mismatch, respectively. Sections 4 and 5 review the studies that have researched the consequences and causes of skill mismatch. Section 6 explores some areas where policy intervention may help address skill mismatch. Section 7 concludes and puts forward ideas for future research.

1. Getting the context right: types of mismatch and theoretical background

12. In perfectly competitive labour markets, demand, supply and institutional shocks to the market for skills would only result in changes in the wage structure. However, modern day labour markets are far more complex than stylised, perfectly competitive ones and suffer from numerous imperfections including: wage rigidities; imperfect information on applicants' skills; matching frictions; and limited geographical

mobility of workers. These imperfections generate several types of skill imbalances ranging from skill shortages to qualification and skill mismatches[1] (Table 1). While this paper only addresses qualification and skill mismatch, research concerning skill shortages is summarised in Box 1.

Table 1 **Types of mismatch and theoretical explanations**

Type of skill imbalance	Definition	Level of analysis	Why does it emerge? (demand or supply factor)
Skill shortage	Arises when employers are unable to recruit staff with the required skills in the accessible labour market and at the ongoing rate of pay	Aggregate, occupation	Adjustment lags of firms (skill demand); Wage rigidities (skill demand); Adjustment lags of education system (skill supply); Lack of geographical mobility (skill supply); Imperfect information for students on which skills to acquire (skill supply).
Skill Mismatch	A *Skill deficit (skill gap)* signals the inadequacy of a worker's skills relative to the requirements of his/her job. *Skill underutilisation (over-skilling)* points to the opposite phenomenon whereby a worker's skills exceed those required by his/her job	Individual	Adjustment lags of firms (skill demand); Wage rigidities (skill demand); Adjustment lags of education system (skill supply); Frictions in matching process (skill demand and supply).
Qualification mismatch	*Over-qualification* arises when a worker has more qualifications than required by his/her job. *Under-qualification* arises when a worker possesses less qualifications than required by his/her job	Individual	Same as skill mismatch; Skill heterogeneity within qualification groups (skill supply); Imperfect information on the applicants' skills (skill demand and supply).

Source: OECD own elaboration.

13. As Table 1 suggests, a number of labour market imperfections could be behind qualification and skill mismatch and there has been no attempt so far to develop a unified theory. Instead, the mismatch literature relies on existing labour market theories:

- *Human Capital* theory predicts that firms are willing to fully utilize the skills of their workforce by adapting their production process in response to any changes in the relative supply of labour. As a result wages always equate an individual workers' marginal product which in turn is determined by the level of human capital that they have accumulated through either formal education or on-the-job training. In this framework, mismatches can only arise in the short run while firms adjust their production processes in order to fully utilize the individuals' human capital (*Technological Change* theory predicts this delay by the existence of positive adjustment costs) or for as long as it takes workers to find a more appropriate match through job-search

1. Qualification and skill mismatch are both meant to measure the gap between a person's abilities and those required by his/her job. However, as qualifications are an imperfect proxy of individuals' skill endowments, it is possible that qualification mismatch does not translate into skill mismatch. For instance, a university graduate holding a job requiring just an upper secondary qualification could in fact lack some of the skills required to obtain a graduate job, resulting in him/her being over-qualified but not over-skilled for his job.

(*Career Mobility* theory and *Search* theory explain this mismatch through the workers' lack of experience or the firms' lack of information on the workers' skills respectively).

- *Job Competition* theory predicts that job characteristics are the only factor determining earnings and that qualifications are important for the allocation of jobs. Individuals compete for job opportunities based on their relative training costs – *i.e.* their position in the hiring queue is determined by their cost in terms of training. This model assumes that qualifications serve as a proxy for training costs with the more highly qualified seen as more able and therefore requiring less training by the firm. Within this framework, the larger the number of qualified persons in the economy, the more imperative it is for individuals to invest in education in order to protect their place in the queue although they will not necessarily get a job that utilises all their competencies. Because education is used merely as a rationing/allocation device, some authors have employed the term *credentialism* in systems functioning according to this model (Berg, 1970). The two key empirical predictions of Job Competition theory are that qualification mismatch is a persistent phenomenon and that wages are fully dependant on required qualifications while returns to surplus qualifications are zero.

- *Signalling* theory is similar to Job Competition theory in that education performs a mere signalling role (Spence, 1973). However, in the signalling model there is a limit to the amount of education an individual will invest in based on the balance between earnings and the cost of education. In the basic signalling model, the cost of acquiring education is lower for higher ability individuals. Hence, an exogenous reduction in the costs of acquiring education – *e.g.* due to lower academic requirements for university access – will encourage lower ability individuals to invest in more education than previously, thereby raising the average education level of labour market entrants. If firms find that requiring a certain level of education no longer ensures that they get workers with the necessary ability, they will tend to upgrade educational requirements for applicants – but not job content – leading to so-called *qualification inflation*. As an outcome to this model, qualification mismatch arises but there is no underlying skill mismatch.[2]

- *Assignment* model stand in middle ground between Human Capital theory on the one hand and Job Competition and Signalling models on the other. In Assignment models, additional investments in human capital depend in part on the match between the worker and the job. The basic idea put forward in these models is that, although education raises productivity in general, the actual level of realised productivity is also determined by the level of complexity of the job held. Working in a job below one's own qualification/skill level imposes a ceiling on a worker's productivity because it limits the extent to which his/her skills can be utilised and results in lower wages. Conversely, working in a job above one's own level raises this productivity ceiling, allowing workers to be more productive than they would be when working at their own level. However, in this case, the worker's own skills are the factor limiting productivity. Because workers employed in a job at their own skill level are already performing close to their own personal productivity ceiling, the wage benefits of working above one's own level are generally more modest. According to assignment theory, productivity is maximised when workers are allocated top-down according to their skills, whereby the most skilled are assigned to the most

2. The same disconnection between qualification and skill mismatch may arise because of *grade drift* whereby the deterioration of education standards encourages employers to upgrade the educational requirements of jobs. Grade drift differs from qualification inflation in that it is based on a genuine change in the education and skill content of a particular qualification rather than just a change in its signalling power. Some of the incidence of apparent under-qualification among older workers could reflect the occurrence of grade drift as older workers acquired their qualifications when standards were higher. Unfortunately, the extent of grade drift has proven difficult to quantify (Green *et al*., 1999).

complex job and the least skilled to the simplest job. Over-qualification and skill underutilisation are explained by differences in the share of complex jobs and skilled workers.

14. Several studies have attempted to empirically test which theoretical perspective is most consistent with the observed facts on mismatch (Duncan and Hoffman, 1981; Hartog and Oosterbeek, 1988; Sloane *et al*. 1999; and McGuinness, 2006). Overall, these studies have found Assignment theory to be the most consistent with findings on the persistence of mismatch and on its effect on wages. However, the models have been mostly tested using measures of over-qualification and the findings tend to understate the importance of skill heterogeneity, hence of human capital theory.

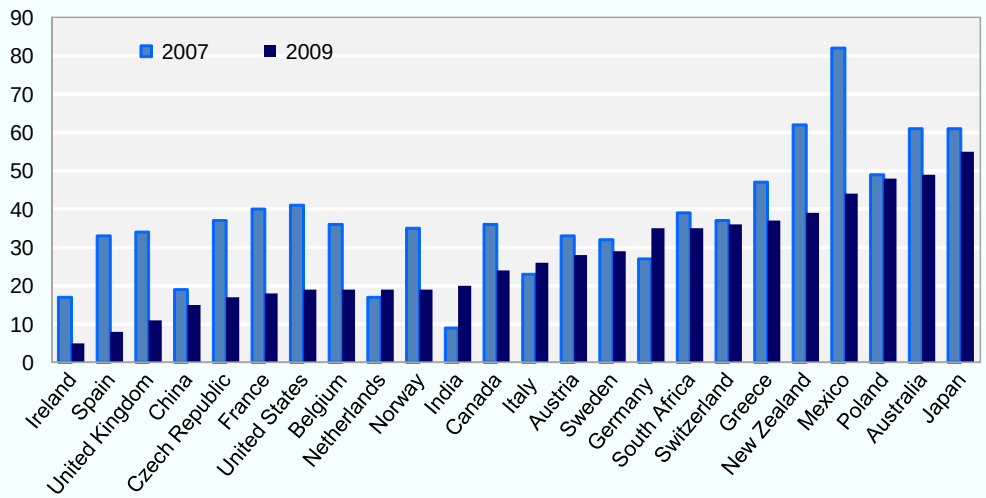
Box 1. **Skill shortages: typology, measurement and relevance for policy**

A skill shortage characterises the situation where employers are unable to recruit staff with the skills they are looking for in the accessible labour market and at the ongoing rate of pay. This could result from: i) a lack of workers in countries with unemployment rates at their frictional level (also referred to as *labour shortage*); ii) geographical imbalances in supply, whereby there are sufficient skilled people in the labour market but not easily accessible to available jobs (also referred to as *geographical mismatch*); or iii) a genuine shortfall in the number of appropriately skilled individuals.

Skill shortages can be both cyclical and structural. On the one hand, shortages which occur in periods of rapid economic growth when unemployment is very low and the pool of available workers is reduced to a minimum are significantly reduced during periods of economic slowdown. On the other hand, some structural changes – such as the adoption of new technology – could require skills that are not immediately available in the labour market, creating shortages while wages adjust and the education/vocational systems adapt to the new skill requirements.

As far as measurement is concerned, three source of information can be used to construct measures of skill shortages. *Employers' own assessments* of skill shortages constitute one of the most direct ways of assessing the size of the phenomenon. Employers' views are often collected in surveys conducted by employer associations, recruitment agencies or other institutions. These surveys explicitly question employers on the existence of skill shortages and on what jobs they have more difficulties filling. However, they often take different formats across countries and are repeated infrequently, making international comparisons very difficult. The Figure below shows the share of employers reporting difficulties filling positions due to the lack of suitable skills in their market for some OECD countries and a number of selected non-OECD countries. It is apparent that there is significant variation in reported shortages across countries and that shortages have a strong cyclical component.

Share of employers reporting recruitment difficulties, selected OECD and non-OECD countries, 2007[a] and 2009



Data refer to 2008 rather than 2007 for the Czech Republic, Greece and Poland.

Source: 2009 Talent Shortage Survey Results, Manpower Inc.

Secondly, *job vacancies* have been used extensively to measure mismatch at the aggregate or occupation level. Petrongolo and Pissarides (2001) exploit the ratio of *vacancies to unemployment* as a measure of the degree of tightness of the labour market and Jackman *et al*. (2002) suggest using *vacancy duration*. Most often, *vacancy rates* – obtained by dividing the stock of unfilled job openings to total employment – are analysed in conjunction with the unemployment rate to draw the so-called *Beveridge Curve* (BC). Over the business cycle, vacancy rates and unemployment rates are negatively correlated, with high vacancy rates and low unemployment rates when the economy is growing and vice versa when the economy is contracting. This co-movement along a downward sloping line designs the BC. In the short-run the downward sloping line is fixed but in the longer-run the line can shift to reflect structural changes in the labour market. Notably, a rise in skill shortages would shift the curve outwards as unemployment and vacancies would coexist at higher levels. Layard *et al.* (1991) suggest using the variance across skill groups in the ratio of vacancies to unemployment to measure how skill imbalances affect the location of the aggregate BC. However, shifts in the BC could be driven by factors other than skill shortages, such as the efficiency of the public employment service in matching the unemployed to existing vacancies and some labour market institutions – employment protection regulation, home ownership, taxation and wage bargaining regimes (Nickell *et al.*, 2002). Also, while the BC could point to the existence of shortages it provides no further insight into which occupations are suffering from it.

A major drawback of using vacancy indicators to pinpoint skill shortages is that their reliability depends on the quality of vacancy data. In many OECD countries, data on job vacancies are collected by public employment offices, thus they tend to represent low-skilled job openings only. In addition, in countries where unfilled vacancies data are not available, notably in Canada and the United States, help-wanted advertising indices are used. Many researchers have pointed to the fact that these indices may have increased over time for reasons unrelated to increased mismatch. Abraham (1987) argued that part of the rise in the US index during the 1960s and the 1970s could be attributed to factors such as: the long-term changes in the occupation composition of employment towards white-collar jobs that are more likely to be advertised; the increased job advertising linked to equal opportunity pressures; and the consolidation in newspaper markets. In this respect, indicators constructed using on-line job advertising could help draw a more comprehensive picture of present-day job vacancies.

Finally, some countries have exploited data on *wage growth* coupled with unemployment and employment rates to identify occupations in shortage for immigration purposes. The mismatch between rising labour demand – measured by rising job vacancy indices or high employment growth – and tight labour supply – measured by low unemployment rates – is likely to generate wage pressures. In order to attract and keep employees when workers with adequate skills are few, employers must make their job offer more attractive than alternatives, most often through higher wages. Wage pressures can be identified by looking at wage growth by occupation. Some researchers have also suggested looking at job-to-job changes carrying wage premia of 15% or over (EEO, 2001). Indeed, as skill shortages emerge, some employers may try to lure specialists from other firms by offering them higher wages. Unfortunately, this method cannot reveal skill shortages that are addressed through alternative, non-financial arrangements, such as training the existing workforce or attracting foreign workers. Also, higher than average wage growth could be explained by factors other than the existence of skill shortages, such as: structural wage adjustments, notably in transition economies or in periods of economic restructuring; the nature of wage bargaining and the extent of union coverage; or changes in the minimum wage rate. Finally, wage related skill-shortage measures require good hourly wage data or good data on monthly/weekly wages and on hours worked and these are often unavailable.

Skill shortages have important consequences on economic performance which explains their relevance for policy-makers. The main channel through which skill shortages affect growth is their negative effect on labour productivity. Haskel and Martin (1993a) argue that shortages increase the hiring cost per skilled worker, leading firms to substitute to less productive unskilled workers and may also put workers in a stronger bargaining position to demand an easier pace of work. Their results suggest that, controlling for other labour and product market effects, the increase in shortages of skilled labour in the United Kingdom over the mid-80s reduced productivity growth by around 0.7% per year while shortages of unskilled workers had no significant effect. Tang and Wang (2005) show that skill shortages have a negative impact on the labour productivity – current value added per employee – of small- and medium-sized Canadian firms. Similarly, Bennet and McGuinness (2009) find a negative effect of hard-to-fill and unfilled vacancies on the output per worker of high-tech firms in Northern Ireland. Some authors have suggested that skill shortages may affect productivity through the difficulties they cause in technology adoption. Foley *et al*. (1993) suggest that skill shortages associated with craft workers in the United Kingdom have acted as a barrier to the use of new technologies and led to lower productivity. An indirect effect of skill shortages on productivity via difficulties in technology adoption is also found by Forth and Mason (2006) in their study on ICT skill shortages in the United Kingdom.[a] Similarly, Nickell and Nicolitsas (2000) find that skill shortages reduce firms' investment in R&D, although the effect is found to be only temporary.

At the aggregate level, Lucifora and Origo (2002) measure the effect of skill shortages on GDP by using the sum of the cost of vacancies and the cost of unemployment. The cost of vacancies is measured as the loss of production while vacancies remain unfilled and is born by firms while the cost of unemployment is measured as the sum of workers' foregone earnings, unemployment benefits and activation costs. Using this method, the authors put the cost of skill shortages to 7% of GDP on average.[b]

Several OECD countries have responded to skill shortages through proactive targeted immigration policies. In this context, carefully determining skill shortages is very important and is either done through the so-called "employment test" – *i.e.* by requiring employers to advertise a position nationally for a given amount of time before they turn to foreign candidates – or through shortage lists[c] (OECD, 2009).

To address high-skilled shortages, many OECD governments have also attempted to encourage more young people to enroll in tertiary studies and several have set numerical targets that they aim to meet over the coming decades. However, while governments have a role to play in encouraging tertiary enrolments – notably, through guidance and financial-support schemes – skill acquisition decisions are based on returns to skills. As a result, wage-setting institutions that allow wages to adjust to the existence of skill shortages are an important part to any policy aiming to reduce this type of skill imbalance. Unfortunately, at the firm level, evidence that wages respond to the existence of shortages is mixed even in countries with relatively flexible wage setting frameworks,[d] such as Canada and the UK (Haskel and Martin, 1993b; Haskel and Martin, 2001; and Fang, 2009). On the other hand, there is evidence that employers modify workplace practices, such as the adoption of flexible working hours or the increased reliance on overtime or flexible job design, to alleviate the effects of skill shortages on the workplace. These changes do not solve the problem of skill shortages but provide less-costly short-term remedies. Fang (2009) exploits Canadian data on firms' practices and vacancies and finds that firms faced with hard to fill vacancies are more likely to employ flexible management practices such as job rotation, multi tasking and the introduction of problem-solving teams, and to adopt more flexible working-hours policies and, to a lesser extent, increase overtime.

a) The authors find that ICT skill shortages have a negative impact on productivity performance through the restrictions that such deficiencies place on ICT adoption and on the intensity of ICT use post-adoption.
b) The study covers a number of European countries, namely Belgium, Denmark, France, Finland, Germany, the Netherlands, Spain, Sweden and the United Kingdom.
c) Shortage lists are now used in France, Italy, Spain and the United Kingdom and take various forms. One direct way to compile the list is to compare, for each occupation, the number of unfilled vacancies advertised at the public employment services with the number of unemployed persons. This method is used in Spain and the United Kingdom but tends to be biased towards low skilled occupations. In order to draw shortage lists for skilled work permit applications, the United Kingdom has recently developed and implemented a systematic methodology incorporating several of the measures of skill shortages outlined above, including, by occupation: vacancy rates, vacancy duration and application rates, wage changes and premiums and changes in unemployment and employment rates.
d) In countries where wages are relatively flexible, employers may be reluctant to raise wages to attract new recruits because they would have to raise wages of their internal incumbents for reasons of internal equity (Johansen and Strom, 2001).

2. Qualification mismatch

15. The mismatch between the educational qualifications held by a worker and those required by his/her job is by far the most studied concept of mismatch, mainly because data on workers' qualifications are more easily available than data on workers' skills. Over-qualification has received significantly more attention than under-qualification, because of fears that it may have been caused by the increased supply of university and college graduates over the past few decades in several OECD countries. In fact, the starting point in the academic literature is considered to be the analysis by Freeman (1976) who examined the falling rates of return to college graduates in the United States and linked them to the larger supply of graduates. Freeman's projections of further declines in the returns to college education were proven wrong in the years to come by several researchers (Smith and Welch, 1978; Bound and Johnson, 1992; Levy and Murnane, 1992; and Katz and Murphy, 1992) who pointed to rising wage premia paid to US college-educated workers alongside a further expansion in the number of workers who completed college in the country. Indeed, several researchers have shown that technical progress helped sustain the demand for skilled labour (Krueger, 1993; Acemoglu, 1999; Autor, Levy and Murnane, 2003) in the face of the ever rising supply.

16. Duncan and Hoffman (1981) were the first to analyse over-qualification from a micro perspective and found a rate of over-qualification of 42% in the United States in 1976. Since then, there has been an upsurge of interest, with studies in over 20 countries. Most of the research focuses on the Netherlands, Spain, the United Kingdom and the United States with a smaller number of studies on Australia, Belgium, France, Germany and Portugal. This increased interest has also generated a number of extensive reviews (Hartog, 2000; Groot and Maasen van den Brink, 2000a; Sloane, 2003; and McGuinness, 2006).

Measuring qualification mismatch

17. In order to determine whether a worker is over-qualified (or under-qualified), the required schooling for his/her job must be determined. Three measures of required education can be found in the literature: "normative", "statistical" and "self-declared". The "normative" approach uses an *a priori* presumed correspondence between education and occupations. For instance, using ISCO occupational coding, jobs in the "legislators, senior officials and mangers" category are presumed to require a tertiary qualification.[3] This measure is used frequently in the literature but it is based on the assumption that all jobs with the same title have the same educational requirement and that this is true in all countries using the same occupational classification,

18. In the "statistical" approach, the distribution of education is calculated for each occupation and employees who depart from the mean (Verdugo and Verdugo, 1989; Bauer, 2002) or mode[4] (Kiker *et al*., 1997; and Mendes de Oliveira *et al.*, 2000) by more than some *ad-hoc* value – generally, one standard deviation – are classified as over-qualified. These statistical definitions of required education have the advantage of always being available but suffer from several limitations: like the normative measure, they require the assumption that all jobs with the same occupational title have identical educational requirements; they are sensitive to cohort effects, especially in the case of a rapid change in the educational level required for a given occupation; and results depend on the level of aggregation necessary to obtain a reliable distribution of education.[5]

19. The "self-declared" approach consists in using individuals' opinions on whether their jobs match their level of education, either through direct questions or by asking individuals about the requirements of their current job (Sicherman, 1991; Sloane *et al*., 1999; Battu *et al*., 2000; and Dorn and Sousa-Poza, 2005).[6]

---

3. Studies on the United States generally use the Dictionary of Occupational Titles (DOT) to establish these correspondences (McGoldrick and Robst, 1996).

4. The mode has the advantage of being less sensitive to outliers and technological change.

5. Other more complex statistical methods are used in the academic literature. Nauze-Fichet and Tomasini (2002) measure over-qualification in France by relating it to wages. A person is classified as over-qualified if two-thirds of the individuals at the level of education immediately lower are better paid. Indeed, all else being equal, education should enhance the productivity of work and thus raise the expected wage rate. As a result, individuals who are paid significantly less than the wage corresponding to their level of education are considered to be over-qualified. Lainé and Okba (2005) use regression techniques to estimate the probability that a French youth leaving the education system will hold a low-skilled job – defined using the normative method – based on the level and field of the person's highest qualification and the place of residence. Over-qualified youth are those employed in low-skilled jobs when the statistical norm (in this case, estimated from a logistic model) would not predict such employment.

6. Chevalier (2003) mixes the "normative" and "self-declared" approaches to obtain a more refined measure of over-qualification. The author uses the "normative" method to determine whether an individual is over-qualified. Then, he uses a subjective question on the "satisfaction regarding the match between education and job" to divide the over-qualified between: apparently over-qualified (the *normatively* over-qualified satisfied with their match) and the genuinely over-qualified (the *normatively* over-qualified unsatisfied with their match).

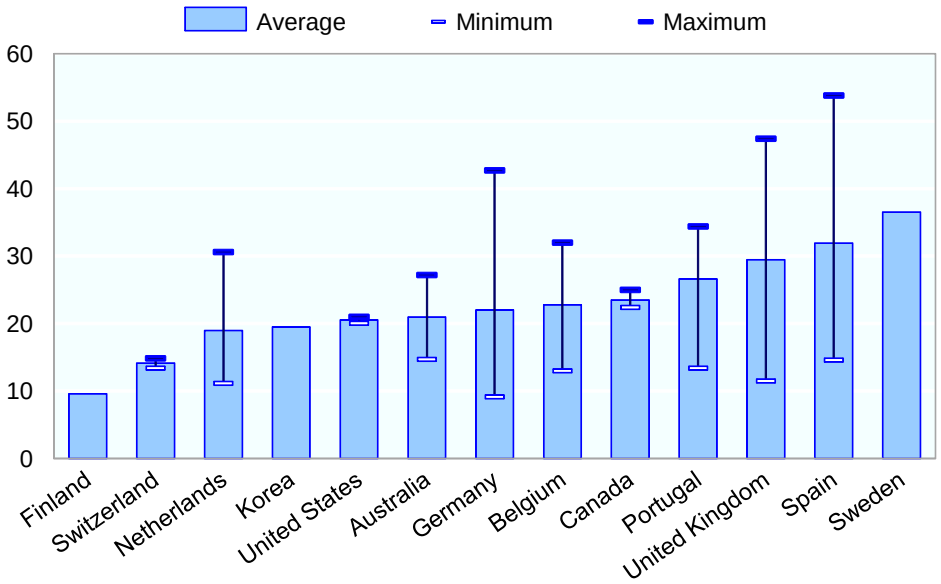
The incidence of qualification mismatch

20. It is difficult to summarise the rich literature on the incidence of over-qualification in OECD countries. For each individual country, there are often several studies available differing in the data used, the year of study, the socio-demographic group of interest and the method chosen to measure required qualifications. With these limitations in mind, Figure 1 shows the incidence of over-qualification in a number of OECD countries based on the meta analysis summarised in Table A1.1. For each country, only studies focused on the general population over the 1990s and 2000s are used to calculate the average shown. Where more than one study is available, the variation across studies is often quite large. Spain and the United Kingdom appear to have the largest incidence of over-qualification according to the average across studies but the difference between the minimum and maximum value recorded in the literature is very large. Groot and Maassen van den Brink (2000a) carry out a cross-country meta analysis of 25 studies and find an overall incidence of over(under)-qualification of 26% (33%), after controlling for study characteristics.

21. Most of the variation in the incidence of over-qualification presented in Figure 1 derives from the fact that different studies use different methods to measure required education. To isolate the effect of the measurement method on the incidence of over-qualification, some authors have computed this incidence using all three methods described above on the same data. McGoldrick and Robst (1996) compute over-qualification rates for the United States in the late 1970s/early 1980s and find substantial differences in estimated over-qualification depending on the measure of required schooling. The "normative" method classifies over half of both men and women as over-qualified. The "self-declared" method classifies 31.5% of women and 30.1% of men as over-qualified. The "statistical" method – based on the mean level of education by occupation – results in only 9.3% of women and 15.8% of men being classified as over-qualified.[7] Similar differences across methods are found in studies covering other countries (Table A1.1).

7. In their meta analysis, Groot and Maassen van den Brink (2000a) also find that, of the methods used in the literature to assess over-qualification, only studies using the statistical method yield significantly lower estimates of over-qualification than studies that use the other definitions.

Figure 1. **Incidence of over-qualification across studies,[a] selected OECD countries**



a) Only studies concerning the general population, referring to the 1990s or 2000s are included. Averages across gender are used where applicable but are not considered a source of variation. Variation comes primarily from the method used to estimate over-qualification but could also arise because of difference in the data used and the year of the study. For countries where one or more studies calculate several values of the incidence of over-qualification (by method and/or b y year), these individual values are used to determine the minimum and maximum reported for the country. Countries where minimum and maximum are not available are those for which only one study using a single method on a single year/period underlines the incidence of over-qualification reported in the figure.

Source: OECD elaboration of Table A1.1.

22. Beyond average incidence, there is evidence that the occurrence of over-qualification varies significantly by socio-demographic characteristics such as age, gender and ethnicity. There is extensive evidence that the incidence of over-qualification is larger for youth than for adults (Crompton, 2002; Dekker *et al*., 2002; Dorn and Sousa-Poza, 2006; and Vahey, 2000) and that immigrants are more likely to be over-qualified than native workers (Chiswick and Miller, 2005; Fernandez and Ortega, 2006; Kler, 2006; Lianos, 2007; Lindley, 2009; Messinis, 2008; OECD, 2007a; and Pohl Nielsen, 2007). Several theoretical explanations can be put forward to support the finding that youth are more likely to be over-qualified, based on their lack of work experience (*career mobility* theory) or on the fact that their skills are less likely to be apparent to prospective employers (*search* theory). On the other hand, the differences across immigrant status and ethnicity reflect a variety of factors including discrimination, the lack of language skills, the limited transferability and the quality of qualifications obtained in the home country and imperfect information concerning such qualifications (Battu and Sloane, 2004; Bonikowska *et al*., 2008; Chiswick and Miller, 2010; Støren and Wiers-jenssen, 2010). Some of these factors improve over time. For example, over-qualification may decline for immigrants as they accumulate host-country-specific human capital such as language skills and experience.

23. The evidence on differences in the incidence of over-qualification by gender provides more mixed results. Theoretically, more frequent over-qualification among (married) women is predicted by *spatial* models of job search. According to these models, husbands tend to optimise their individual job search while their wives are simply "tied movers" or "tied stayers" in the sense that their job search is undertaken under the condition that the job search of their husband is optimised. Indeed, most empirical studies find that women are more likely to be over-qualified in their job than men but the difference is sometimes very small and the reverse has also been found (Table A1.1). In addition, little support has been found so far for the hypothesis that over-qualification among married women is caused by dual job search

with their husbands.[8] Finally, 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 (Green *et al*., 1999).

The persistence of qualification mismatch

24. For policy-makers, the relevance of the spreading of over-qualification depends crucially on whether this type of mismatch is permanent or transitory. Unfortunately, evidence on this issue is mixed. The earliest research indicates that over-qualification is a temporary phenomenon, lending support to career mobility theory by which over-qualification affects mostly new entrants to the labour market who lack work-experience. Sicherman (1991) argues, using 1976 and 1978 Panel Study of Income Dynamics data for the US, that over-qualified workers have higher rates of firm and occupational mobility and are more likely to move to a higher-level job. Alba-Ramirez (1993) shows that in Spain the over-qualified improve their match quality over time and that over-qualification falls with age. Further support for career mobility theory is available in Robst (1995b) and more recently Wasmer *et al.* (2007). The latter look at several European countries and find some evidence that over-qualification is a transitory phenomenon (the probability of being over-qualified falls with labour market experience). Dorn and Sousa-Poza (2005) also find evidence to support the transitory nature of over-qualification using Swiss data but they do not ascribe it to career mobility. Instead, their paper provides an alternative explanation for this phenomenon; specifically, that the constant accumulation of experience and qualifications throughout a worker's career implies that, for a good job match to be maintained, qualification-specific job requirements must increase as the worker ages. Should this not occur, even older workers face a risk of becoming overqualified.

25. Recent research, however, finds evidence that a significant proportion of workers remains overeducated for longer periods. Büchel and Mertens (2004) find little support for career mobility theory for Germany. They find that the over-qualified are less likely to experience upward career mobility relative to the well-matched. In Canada, Frenette (2004) finds that over-qualification is quite stable between two and five years after graduation and this is inconsistent with career mobility and search theory. Dolton and Vignoles (2000) find that 38% of UK graduates from 1980 were over-qualified in their first job and 30% remained over-qualified six years later. For Sweden, Böhlmark (2003) examines the transitions between match types for 18-30-year-old youth and finds that 61% of those over-qualified in 1981 were still so ten years later. The equivalent figure between 1991 and 2001 is 54%. Even more seriously, he finds evidence of a deterioration in match quality amongst youth with some of them moving into over-qualification from being well matched. For the US, Rubb (2003a) uses late 1990s Current Population Survey data and finds that approximately three out of four over-qualified individuals in year *t* were over-qualified in year *t+1*. Similarly to Böhlmark (2003), he finds that 3% of well-matched individuals in year *t* become categorized as over-overqualified the following year.

26. Some authors have also questioned the role of job mobility in ensuring an improvement in the worker-job match. Sloane *et al*. (1999) find evidence that mobility may consist of moves from one state of over-qualification to another. Hysteresis or scarring effects are also found by McGuiness (2003a) and Dolton and Silles (2001) with the latter study finding that being over-qualified in the first job can permanently restrict graduates to low-level jobs. Battu *et al*. (2000) examine whether firms upgrade the tasks they give to their over-qualified workers. The authors test the hypothesis that there is convergence in graduates' skills and graduates' jobs over time so that over-qualification disappears. Convergence is tested via: *i)* a narrowing of the earnings gap; *ii)* rising job satisfaction amongst the over-qualified; *iii)* job characteristics; and *iv)* career prospects. The authors find no evidence that job quality for the over-qualified converges to that of well-matched graduates.

8. However, several studies have found evidence in favour of a more general prediction of *spatial* models that the size of the labour market is crucial in determining the likelihood of over-qualification (Büchel and Battu, 2003; Büchel and van Ham, 2002; McGoldrick and Robst, 1996; Ramos and Sanromá (2004); and Jauhiainen (2006).

The effect of qualification mismatch on earnings

27. A major line of research has developed concerning the effects of qualification mismatch on earnings. Most studies use the so-called ORU specification which includes years of over-, required and under-education, while a smaller number of studies control for the individual's qualifications and include dummy variables for over- and under-qualification. Under the ORU specification, the over-qualified are being compared to individuals doing the same job but who just possess the qualifications required by the job. Under the dummy variable approach, the over-qualified are compared to those with the same qualifications but who are well matched.[9] Empirical results (Table A1.2) suggest that individuals working in jobs for which lower qualifications than their own are required (over-qualified) are generally found to earn less than individuals with their same qualifications working in jobs for which these qualifications are required, but more than individuals working in an equivalent job and holding the qualifications the job requires. Conversely, individuals working in jobs for which higher qualifications are required (under-qualified) are generally found to earn more than individuals with the same qualifications and working in a job for which these qualifications are required, but less than individuals working in an equivalent job and holding the qualifications that the job requires. Groot and Maassen van den Brink (2000a) in their cross-country meta analysis of 25 studies report a return of 7.9% for one year of required education, a return of 2.6% to surplus education and a penalty of 4.9% for each year of under-qualification. It is worth noting that the choice of measure of required education has a large effect on the incidence of over-qualification but only a small one on the pay penalty associated with it (Groot and Maasen van den Brink, 2000; and Rubb, 2003b).

28. The evidence on the returns to over-qualification is consistent with a view of the labour market where wages are determined by both workers and job characteristics, as predicted by assignment models (Box 1). However, several authors have argued that wage equations may be picking up factors other than over-qualification, *i.e.* unobserved job and/or individual characteristics (McGuinness, 2006). Over-qualified workers may find themselves in that state because they possess different skills or abilities or motivation levels than those who are well matched: the over-qualified may be less able than the well-matched and the fact that they receive lower wages may reflect their lower ability. Over-qualification may not represent a labour market inefficiency. For example, Chevalier (2003) argues that the widening of access to higher education in the UK has increased the heterogeneity of graduates, for example, via low ability students entering the tertiary sector. Some estimates of over-qualification may then overstate the phenomenon, as some graduates are not endowed with the skills needed to obtain graduate jobs.

3. Skill deficits and skill underutilisation

29. As the recent academic literature has highlighted, qualification mismatch could partly be explained by skill heterogeneity among workers with the same qualifications. Hence, over-qualification could hide either real skill underutilisation (also referred to as over-skilling) – whereby over-qualified workers are indeed over-skilled for the job they hold – or skill heterogeneity – whereby over-qualified workers are apparently over-qualified for their job but in fact lack a variety of the skills required – occupation-specific and/or generic skills – to carry out a job corresponding to their qualifications, either skills or generic work skills.

9. Studies using the ORU specification generally find a lower, but still positive, return from years of overeducation relative to required education. The dummy variable approach tends to find a negative sign on the overeducation dummy: the overeducated earn less than their counterparts who are adequately matched. The findings from the ORU studies are not necessarily at odds with those that use the alternative methodology. A negative sign on the overeducation dummy does not imply a negative return to additional years of over-education. Instead, it indicates the extent to which over-educated workers are in lower-level jobs, when compared to appropriately educated individuals.

30. Although qualifications have been used extensively in the literature as a proxy for skills, several stylised facts point towards the existence of skill heterogeneity within educational classes. First, in most OECD countries, the share of the population holding at least an upper secondary qualification has risen over the past decades and this has been accompanied both by a higher return to years of education and by an increase in the variance of wage income within educational categories.[10] Second, some studies have shown that the incidence of over-qualification among graduates varies significantly by field of study (Battu *et al*., 1999; Dolton and Vignoles, 2000; Dolton and Silles, 2002; Chevalier, 2003; Wolbers, 2003; Büchel and Pollmann-Schult, 2004; and Frenette, 2004), suggesting that field-of-study mismatch – hence the lack of occupation-specific skills – may contribute to over-qualification.

31. The literature on skill mismatch is rather limited, particularly compared with the literature on qualification mismatch. This is due to the difficulty of identifying good measures of skills and the paucity of databases that include such measures. Some studies directly measure specific workers' skills – most often literacy and numeracy – and compare them with the level of the same skills required by the job they hold. Alternatively, skill mismatch is measured through self-assessment by workers who are asked whether they are able to use all their skills in their job – to measure skill underutilisation – and whether they would carry out their job better if they had additional skills – to assess skill deficits.[11] Both measurement methods have pros and cons. While direct methods allow studying deficits and underutilisation of specific skills, they provide only a partial view of the overall incidence of skill mismatch. On the other hand, self-assessment methods are useful to measure the overall incidence of skill mismatch but they do not provide information on what specific skills are most in deficit or excess.

Direct measurement of workers' skills and their use in the workplace

32. As mentioned above, some studies have explored skill mismatch by comparing the level of literacy and numeracy possessed by employees with that required by the job they carry out. Krahn and Lowe (1998) use the International Adult Literacy Survey to compare the literacy level of Canadian employees – measured through reading, writing and numeracy tests – with the frequency with which literacy tasks are performed in the workplace. The authors find that literacy mismatch affects approximately a quarter of workers, with 21% of employees underusing their literacy skills and another 5% suffering from a skill deficit in literacy. The authors find that women, young workers, workers in non-supervisory jobs, the self-employed, and part-time and temporary workers were the most likely to under-utilise their literacy skills.[12] Ryan and Sinning (2009) develop similar measures for Australia using the Survey of Aspects of Literacy and the Adult Literacy and Life Skills Survey. They compare workers'

10. Ingram and Neumann (2006) have explored the difference between the return to years of education and the return to various dimensions of skill and found that, after accounting for other elements of skills, the return to years of education has remained constant in the US since 1970. Moreover, they show that variations in direct measures of skill, such as mathematical ability, account for a substantial fraction of the increased dispersion in income among university graduates, and some of the increase in wage dispersion among their less-qualified counterparts.

11. The way these questions are formulated varies across databases and is key to ensure that skill mismatches are measured appropriately. The literature suggests that questions on skill deficits are particularly difficult to formulate. Indeed, the weak evidence on the effect of skill deficits on wages, job satisfaction and job turnover has been blamed on the lack of discriminatory power of the skill deficit indicators derived using self-assessment questions (Allen and van der Velden, 2001).

12. Boothby (2002) also exploits Canadian data from the International Adult Literacy Survey to disentangle the relationship between schooling, literacy and occupational characteristics. He concludes that literacy plays a significant role in occupational assignment, independent of the role of schooling, suggesting that employers are capable of determining their employees' literacy skills by more accurate means than simply depending on the level of schooling.

literacy/numeracy and their use of literacy/numeracy at work and, unsurprisingly, find that the two are correlated. Unfortunately, the authors do not use the measures they derive to assess the incidence of literacy/numeracy skill mismatch in the Australian labour market.

Self-reported skill underutilisation and skill deficits

33. Another small strand of academic literature has focused on self-reported discrepancies between workers' overall skill level and the skills used at work. Many of these studies aim to test whether qualification mismatches imply skill mismatches which in turn have an effect on productivity and wages, as suggested by assignment theory. Despite being key to understand the origin of qualification mismatch, this is an issue that remains unexplored in many OECD countries and for which many questions remain unanswered. This is partly due to the lack of data and the difficulty in measuring skill mismatch, hence measurement and data sources are described in detail in what follows.

The Netherlands

34. The first comprehensive study of the interactions between qualification and skill mismatch was conducted by Allen and van der Velden (2001) for the Netherlands. The authors use the Higher Education and Graduate Employment in Europe database – an international comparative study of the labour market situation of university and tertiary vocational graduates in 11 European countries and Japan. They exploit the cohort of youth who graduated in 1991 and study their labour market situation seven years later, in 1998. Self-declared required education is used to obtain measures of over- and under-qualification. Skill underutilisation is measured by the extent to which one disagrees with the statement: "My current job offers me sufficient scope to use my knowledge and skills". A skill deficit is measured by the extent to which one agrees with the statement: "I would perform better in my current job if I possessed additional knowledge and skills". Using these indicators, skill underutilisation is found to affect 14% of Dutch university graduates and 15% of Dutch tertiary vocational graduates and skill deficits are found to concern about half of the graduates in each group.

35. If the assignment theory explanation of mismatches was valid, qualification mismatch would imply skill mismatch: one should find that individuals working below their own qualification level are underutilising their skills while individuals working above their level lack some of the knowledge and skills required to perform optimally in their job. Data for the Netherlands do not support this view. Allen and van der Velden (2001) find that while a good match in terms of formal qualifications improves the chances that a graduate will be given the opportunity to use his/her knowledge and skills, this is neither a necessary nor a sufficient condition for skill utilisation: even graduates whose qualifications match their jobs report rather severe underutilisation. Also, a large proportion of all categories of graduates – over-qualified, under-qualified or well-matched – report rather high levels of skill deficits. Assignment theory would also predict that the effects of qualification mismatch on wages[13] should be accounted for by skills mismatch. However, Allen and van der Velden (2001) find that this is not the case. The effect of over-qualification in a wage equation is only slightly reduced when skill underutilisation is included and there is a distinct, albeit small, effect of skill underutilisation on wages. Allen and van der Velden (2001) suggest an explanation drawn from human capital theory for the effects they observe, whereby qualification mismatches are primarily due to differences in unmeasured skills among graduates – namely, graduates with the same qualifications but differing skills are sorted in the market, with the most competent obtaining jobs "above their qualifications" and the least competent obtaining jobs "below their qualifications". The authors' results also suggest that this heterogeneity coexists with a separate, small but significant, effect of skill mismatches on wages.

13. In wage equations, Allen and van der Velden (2001) compare over-qualified and under-qualified workers to well-matched workers with the same qualifications.

Australia

36. Self-assessment methods have also been used in several studies measuring skill underutilisation in Australia. These studies exploit the Household, Income and Labour Dynamics in Australia (HILDA) survey which asks all employed respondents the extent to which they agree with the statement: "I use many of my abilities in my current job". Responses to this statement take values of 1 (strongly agree) to 7 (strongly disagree) and much of the analysis has focused on so-called "severely over-skilled workers" – whose skills are most severely underutilised – reporting values of 6 or 7. Mavromaras *et al*. (2009a) find that about 11.5% of working age employees in full-time employment in the 2004 and 2005 waves of HILDA were severely over-skilled.[14] In line with Allen and van der Velden (2001), the authors report only a weak correlation between over-qualification and over-skilling. Also in line with international evidence, Australian workers who are severely over-skilled are found to be paid less, on average, than their equally skilled, well-matched, counterparts. Interestingly, Mavromaras *et al*. (2009a) find that as the level of highest educational attainment increases, the incidence of over-skilling decrease but the wage penalty increases. [15]

37. Exploiting the same data source, McGuinness and Wooden (2007) explore the *persistence* of over-skilling among Australian employees. They find that while over-skilled workers are much more likely to change jobs only a minority actually find jobs which provide a good skill match: of those workers who left their job voluntarily in 2001, only 19% were in jobs for which they were well-matched the following year and only 23% were well-matched three years later.[16] Finally, Mavromaras *et al*. (2007b) compare over-qualification to over-skilling in Australia using a methodology similar to that employed by Allen and van der Velden (2001) for the Netherlands. The outcome is very similar: the coefficient of the over-skilling variable in a wage equation is robust to the inclusion of the over-qualification measure.

Great Britain

38. Green and McIntosh (2007) study qualification/skill mismatch in Britain using the second Skill Survey conducted in 2001. In the survey, employees are defined as over-skilled if they disagree or strongly disagree with the statement "In my current job I have enough opportunity to use the knowledge and skills that I have"; or if they answer little or very little to the question "How much of your past experience, skill and abilities can you make use of in your present job". Employees are defined as under-skilled if they strongly disagree with the statement "I would perform better in my current job if I possessed additional knowledge and skills". Using these indicators, the authors calculate that 35% of UK employees were over-skilled in 2001 and 13% were under-skilled. Employees who claim to have unused skills and abilities work in jobs where low importance is attached to professional communication, planning, numeracy,

14. Another 31% of employees in the sample were moderately over-skilled (values 4 and 5 in their responses) and 58% considered themselves well matched (values 1 to 3).

15. For instance, individuals with the lowest educational attainment are the most likely to consider themselves as severely over-skilled but are the least likely to suffer a wage penalty, although the absence of a wage penalty may be due to the fact that the least qualified are the most likely to be employed at or near the minimum wage. At the other extreme, university-qualified employees represent a challenge: they are by far the best matched employees in the Australian labour market but those among them who are severely over-skilled suffer a 25% wage penalty compared with their well-matched counterparts. Upper secondary school drop-outs – those who start upper secondary education but do not graduate – are found to be the most problematic group, with high over-skilling and high wage penalties, while upper secondary graduates are the least problematic group.

16. Mavromaras *et al*. (2007a) extend the persistence analysis by one year and find that 30% of voluntary job leavers in 2001 were employed in well-matched jobs four years later, possibly suggesting some slow improvement in skill mismatch over time.

literacy and problem solving skills. Mismatched employees are found to be non-prime age, to have family responsibilities and to work in unstable forms of employment – notably, part-time and shift work in the private sector. In line with studies for Australia and the Netherlands, Green and McIntosh (2007) find little correlation between qualification mismatch and skills mismatch and show that, holding constant the extent of skill underutilisation, over-qualified workers still earn less than their well-matched counterparts with the same qualifications.

39. Mavromaras *et al*. (2007b) also assess the incidence of over-skilling in Britain and compare it with the results obtained for Australia. The methodology is very similar to that used for HILDA and data are taken from the British Workplace Employment Relations Survey (WERS), a cross-section database of establishments and their employees. The WERS measure of over-skilling is derived from responses to the question: "How well do the skills you personally have match the skills you need to do your present job?". There is a five-point scale with respondents answering that their own skills are much higher to much lower than needed. Employees who reply that their skills are much higher than required are classified as severely over-skilled. The authors find that the incidence of over-skilling, estimated at 21% in 2004, is much higher in Britain than in Australia and that, in Britain, this incidence does not vary much across educational attainment (ranging from 18% to 21%). According to this study, not only does Britain suffer from more extensive over-skilling than Australia but over-skilling also has a more negative impact on wages.

Portugal

40. Cabral Vieira (2005) explores skill mismatch in Portugal using the European Community Household Panel for the years 1994-1999. The author defines over-skilled individuals as those who answer positively to the question "Do you feel that you have skills or qualifications to do a more demanding job that the one you now have?". Using this definition, 47% of Portuguese employees in the survey are classified as over-skilled. This compares with an incidence of over-qualification of 33.3% in the early 1990s (Martins, 2001).

41. Overall, findings for these four countries suggest that to a large extent over-qualification is likely to hide skill heterogeneity – a skill deficit of over-qualified workers relative to well-matched workers with the same qualifications – rather than a systematic underutilisation of skills. However, skill mismatch is widespread in some countries and is found to have an impact on wages, albeit modest. Skill mismatch also appears to affect a much broader proportion of the labour force than over-qualification which is typically concentrated among tertiary graduates.[17]

4. The consequences of mismatch on workers, firms and the economy

42. As far as workers are concerned, the main consequence of being mismatched at work is that they are likely to be paid less as a result. Because wage penalties are an intrinsic part of the measurement issue, they have been discussed at length in the previous sections. Overall, there is evidence that over-qualified workers earn less than their well-matched equally-qualified counterparts and under-qualified workers earn less than well-matched individuals doing their same job. The literature on skill mismatch shows this may be because qualification does not entirely reflect workers' skills.

17. Given much more significant measurement difficulties than with over-qualification, it is possible that these results derive from bad measurement of skill mismatch. However, the strongly significant and negative effect of the over-skilling variable on wages in most studies, suggests that the over-skilling measures contain some important information. More doubts remain on the measures of skill deficits.

43. Beyond wage penalties, several studies have explored the effect of qualification mismatches on job satisfaction, job mobility and training participation.[18] The results vary depending on the method used to measure over/under-qualification and on whether over/under-qualified workers are compared to matched workers with their same qualifications or with well-matched workers in a similar job.

44. Across studies and methods, over-qualified workers are found to be less satisfied with their job than well-matched workers with the same qualifications and the results are statistically significant (Tsang, 1987; Battu *et al.*, 2000; Verhaest and Omey, 2006b; and Verhofstadt and Omey, 2007). Most studies, but not all, find that over-qualified workers are also less satisfied than well-matched workers in the same job (Hersch, 1991; Tsang *et al.*, 1991; and Verhaest and Omey, 2006b). For under-qualified workers, the findings in the literature are inconsistent, with both positive and negative coefficients, often statistically insignificant. Skill mismatch has also been found to reduce job satisfaction. Cabral Vieira (2005) finds that skill underutilisation reduces job satisfaction overall and on several dimensions of satisfaction – satisfaction with pay, job security, type of work and number of hours worked – taken separately. In fact, in their study of qualification and skill mismatch in the Netherlands, Allen and van der Velden (2001) claim that skill mismatches are much better predictors of job satisfaction than qualification mismatches.

45. Many researchers have argued that the effect of qualification mismatches on wages and job satisfaction may have implications for the mobility behaviour of workers. Indeed, a number of studies have found that over-qualified workers are significantly more mobile than well-matched workers with the same qualifications (Hersch, 1991; Sicherman, 1991; Robst, 1995b; and Verhaest and Omey, 2006b) and Allen and van der Velden (2001) suggest that this positive relationship may be due to skill mismatch. Compared with well-matched workers holding a similar job, the over-qualified were also found to be more mobile (Tsang *et al.*, 1991; Robst, 1995b; and Büchel, 2002), although the results were not always statistically significant. Only Robst (1995b) found a negative and significant effect of under-qualification on job and occupational mobility within a year of being hired.[19]

46. Finally, Hersch (1991), van Smoorenburg and van der Velden (2000), Büchel and Mertens (2002) and Verhaest and Omey (2006b) find that over-qualified workers are less likely to take part in training than well-matched workers with the same qualifications and the results are statistically significant and robust to the method used to measure over-qualification.[20] On the other hand, under-qualified workers have a higher probability of being trained than well-matched workers with the same qualifications (Büchel and Mertens, 2004; and Verhaest and Omey, 2006b). However, when mismatched workers are compared with well-matched workers in the same job, the over-qualified are found to get more training (Büchel, 2002; and

18. While most of the literature focuses on these three aspects, De Grip *et al*. (2007) also explore the effect of mismatch and cognitive decline. They find that over-qualified workers experience a cognitive decline as a result of skill underuse – notably, in memory, cognitive flexibility and verbal fluency – while under-qualified workers experience more cognitive resilience.

19. Mobility measures vary across studies as follows: on-job-search (Hersch, 1991; Robst, 1995b; and Allen and van der Velden, 2001); job change (Robst, 1995b and Verhaest and Omey, 2006b); tenure (Büchel, 2002); firm change (Sicherman, 1991); occupation change (Sicherman, 1991); and quit intentions (Tsang *et al.*, 1991).

20. Wolbers (2003) questions this result in his study of field-of-study mismatch among school leavers. The author finds that the negative effect of mismatch on training disappears once differences in training participation across countries are taken into account. The effect of mismatch on training is even found to be positive once the vocational orientation of the education system – the share of school-based vocational education and the share of apprenticeship-type training – is included as an explanatory variable of training participation although this positive effect is decreasing with the extent of vocational orientation. Put more simply, in countries where the share of school-based and apprenticeship-type vocational education is low, the impact of skills mismatch on training participation is positive.

Verhaest and Omey, 2006b) and the under-qualified get less, although for the under-qualified the coefficient is hardly ever statistically significant.

47. At the firm level, the reduction in job satisfaction and increase in job mobility documented above are likely to affect productivity. Unfortunately, very few studies have addressed this issue directly and the results are mixed. Tsang (1987) was the first to assess the impact of the underutilisation of employees' qualifications on firms' output. The author uses a database of 22 U.S. Bell companies[21] for the period 1981-1982 and finds that over-qualification is negatively and significantly related to firm output: a one year reduction in the level of over—qualification of employees is associated with an 8.4% gain in additional output. More recently, Rycx (2011), exploits linked employer-empoyee data for Belgium and shows that productivity – measured as average value-added per worker – depends significantly on qualification mismatch. However, contrary to Tsang (1987), the author finds that over-qualification increases productivity.

48. At the aggregate level, several researchers have argued that a rise in skill mismatches is likely to cause higher (structural) unemployment and increase unemployment persistence (Jackman *et al.*, 1991; Sneessens, 1995; Manacorda and Petrongolo, 1998; Thissé and Zebou, 2000; Marsden *et al.*, 2002; Skott and Auerbach, 2003; and Olitsky, 2008) but empirical evidence is mixed. A small number of papers have studied the impact of skill mismatch on wage inequality. Skott and Auerbach (2003) develop a theoretical model in which a negative skill-neutral shock forces high-skilled workers to accept low-skill positions and low-skilled workers to lose their job, hence it causes an increase in wage inequality both between and within skill groups and an increase in unemployment, particularly among low-skilled individuals. Findings by Slonimczyk (2009) using US data are consistent with the predictions of this model. The author finds that a substantial fraction (11% for men and 32% for women) of the increase in wage dispersion[22] during the period 1973/2002 was due to the increase in over-qualification rates and over-qualification premia. Similarly, Budría and Egido (2008) use Spanish data to show that the incidence of mismatch contributes to increase wage differences within education groups by driving a wedge between matched and mismatched workers.

49. Finally, Mavromaras *et al*. (2007) attempt to quantify the impact of skills mismatch on GDP. To do so, they exploit the estimated wage penalty associated with over-skilling as a proxy for productivity losses. The authors use their estimated over-skilling wage penalties by educational attainment to derive average yearly losses per Australian worker. Then, they multiply the number of over-skilled workers at each educational attainment by their penalty to obtain an aggregate cost of over-skilling in Australia of 2.6% of GDP in 2005.[23]

5. The causes of skill mismatch

50. The determinants of skill mismatch are both cyclical and structural. On the one hand, skill mismatch has been found to be procyclical with recessions causing firms to separate from the matches with the lowest productivity.[24] On the other hand, some structural changes – such as the adoption of new

21. Active in the telephone and telegraph industries.

22. Measured by the coefficient of variation of log earnings.

23. Dearden *et al*. (2006) have found that wage effects tend to be around half as large as the total productivity impacts, in their study of the relationship between training, wages and productivity in the United Kingdom. As a result, Mavromaras *et al*. (2007) argue that their estimate of the cost of over-skilling on the economy may just be a lower-bound of the real effect.

24. Olitsky (2008) finds that the proportion of unskilled workers in skilled jobs and the overall proportion of mismatches are negatively correlated with the unemployment rate in the United States. Although this result is at odds with the prediction of models with one type of worker and one type of firm, the author finds that it is consistent with a model where unskilled workers are allowed to accept complex jobs.

technology – require skills that are not immediately available in the labour market. While education/vocational systems adapt to these new skill requirements, firms experience skill gaps between their employees' skills and those required by the jobs they fill.[25] Also, the institutional framework regulating the labour market will influence the speed at which firms are able to adapt to structural change.

51. Very few empirical studies have looked at the determinants of skill mismatch, mostly because of the difficulty in identifying and/or collecting data on a suitable cross-country longitudinal measure of mismatch as dependent variable. The few researchers who have approached the task have looked at measures of matching inefficiency, derived from the job search and matching literature. Marsden *et al*. (2002) explore the effect of demand, supply and institutional factors in European countries using the indicator developed by Layard *et al*. (1991) which consists of the variance of skill specific unemployment rates.[26]

52. Because of its broad range of explanatory factors – covering the business cycle, the education system, several labour market institutions, technological change and international competitiveness – the study by Marsden *et al*. (2002) is the most comprehensive available so far.[27] Unfortunately, not all of the explanatory variables are found to have a statistically significant impact on skill mismatch and some turn out to have the opposite of the expected effect. The share of employment in small firms, the incidence of long-term unemployment and union density are found to increase skill mismatch, as expected. Expenditure on education and training, the degree of co-ordination in wage bargaining and the share of tertiary educated individuals in the labour force are found to decrease skills mismatch, as expected. On the other hand, contrary to expectations, employment protection regulation and international competition are found to reduce skills mismatch. It is also noteworthy that institutions by themselves – expenditure on education and training, expenditure on active labour market policies, employment protection regulation, union density and wage bargaining co-ordination – poorly explain the variance in skill mismatch across countries and over time while market factors – both demand and supply ones – have a much higher explanatory power.

53. In the work by Marsden *et al*. (2002), technological progress, measured as expenditure in R&D, is not found to affect skills mismatch. On the other hand, Haskel and Martin (2001) use UK firm-level data

25. In addition to generating skill shortages and skill deficits, technological change has also been linked to over-qualification and under-qualification, although through a somewhat different mechanism. Mendes de Oliveira *et al*. (2000) argue that qualification mismatches arise if new graduates are equipped with skills that are better aligned with emerging technology while firms are slow to adjust to new technology. As a result, these new workers are over-qualified and, as firms adapt to new technologies, existing workers become under-qualified. This demand-side argument is often used by commentators to justify the existence of over-qualification but assumes that the over-qualified are indeed over-skilled which has been questioned by some, as seen above.

26. This indicator is $\frac{1}{2}\mathrm{var}(u_i/u)$, where u_i is the unemployment rate relative to the ith skill group and u is the national unemployment rate.

27. In addition to time fixed effects to capture the cyclicality of mismatch, the explanatory factors include the following (variable/data used; expected sign of the effect on mismatch): skill-biased technological progress (private R&D expenditure; positive); international competition (the sum of imports and exports as a percentage of GDP; positive); information costs (the incidence of employment in small firms; uncertain); the level of skills (the incidence of tertiary-educated people in the labour market; negative); the speed at which skills become obsolete (the incidence of long-term unemployment; positive); the extent of migration (the incidence of EU immigrants in the labour force; negative); investment in education (expenses in education and training as a percentage of GDP; negative); investment in active labour market programmes (total expenses in active labour market policies as a percentage of GDP; negative); employment protection regulation (OECD indicator of employment protection regulation; uncertain); wage bargaining framework and wage compression (union density; positive); and the level of co-ordination between wage-bargaining parties (index of bargaining and co-ordination; negative).

and find that skills deficiencies are significantly higher for high-tech establishments.[28] Similarly, Robson (2006) explores the effect of structural change[29] on the efficiency of matching in UK regions exploiting the index of sectoral shifts developed by Lilien (1982).[30] His findings suggest that an increase in sectoral shifts may lead to an increase in the degree of mismatch between the skills possessed by on-the-job searchers and the skill requirements of local employers. Robson (2006) also explores the role of the degree of specialisation in regional employment in the efficiency of the matching process but finds no evidence to support the expected positive effect.

54. Some of the results obtained from micro-econometric studies of the determinants of over-qualification also provide some insights on the factors that influence the incidence of skill mismatch at the aggregate level. Employees in unstable jobs – notably, part-time work and shift-work – are found to be more likely to be over-qualified (Dolton and Silles, 2002; Wolbers, 2003; and Green and McIntosh, 2007) along with workers in the retail sector (Dolton and Silles, 2002) and in SMEs (Dolton and Silles, 2002; and Wolbers, 2003). On the other hand, academic achievement – notably, graduating with honours – reduces the probability of being over-qualified (Battu *et al*., 1999; Dolton and Silles, 2002; and Büchel and Pollmann-Schult, 2004). Also, Battu *et al*. (1999) and Büchel and Pollmann-Schult (2004) find that geographical mobility reduces the risk of qualification mismatch and Wolbers (2003) shows that working on a temporary contract increases it. Finally, studies finding that graduates of certain fields of education – notably, humanities – are more likely to be over-qualified than others (Battu *et al*., 1999; Dolton and Vignoles, 2000; Dolton and Silles, 2002; Chevalier, 2003; Wolbers, 2003; Büchel and Pollmann-Schult, 2004; and Frenette, 2004) point to the potentially important role played by career guidance in tackling over-qualification.

55. Unfortunately, there is evidence that results obtained from micro-econometric analysis are sensitive to the measure of skill/qualification mismatch used. Verhaest and Omey (2009) test the consistency of results obtained using different measures of educational mismatch while studying the determinants of over-qualification in the Netherlands. Only two findings are found to be robust to the measure used: *i*) working while studying does not reduce the likelihood of over-qualification at graduation; *ii*) academic achievement reduces the likelihood of over-qualification.

6. What can be done to tackle mismatch

56. Only a small number of studies in the extensive mismatch literature discuss policy initiatives to tackle the discrepancies between the demand and supply of skills. Two general messages emerge (Kalleberg, 2006). First, policy interventions designed to reduce mismatches require the co-operation of the many different actors involved in generating jobs, acquiring skills and bringing jobs and workers together: employers, individual workers, central and local governments, public employment services and the social partners. Second, despite these interactions, 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 drives the evolution of the occupational structure – hence for policy interventions to be effective they need to be sensitive to these trends.

28. The variable used by Haskel and Martin (2001) is constructed based on the question "would you say that this establishment has experienced a skill shortage?". Hence, the answers could reflect either skill deficiencies in the existing workforce or difficulties in hiring new workers.

29. New technologies are often accompanied by structural change.

30. Lilien's index is a weighted standard deviation of sectoral employment growth relative to aggregate employment growth.

The role of initial education and adult education and training

57. A well functioning education and training system – including initial education and adult education and training – should be associated to lower levels of persistent mismatch between the skills of its graduates and those required by the labour market. Many analysts consider the too-rapid rise in the number of university graduates relative to demand as the main determinant of qualification mismatch. Also, employers often blame initial education for not providing youth with the skills needed on the labour market.

58. Although there is evidence that quantity is important[31], quality and responsiveness to labour demand are key in the context of education policy. Indeed, research reviewed in Section 3 shows that over-qualification often hides skill heterogeneity, hence it may not be the result of a quantitative mismatch between the number of tertiary graduates and the number of graduate jobs but rather a matter of skills that new hires lack despite having a tertiary degree.[32] The responsiveness of the education system to changes in skill demand is also crucial although it is important to avoid running into the so-called "lump-of-labour fallacy" by which the number of jobs available in the economy is fixed. For instance, the availability of a larger number of university graduates should encourage firms to move towards production technologies that require a more intensive use of high-skilled workers.

59. In the context of reducing mismatch, a difficult question regarding education and training policy is what area of learning – general, vocational or work-based – should be the focus of attention. Differences in mismatch between academic and vocational education at the secondary level are difficult to gauge because of the very general nature of academic learning at that level. However, there is little evidence that vocational graduates are not confronted with mismatch issues when entering the labour market. In Spain, 39% of secondary vocational students who graduated in 2004 were mismatched in their first job (OECD, 2007b) and in Greece the share of secondary vocational graduates of 2000/01 who were mismatched seven years later was as high as 70% (Rouseas and Vretakou, 2008). Moreover, Wolbers (2003) finds that the incidence of skills mismatches 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. Only Mavromaras *et al*. (2009b) find that post-secondary vocational qualifications reduce the likelihood and persistence of being over-skilled at work in Australia compared with secondary and university education.

60. Finally, adult learning and training – including when they are part of an activation programme for the unemployed – are important in addressing skill obsolescence as well as new skill requirements driven by technological change. Both the unemployed and over-skilled workers risk suffering from skill obsolescence resulting from not using (some of) their competences for a prolonged period of time. Even individuals who are hired in a job corresponding to their skills may need to learn new competencies at some point – notably because of the introduction of new technologies – to avoid becoming under-skilled. Unfortunately, there are no studies exploring the effect of participation in adult learning or training in the context of re-employment programmes on skill mismatch. And there is only limited evidence that the unemployed participating in existing training programmes are more likely to find work than non

31. The debate on whether expanding tertiary education reduces or not skills imbalances is an open one. Marsden *et al*. (2002) find that both the expenditure in education and training and the share of tertiary-educated workers in the labour force help reduce shortages. On the other hand, many analysts consider that over-qualification results from a (temporary) quantitative mismatch between the supply and demand for tertiary-educated workers. This need not be inconsistent with the finding that over-qualification hides skill heterogeneity if the expansion in tertiary education enrolments was achieved by giving access to lower-ability students.

32. 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.

participants (Martin and Grubb, 2001). On the other hand, there is a reasonable amount of 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).

Labour market institutions

61. The institutional framework regulating the labour market is regarded by most researches as an important dimension in explaining the difficulties of some economies in adapting to changing conditions. In the presence of new skill requirements, firms need to adjust wages and/or workforce composition in order to avoid skill mismatch. Labour market institutions that hamper these adjustments are likely to worsen skill mismatch.

62. Stringent regulations on the firing of permanent employees make it more difficult for firms to resolve mismatch between the demand and supply of skills by adapting the workforce structure. On the other hand, in several countries, the use of fixed-term contracts and temporary work agency contracts allows firms to get around strict firing rules while adjusting to new skills requirements.[33]

63. Rigid wage-setting institutions – notably, some collective bargaining systems or public wage policies in place for specific professions[34] – may prevent wages from adjusting in response to skill mismatch.[35] Several aspects of collective bargaining are relevant in this context. First, the presence of strong unions – *i.e*. high union density or broad coverage of collectively bargained agreements – is usually associated with lower intra-firm wage differentials and more homogeneous pay systems, rarely based on individual ability and performance (OECD, 2004). Second, the degree of centralisation – *i.e.* the level where collective contracts are negotiated – also affects the extent to which wages can adjust to different skill endowments. Wage adjustments in the face of mismatch are less likely to occur in countries where bargaining is carried out predominantly[36] by national unions and employers associations. Finally, the extent of co-ordination in wage bargaining – *i.e*. the extent to which pay negotiations are co-ordinated between actors across the economy – can worsen or improve the effects of the other collective bargaining features on wage flexibility. What degree of co-ordination is most likely to reduce skill mismatch remains largely an empirical question. Overall, there is evidence that systems with high unionisation, high coverage and where bargaining is co-ordinated and/or centralised – the so-called "corporatist" wage-bargaining systems – reduce the responsiveness of industry and firm-level wages to sectoral price and productivity developments (Holmlund and Zetterberg, 1991; and Teulings and Hartog, 1998). Consistently with this view Marsden *et al*. (2002) find that the degree of unionisation is positively correlated with skill mismatch but that co-ordination in wage bargaining reduces mismatch.[37]

---

33. Marsden *et al*. (2002) argue that it is also possible that employment protection regulation discourages job creation and destruction to such an extent that the *status quo* prevails and there is little change in the structure of skills in response to technical change, hence little skill mismatch. The authors interpret the negative sign of the employment protection regulation index on their measure of mismatch as evidence to support this explanation.

34. For instance, in some countries, the wage rates of health professionals are capped.

35. As mentioned in section 1, in perfectly competitive labour markets, wages should adjust to the existence of skill mismatch driving individuals' skill-acquisition decisions and thus helping to re-equilibrate the demand and supply of skills.

36. In many countries, bargaining occurs at multiple levels.

37. Marsden *et al*. (2002) justify this result by suggesting that because high co-ordination systems have the potential to reduce conflict between the bargaining parties and facilitate an overall view of the economy, they may help solve some mismatch problems.

Work-based training

64. There is some evidence that work-related training could alleviate skill mismatch. On the one hand, for under-skilled workers training is a means of acquiring the competencies they lack in order to earn a wage commensurate with the type of work they undertake. On the other hand, for workers who begin employment with the required level of skills or with more skills than necessary, training could help avoid or "repair" skill obsolescence caused by human capital depreciation. Skill obsolescence is particularly relevant, for both over-skilled and under-skilled workers, 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).

65. In this respect, Messinis and Olekalns (2007) exploit Australian data to show that the financial disadvantage of being under-qualified can be improved through subsequent training. The authors also find a wage benefit to training for the over-qualified although the benefit for the under-qualified is bigger. Unfortunately, the data used in the study does not allow determining whether training was provided by the employer with the express objective of reducing skill mismatch. Also, Fang (2009) finds no direct effect of skill shortages on firms' training expenditure per employee.

7. Conclusions

66. This paper has reviewed existing academic literature on the incidence of qualification and skill mismatch. Empirical evidence shows that qualification mismatch is widespread in many OECD countries but estimates of its incidence vary significantly across different methods used to measure it. Some groups of workers – notably youth and immigrants – are consistently found to be more affected by qualification mismatch than average while the evidence on differences across gender is mixed.

67. Although qualifications are a good approximation of competences when information on skills is not available, empirical evidence shows that a good match between qualifications and job requirements is neither a necessary nor sufficient condition for a good skill match. The inverse is also true and qualification mismatch does not always imply skill mismatch. These findings suggest that qualification mismatch may be due primarily to skill heterogeneity but that skill underutilisation and skill deficits do exist and have important implications for job satisfaction and turnover and, to a smaller extent, wages.

68. So far, studies on skill mismatch are very few and focused primarily on Australia, the Netherlands and the United Kingdom. A priority for future OECD-EC research is to extend the analysis to more countries and study the interaction of skill mismatch and qualification mismatch using comparable cross-country measures. Secondly, while the persistence of qualification mismatch has been explored extensively, little is known of the persistence of skill mismatch. Also, more research needs to be carried out on firms that suffer skill mismatch to understand: on the one hand, what occupations, in what industries, are more likely to be filled by mismatched workers; and on the other, what actions are taken by firms – such as training and changes to the organisation of work – to remedy mismatch among their workforce. Finally, it is essential to shed light on the causes of skill mismatch in order identify what policy interventions would work best to reduce it.

69. Despite this rich research agenda, a word of caution is needed concerning the significant data constraints faced when attempting to measure skills in general, and skill mismatch in particular. The use of proxies may be needed and some issues may find only preliminary answers.

BIBLIOGRAPHY

Abraham, K. (1987), "Help-Wanted Advertising, Job Vacancies and Unemployment", *Brookings Papers on Economic Activity*, Vol. 1, pp. 207-248.

Acemoglu, D. (1999), "Changes in Unemployment and Wage Inequality: An Alternative Theory and Some Evidence", *American Economic Review*, Vol. 89, No. 5, pp. 1259-1278.

Ahn, J., S. Moon and Y. Lee, (2001), "Mismatch and Job Satisfaction of Korean Workers", mimeo.

Alba-Ramirez, A. (1993), "Mismatch in the Spanish Labor Market: Overeducation?", *Journal of Human Resources*, Vol. 27, No. 2, pp. 259-278.

Alba-Ramirez, A. and M. Blázquez (2004), "Types of Job Match, Overeducation and Labour Mobility in Spain", in F. Buchel, A. de Grip and A. Mertens (eds.), *Overeducation In Europe: Current Issues In Theory and Policy*, Edward Elgar, Cheltenham.

Allen, J. and E. De Weert (2007), "What Do Educational Mismatches Tell Us About Skill Mismatches? A Cross-country Analysis", *European Journal of Education*, Vol. 42, No. 1, pp. 59–73.

Allen, J. and R. van der Velden (2001) "Educational Mismatches versus Skill Mismatches: Effects on Wages, Job Satisfaction, and On-the-Job Search", *Oxford Economic Papers*, Vol. 53, No. 3, pp. 434-452.

Alpin, C, J. Shackelton and S. Walsh (1998), "Over and Under-Education in the UK Graduate Labour Market", *Studies in Higher Education*, Vol. 23, No. 1, pp.17-34.

Arulampalam, W., A. Booth, and M. Bryan (2004), "Training in Europe", *Journal of the European Economic Association*, Vol. 2, pp. 346-360.

Autor, D., F. Levy and R. Murnane (2003), "The Skill Content of Recent Technological Change: An Empirical Exploration", *The Quaterly Journal of Economics*, November 2003, pp. 1279-1333.

Badillo-Amador, I., A. Garcia-Sanchez and I. Vila (2005), "Mismatches in the Spanish Labor Market: Education vs. Competence Match", *International Advances in Economic Research*, Vol. 11, pp. 93-109

Battu, H., C. Belfield and P. Sloane (1999), "Overeducation Among Graduates: a Cohort View", *Education Economics*, Vol. 7, No. 1, pp. 21-38.

Battu, H., C. Belfield, and P. Sloane (2000), "How Well Can We Measure Graduate Over-Education and its Effects?", *National Institute Economic Review*, Vo. 171, pp. 82-93.

Battu, H., and P. Sloane (2004). "Over-Education and Ethnic Minorities in Britain". *The Manchester School*, Vol. 72, No. 4, pp. 535-559.

Bauer, T. (2002), "Educational Mismatch and Wages: a Panel Analysis", *Economics of Education Review*, Vol. 21, pp. 221-229.

Beneito, P., J. Ferri, M. Molto and E. Uriel (2002), "Over/Undereducation and Specific Training in Spain: Complementary or Substitute Components of Human Capital?", in: H. Heijke and J. Muysken (eds.) *Education and Training in a Knowledge-Based Economy*, Applied Econometrics Association Series, Palgrave Macmillan, pp. 191-214.

Bennet, J. and S. McGuiness (2009), "Assessing the Impact of Skill Shortages on the Productivity Performance of High-Tech Firms in Northern Ireland", *Applied Economics*, Vol. 727-737.

Berg, I. (1970), "Education and Jobs: the Great Training Robbery", Praeger, New York.

Böhlmark, A. (2003), "Over- and Undereducation in the Swedish Labour Market. Incidence, Wage Effects and Characteristics 1968-2000", Swedish Institute for Social Research (SOFI), Stockholm University.

Bonikowska, A., D. Green and C. Riddell (2008), "Literacy and the Labour Market: Cognitive Skills and Immigrant Earnings", Statistics Canada Catalogue No. 89-552, No. 20.

Boothby, D. (2002), "Literacy Skills, Occupational Assignment and th Returns to Over-and Under—Education", Statistics Canada Catalogue No. 89-552, No. 9.

Bound, J. and G. Johnson (1992), "Changes in Earnings Differentials in the 1980s: Concordance, Convergence, Causes and Consequences", NBER Working Paper No. 3901.

Büchel. F. (2002), "The Effects of Overeducation on Productivity in Germany – the Firms' Viewpoint", *Economics of Education Review*, Vol. 21, pp. 263-275.

Büchel, F. and H. Battu (2003), "The Theory of Differential Overqualification: Does it Work?", *Scottish Journal of Political Economy*, Vol. 50, No.1, pp.1-16.

Büchel, F. and M. van Ham (2002), "Overeducation, Regional Labour Markets and Spatial Flexibility", IZA Discussion Paper No. 424.

Büchel, F and A. Mertens (2004), "Overeducation, Undereducation and the Theory of Career Mobility", *Applied Economics*, Vol. 36, pp. 803–816

Büchel, F. and M. Pollmann-Schult (2004), "Overeducation and Human Capital Endowments", *International Journal of Manpower*, Vol. 25, No. 2, pp. 150-165.

Budría, S. and A. Moro-Egido (2005), "Education, Over-education, and Wage Inequality: Evidence for Spain", Studies on the Spanish Economy 211, FEDEA.

Burris, V. (1983), "The Social and Political Consequences of Overeducation", *American Sociological Review*, Vol. 48, pp. 454-467.

Chevalier, A. (2003), "Measuring Over-Education", *Economica*, Vol. 70, pp. 509-531.

Chiswick, B.R. and P. Miller (2005), "Why is the Payoff to Schooling Smaller for Immigrants?", IZA Discussion paper No. 1731.

Chiswick, B.R. and P. Miller (2010), "The Effects of School Quality in the Origin on the Payoff to Schooling for Immigrants", IZA Discussion paper No. 5075.

Cohn, E and S. Kahn (1995), "The Wage Effects of Overschooling Revisited", *Labour Economics*, Vol. 2, pp. 67-76.

Crompton, S. (2002), "I Still Feel Overqualified for my Job", *Canadian Social Trends*, No. 67, Winter, Statistics Canada, Catalogue No. 11-008-XIE.

Cutillo, A. and G. DiPietro (2006), "The Effects of Overeducation on Wages in Italy: a Bivariate Selectivity Approach", *International Journal of Manpower*, Vol. 27, No. 2, pp. 143-168.

Daly, M., F. Buchel and G. Duncan (2000), "Premium and Penalties for surplus and deficit education: Evidence from the United States and Germany", *Economics of Education Review*, Vol. 19, pp. 169-178.

Dearden, L., H. Reed and J. Van Reenen (2006), "The Impact of Training on Productivity and Wages: Evidence from British Panel Data", *Oxford Bulletin for Economics and Statistics*, Vol. 68, pp. 397-421.

Dekker, R., A. de Grip and H. Heijke (2002), "The Effects of Training and Overeducation on Career Mobility in a Segmented Labour Market", *International Journal of Manpower*, Vol. 23, No. 2, pp. 106-125.

Denolf, L. and J. Denys (1996), "Les Entreprises et le Recrutement en Belgique 1995", Hoger Instituut voor de Arbeid (HIVA), Katholieke Universiteit Leuven.

DiPietro, G. and P. Urwin (2006), "Education and Skills Mismatch in the Italian Graduate Labour Market", *Applied Economics*, Vol. 38, No. 1, pp. 79-94.

Dolton, P. and M. Silles (2001), "Over-education in the Graduate Labour Market: Some Evidence from Alumni Data", CEP Discussion Paper, June 2001.

Dolton, P. and M. Silles (2002), "The Determinants of Graduate Over-Education", University of Oxford, Department of Economics Working Paper No. 127.

Dolton, P. and A. Vignoles (2000), "The Incidence and Effects of Overeducation in the UK Graduate Labour Market", *Economics of Education Review*, Vol. 19, pp. 179-198.

Dorn, D. and A. Sousa-Poza (2005), "Over-qualification: Permanent or transitory", mimeo, University of St Gallen, Switzerland.

Duncan, G. and S. Hoffman (1981), "The Incidence and Wage Effects of Overeducation", *Economics of Education Review*, Vol. 1, pp. 57-68.

EEO (2001), "Labour Shortages and Skill Gaps", European Employment Observatory annual conference 2001, 31 May – 1 June, Birmingham.

Fang, T. (2009), "Workplace Responses to Vacancies and Skill Shortages in Canada", *International Journal of Manpower*, Vol. 30, pp. 326-348.

Fernandes, C. and C. Ortega (2006), "Labour Market Assimilation of Immigrants in Spain: Employment at the Expense of Bad Matches", IESE Working Paper No. 644.

Foley, P., H. Watts and B. Wilson (1993), "New Technologies, Skill Shortages and Training Strategies", in P. Swann (ed.), *New Technologies and the Firm: Innovation and Competition*, Routledge, London and New York.

Forgeout, G. and J. Gautie (1997), "Overeducation in the Youth Labour Market in France", Applied Econometrics Association Conference, Maastricht.

Forth, J. and G. Mason (2006), "Do ICT Skill Shortages Hamper Firms' Performance? Evidence from UK Benchmarking Surveys", National Institute of Economic and Social Research, Discussion Paper No. 281.

Freeman (1976), *The Overeducated American*, Academic Press, New York.

Frenette, M. (2004), "The Overqualified Canadian Graduate: the Role of the Academic Program in the Incidence, Persistence, and Economic Returns to Overqualification", *Economics of Education Review*, Vol. 23, No. 1, pp. 29-45.

García-Espejo, I. and M. Ibáñez (2006), "Educational-Skill Matches and Labour Achievements among Graduates in Spain", *European Sociological Review*, Vol. 22, No. 2, pp. 141–156.

García-Serrano, C. and M. Malo-Ocaña (1996), "Educational Mismatch and Internal Labour Markets: Is there any relationship?", ISER Working Paper no. 1996-16, University of Essex.

Green, F., S. McIntosh and A. Vignoles (1999), "Overeducation and Skills –Clarifying the Concepts", Centre for Economic Performance, Discussion Paper 435.

Green, F. and S. McIntosh (2007), "Is There a Genuine Under-Utilization of Skills Amongst the Over-Qualified?", *Applied Economics*, Vol. 39, pp. 427-439.

Groeneveld, S. and J. Hartog (2004). "Overeducation, Wages and Promotions within the firm", *Labour Economics*, Vol. 11, No. 6, pp. 701-714.

Groot, W (1993), "Overeducation and the Returns to Enterprise-related Schooling", *Economics of Education Review*, Vol. 12, No. 4, pp. 299-309.

Groot, W. (1996), "The Incidence of, and Returns to Overeducation in the UK", *Applied Economics*, Vol. 28, pp. 1345-1350. .

Groot, W. and H. Maasen van den Brink (2000a), "Overeducatio in the Labour Market: A Meta Analysis", *Economics of Education Review*, Vol. 19, pp. 149-158.

Groot, W. and H. Maassen van den Brink (2000b), "Skill Mismatches in the Dutch Labor Market", *International Journal of Manpower*, Vol. 21, No. 8, pp. 584-595.

Hartog, J. (2000), "Over-education and Earnings: Where Are We, Where Should We Go?", *Economics of Education Review*, Vol. 19, pp. 131-147.

Hartog, J. and H. Oosterbeek (1988), "Education, Allocation and Earnings in the Netherlands; Overschooling?", *Economics of Education Review*, Vol. 7, No. 2, pp. 185-194.

Hartog, J, P. Perreira and J. Veira (2001), "Changing Returns to Education in Portugal during the 1980s and early 1990s: OLS and Quantile Regression Estimators", *Applied Economics*, Vol. 33, No. 8, pp. 1021-1037.

Haskel, J. and C. Martin (1993a), "Do Skill Shortages Reduce Productivity? Theory and Evidence from the United Kingdom", *The Economic Journal*, Vol. 103, pp. 386-394.

Haskel, J. and C. Martin (1993b), "The Causes of Skill Shortages in Britain", *Oxford Economic Papers*, Vol. 45, pp. 573-588.

Haskel, J. and C. Martin (2001), "Technology, Wages, and Skill Shortages: Evidence from UK Micro Data", *Oxford Economic Papers*, Vol. 53, pp. 642-658.

Hersch, J. (1991), "Education Match and Job Match", *Review of Economics and Statistics*, Vol. 73, pp. 140-144.

Hersch, J. (1995), "Optimal Mismatch and Promotions", *Economic Inquiry*, Vol. 33, pp. 611-624.

Holmlund, B. and J. Zetterberg, "Insider Effects in Wage Determinations: Evidence from Five Countries", *European Economic Review*, Vol. 35, pp. 1009-1035.

Ingram, B. and G. Neumann (2006), "The Returns to Skill", *Labour Economics*, Vol. 13, pp. 35-59.

Jackman, R., R. Layard and S. Savouri (1991) "Mismatch: a Framework for Thought", in F. Padoa-Schioppa (ed.) *Mismatch and labour mobility*, Cambridge University Press, Cambridge, UK.

Jauhiainen, S. (2006), "Regional Differences in Overeducation", 46th Congress of the European Regional Science Association August 30th – September 3rd 2006.

Johansen, K. and B. Strom (2001), "Efficiency Wages, Interfirm Comparison, and Unemployment", *Southern Economic Journal*, Vol. 68, pp. 387-402.

Kalleberg, A. (2006), *The Mismatched Worker*, W.W. Norton & Company, New York.

Karakaya, G., R. Plasman and F. Rycx (2007), "Overeducation on the Belgian Labour Market: Evaluation and Analysis of the Explanatory Factors Through Two Types of Approaches", *Compare: A Journal of Comparative Education*, Vol. 37, pp. 513-532.

Katz, L. and K. Murphy (1992), "Changes in Relative Wages, 1963-1987: Supply and Demand Factors", *Quarterly Journal of Economics*, Vol. 107, pp. 35-78.

Kiker, B., M. Santos, and M. De Oliveira, (1997). "Overeducation and Undereducation: Evidence for Portugal", *Economics of Education Review*, Vo. 16, pp. 111–125.

Kler, P. (2003), "Graduate Overeducation in Australia: Comparing Two Points in Time (1991-1996)", Centre for Economic Policy Modelling, University of Queensland.

Kler, P. (2006), "Graduate Overeducation and its Effects Amongst Recently Arrived Immigrants to Australia: A Longitudinal Survey", *International Migration*, Vol. 44, No. 5.

Krahn, H. and G. Lowe (1998), "Literacy Utilisation in Canadian Workplaces", Statistics Canada, Catalogue no. 89-552-MIE, No. 4.

Krueger, A. (1993), "How Computers Have Changed the Wage Structure: Evidence from Microdata", *The Quaterly Journal of Economics*, Vol. 110, pp. 33-60.

Lainé, F. and M. Okba (2005), "L'insertion des Jeunes Issus de l'Immigration : de l'École au Métier ", Centre d'études et de recherches sur les qualifications, Document No. 15.

Layard, R., S. Nickell and R. Jackman (1991), *Unemployment: Macroeconomic Performance and the Labour Market*, Oxford University Press, Oxford, United Kingdom.

Levy, F. and R. Murnane (1992), "U.S. Earnings Levels and Earnings Inequality; a Review of Recent Trends and Proposed Explanations", *Journal of Economic Literature*, Vol. 30, pp. 1333-1381.

Lianos, T. (2007), "Brain Drain and Brain Loss: Immigrants to Greece", *Journal of Ethnic and Migration Studies*, Vol. 33, No. 1, pp. 129-140.

Lianos, T., D. Asteriou and G. Agiomirgianakis (2004), "Foreign University Graduates in the Greek Labour Market: Employment, Salaries and Overeducation", *International Journal of Finance and Economics*, Vol. 9, pp. 151–164.

Lilien, D. (1982), "Sectoral Shifts and Cyclical Unemployment", *Journal of Political Economy*, Vol. 90, pp. 777-793.

Lindley, J. (2009), "The over-education of UK immigrants and minority ethnic groups: Evidence from the Labour Force Survey", *Economics of Education Review*, Vo. 28, pp. 80-89.

Linsley, I. (2006), "Causes of Overeducation in the Australian Labour Market", *Australian Journal of Labour Economics*, Vol. 8, No. 2, pp. 121-143.

Lucifora, C. and F. Origo (2002), "The Economic Cost of the Skill Gap in Europe", Istituto per la Ricerca Sociale, Milan, Italy.

Manacorda, M. and B. Petrongolo (1998), "Skill Mismatch and Unemployment in OECD Countries", *Economica*, Vo. 66, pp. 181-207.

Marsden, D., C. Lucifora, J. Oliver-Alonso and Y. Guillotin (2002), *The Economic Costs of the Skills Gap in the EU*, Istituto per la Ricerca Sociale, Milan, Italy.

Martin, J. P and D. Grubb (2001), "What Works and for Whom: a review of OECD countries' experiences with Active Labour Market Policies", Swedish Economic Policy Review, Vol. 8, No. 2, pp. 9 56.

Martins, P. (2004), "Over-Education and Unobserved Skills: Evidence from a Matched Panel", mimeo.

Mavromaras K., S. McGuinness, M. Wooden (2007a), "Overskilling in the Australian Labour Market", *The Australian Economic Review*, Vol. 40, pp. 307-312.

Mavromaras K., S. McGuinness, N. O'Leary, P. Sloane, and Y. Fok (2007b), "The Problem of Overskilling in Australia and Britain", IZA discussion paper No. 3136.

Mavromaras K., S. McGuinness and Y. Fok (2009a), "Assessing the Incidence and Wage Effects of Over-Skilling in the Australian Labour Market", *Economic Record*, Vol. 85, pp. 60-72.

Mavromaras K., S. McGuinness and Y. Fok (2009b), "The Incidence and Wage Effects of Overskilling among Employed VET Graduates", NCVER Monograph Series No. 03/2009.

McGoldrick, K. and J. Robst (1996), "Gender differences in overdeducation: A test of the theory of differential over-qualification", *The American Economic Review*, Vol. 86, pp. 280-284.

McGuinness, S. (2003a), "Graduate Overeducation as a Sheepskin effect: Evidence from Northern Ireland", *Applied Economics*, Vol. 35, pp. 597–608.

McGuinness, S. (2003b), "University Quality and Labour Market Outcomes", *AppliedEconomics*, Vol. 35, pp. 1943–1955.

McGuinness, S. (2006), "Overeducation in the Labour Market", *Journal of Economic Surveys*, Vol. 20, pp. 387-418.

McGuinness, S. and M. Wooden (2007), "Overskilling, Job Insecurity and Career Mobility", IZA discussion paper No. 2938.

Mendes de Oliveira, M., M. Santos and B. Kiker (2000), "The Role of Human Capital and Technological Change in Overeducation", *Economics of Education Review*, Vol. 19, pp. 199-206.

Messinis, G. (2008), "Overeducation and Overskilling in Australia: Second generation Greek-Australians and Italian-Australians", Victoria University, Centre for Strategic Economic Studies, Working Paper No. 37.

Messinis, G. and N. Olekalns (2007), "Skills Mismatch and Returns to Training in Australia: Some New Evidence", University of Melbourne, Department of Economics, Research Paper No. 997.

Moullet, S. (2001), "Overeducation, Undereducation and Allocation on the French labour market", Working Paper 01-2001, LEST.

Nauze-Fichet, E. and M. Tomasini, (2002) "Diplôme et insertion sur le marché du travail : Approches socioprofessionnelle et salariale du déclassement", *Économie et Statistique*, No. 354.

Nickell, S. and D. Nicolitsas (2000), "Human Capital, Investment and Innovation: What are the Connections" in R. Barrell, G. Mason and M. O'Mahoney (eds.) *Productivity, Innovation and Economic Performance*, National Institute of Economic and Social Research Economic and Social Studies No. 40, Cambridge University Press, Cambridge, pp. 268-280.

Nickell, S., L. Nunziata, O. Ochel, and G. Quintini (2002), "The Beveridge Curve, Unemployment, and Wages in the OECD from the 1960s to the 1990s" in P. Aghion, R. Frydman, J. Stiglitz, and M. Woodfrod (eds), *Knowledge, Information, and Expectations in Modern Macroeconomics*, Princeton University Press, New Jersey.

OECD (2004), *Employment Outlook*, OECD Publishing, Paris.

OECD (2005), *Promoting Adult Learning*, OECD Publishing, Paris.

OECD (2007a), *International Migration Outlook: SOPEMI*, OECD Publishing, Paris.

OECD (2007b), *Jobs for Youth: Spain*, OECD Publishing, Paris.

OECD (2009), *International Migration Outlook: SOPEMI*, OECD Publishing, Paris.

Olitsky, N. (2008), "The Procyclicality of Mismatches", University of Massachusetts-Dartmouth, mimeo.

Patrinos, H. (1997), "Overeducation in Greece", *International Review of Education*, Vol. 43, pp. 203-224.

Petrongolo, B. and C. Pissarides (2001), "Looking into the Black Box: A Survey of the Matching Function", *Journal of Economic Literature*, Vol. 39, pp. 390-431.

Pohl Nielsen, C. (2007), "Immigrant Overeducation: Evidence from Denmark", AKF Working paper 2007(1), AKF.

Quinn, M. and S. Rubb (2006), "Mexico's Labor Market: The Importance of Education-Occupation Matching on Wages and Productivity in Developing Countries", *Economics of Education Review*, Vol. 25, pp. 147-156.

Ramos, R. and E. Sanromá (2004), "Overeducation and Local Labour Markets in Spain", 44th Congress of the European Regional Science Association Porto, 25th-29th August 2004.

Robson, M. (2006), "Sectoral Shifts, Employment Specialisation and the Efficiency Matching: an Analysis Using UK Data", *Regional Studies*, Vol. 40, pp. 743-754.

Robst, J. (1995a), "College Quality and Overeducation", *Economics of Education Review*, Vol. 14, No. 3, pp. 221-228.

Robst, J. (1995b), "Career Mobility, Job Match, and Overeducation", *Eastern Economic Journal*, Vol. 2, pp. 539-550.

Rouseas, P. and V. Vretakou (2008), Έρευνα Απασχόλησης Αποφοίτων Ανώτερου Κύκλου Δευτεροβάθμιας Εκπαίδευσης (ΤΕΕ Ενιαίο Λύκειο) (Study on employment outcomes for graduates of upper secondary education: TEE and Integrated Lyceum), Transition Observatory, Athens.

Rubb, S. (2003a), "Overeducation: a Short or Long Run Phenomenon for Individuals?", *Economics of Education Review*, Vol. 22, pp. 389–394.

Rubb, S. (2003b), "Overeducation in the Labor Market: a Comment and Re-Analysis of a Meta-Analysis", *Economics of Education Review*, Vol. 22, pp. 621-629.

Rumberger, R. (1987), "The Impact of Surplus Schooling on Productivity and Earnings", *The Journal of Human Resources*, Vol. 22, No. 1, pp. 24-50.

Ryan, C. and M. Sinning (2009), "Skill Matches to Job Requirements", National Centre for Vocational Education Research, Research Report.

Rycx, F. (2011), "The Impact of Educational Mismatch on Firm Productivity: Evidence from Linked Panel Data", paper presented at the 2011 Conference of the Society of Labour Economists in Vancouver B.C. on 29-30 April.

Santos, M. (1992), "An Exploration of Different Measures for Job Requirements: Over-(Under)education in the Portuguese Labor Market", Paper presented at 4th EALE Conference, Warwick.

Sicherman, N. (1991), "Overeducation in the labor market", *Journal of Labor Economics*, Vol. 9, pp. 101—122.

Skott, P. and P. Auerbach (2005), "Wage Inequality and Skill Asymmetries", in M. Setterfield (ed.) *Interactions in analytical political economy: theory, policy and applications*, Armonk, New York.

Sloane, P. (2003), "Much Ado About Nothing? What Does the Overeducation Literature Really Tell Us?", in Buchel, in F. Büchel, A. de Grip and A. Mertens (eds), *Over-education in Europe: Current issues in theory and policy*, Edward Elgar, Cheltenham.

Sloane, P., H. Battu and P. Seaman (1996), "Overeducation and the Formal Education/Experience and Training Trade-Off", *Applied Economics Letters*, Vol. 3, pp. 511-515.

Sloane, P., H. Battu and P. Seaman (1999), "Overeducation, Undereducation and the British Labour Market", *Applied Economics*, Vol. 31, pp. 1437- 1453.

Slonimczyk, F. (2009), "Skill Mismatch and Wage Inequality in the US", Open Access Dissertations, University of Massachusetts Amherst.

Smith J. and F. Welch (1978), "The Overeducated American: a Review Article", RAND paper No. P-6253.

Sneessens, H. (1995), "Asymmetric Growth Effects, Skill Mismatch and Unemployment Persistence", Université Catholique de Louvain, Institut de Recherches Economiques et Sociales, Discussion Paper No. 25.

Spence, M. (1973), "Job Market Signalling", *Quarterly Journal of Economics*, Vol. 87, pp. 355-374.

Støren, L. and J. Wiers-Jenssen (2010), "Foreign Diploma Versus Immigrant Background", *Journal of Studies in International Education*, Vol. 14, No. 1, pp. 29-49.

Tang, J. and W. Wang (2005), "Product Market Competition, Skill Shortages and Productivity: Evidence from Canadian Manufacturing Firms", *Journal of Productivity Analysis*, Vol. 23, pp. 317-339.

Teulings, C. and J. Hartog (1998), *Corporatism or Competition? Labour Contracts, Institutions and Wage Structures in International Perspective*¸ Cambridge University Press, Cambridge.

Thisse, J. and Y. Zenou (2000), "Skill Mismatch and Unemployment", *Economics Letters*, Vol. 69, pp. 415–420.

Tsang, M. (1987), "The Impact of Underutilisation of Education on Productivity: A Case Study of the US Bell Companies", *Economics of Education Review*, Vol. 6, pp. 239-254.

Tsang, M., R. Rumberger and H. Levin (1991), "The Impact of Surplus Schooling on Worker Productivity", *Industrial Relations*, Vol. 30, pp. 209-228.

Vahey, S. (2000), "The great Canadian Training Robbery: Evidence on the Returns to Educational Mismatch", *Economics of Education Review*, Vol. 19, pp. 219-227.

Vaisey, S. (2006), "Education and its Discontents: Overqualification in America, 1972-2002", *Social Forces*, Vol. 85, pp. 835-864.

Van der Velden, R. and M. van Smoorenburg. (1997), "The Measurement of Overeducation and Undereducation: Self-Report versus the Job-Analyst Method", University of Maastricht, mimeo.

Van Hoof, K. (1996), "Is er Verdringing op de Vlaamse Arbeidsmarkt?", Steunpunt WAV, Nieuwsbrief 3.

Van Smoorenburg, M. and R. van der Velden (2000), "The Training of School Leavers, Complementarity or Substitution?", *Economics of Education Review*, Vol. 19, pp. 207-217.

Verdugo, R. and N. Verdugo (1989), "The Impact of Surplus Schooling on Earnings: Some Additional Findings", *Journal of Human Resources*, Vol. 24, pp. 629-643.

Verhaest, D. and E. Omey (2006a), "Discriminating between Alternative Measures of Overeducation", *Applied Economics*, Vol. 38, pp. 2113-2120.

Verhaest, D. and E. Omey (2006b), "The Impact of Overeducation and its Measurement", *Social Indicators Research*, Vol. 77, pp. 419-448.

Verhaest, D. and E. Omey (2009), "The Determinants of Overeducation: Different Measures, Different Outcomes?", University of Gent, Department of Economics Working Paper No. 592.

Verhofstadt, E., H. De Witte and E. Omey (2007), "The Impact of Education on Job Satisfaction in the First Job", *International Journal of Manpower*, Vol. 28, pp. 135-151.

Voon, D. and P. Miller (2005), "Undereducation and Overeducation in the Australian Labour Market", *Economic Record*, Vol. 81, pp. 22-33.

Wald, S. (2005), "The Impact of Overqualification on Job Search", *International Journal of Manpower*, Vol. 26, No. 2, pp. 140-156.

Wasmer, E, P Fredriksson, A Lamo, J Messina and G Peri (2007), "The Macroeconomics of Education in Europe", in G. Brunello, P. Garibaldi and E. Wasmer (eds.), *Education and Training in Europe*, Oxford University Press

Wirz, A. and E. Atukeren (2005), "An analysis of Perceived Overqualification in the Swiss Labor Market", *Economics Bulletin*, Vol. 9, No. 2, pp. 1-10.

Wolbers, M. (2003), "Job Mismatches and their Labour Market Effects Among School-Leavers in Europe", *European Sociological Review*, Vol. 19, pp. 249-266.

Yue, C and J. Yang (2006), "Over Education or Under Education-Some Evidence from Chinese Graduates", Economics of Education: Major Contributions and Future Directions, June 20-23, Dijon, France.

ANNEX 1

Over-qualification literature review tables

70. The following tables are largely based on a study on over-qualification conducted by H. Battu for OECD in 2007.

Table A1.1. **Incidence of over-qualification, studies by country**

Country Author[a]	Database	Time Period	Method[b]	Incidence of over-qualification (male/female) %	Specific groups covered
Australia					
Kler (2003)	Households Sample Files Census	1991/96	Normative	1991: 16/19 1996: 21/21	Graduates
Voon and Miller (2005)	Household Samples Files Census	1996	Mean	15.8/13.6	Full time workers aged 20-64
Linsley (2006)	Negotiating the Life Course Survey	1997	Self-declared	28.7/25.7	18-54 years old
Kler (2006)	Longitudinal Survey of Immigrants to Australia	1993-95	Normative	16 (English Speaking Background-ESB) 48.7 (Asian Non-ESB) 39.2 (Other Non-ESB)	Graduates
Messinis (2008)	HILDA - Household, Income and Labour Dynamics in Australia Survey	2001-2005	Mean	Immigrants (full-time): 8.8-14.7/17.7-32.9 Immigrants (part-time): 4.0-66/12.2-28 Natives (full-time): 7.2/6.7 Natives (part-time): 25.1/28.3	Second generation Italian and Greek immigrants: Full-time and part-time workers
Belgium					
Denolf and Denys (1996)	Annual Vacancy Survey	1995	Self-declared	32	
Van Hoof (1996)	Population and Housing Census	1991	Normative	13	Flemish workers
Verhaest and Omey (2006a)	SONAR - Survey of Flemish School Leavers	2001/03	Normative Self-declared 1 Self-declared 2 Mean Mode	51 27.2 44.2 8.7 11.6	Early Careers
Karakaya *et al.* (2007)	Structure of Earnings Survey	1995	Normative Self-declared	24 22	Private sector only

Table A1.1. **Incidence of over-qualification, studies by country** *(cont.)*

Country Author[a]	Database	Time Period	Method[b]	Incidence of over-qualification (male/female) %	Specific groups covered
Canada					
Vahey (2000)	National Survey of Class Structure and Labour Process	1982	Self-declared	30/32 Aged below 26: 57/33	
Crompton (2002)	General Social Survey	1994 2000	Self-declared	1994: 20/26 Aged 20-29: 25/34 2000: 25/25 Aged 20-29: 35/31	Those with post-secondary qualifications
Frenette (2004)	National Graduates Survey	1984-87 1988-91 1992-95	Self-declared	22.7-57.7	Graduates
Wald (2005)	Changing Employment Relationship Survey	2000	Self-declared	22.4	
China					
Yue and Yang (2006)	Ministry of Education Survey	2003	Self-declared	21	Graduates
Denmark					
Pohl Nielsen (2007)	Administrative registers	1995-2002	Median	Natives: 11 Immigrants: 16	Males aged 30-57
Finland					
Jauhiainen (2006)	Census	2001	Mean	9.6	
France					
Forgeout and Gautie (1997)	French Employment Survey - Enquête Emploi	1995	Normative	18/24	French youth aged 18-29
Germany					
Daly *et al*. (2000)	GSOEP - German Socio-Economic Panel	1984	Self-declared	14.3/20.7	
Bauer (2002)	GSOEP	1984/98	Mean Mode	12.3/10.7 30.8/29.9	West Germany
Büchel (2002)	GSOEP	1984-95	Self-declared	42.7	
Büchel and Battu (2003)	GSOEP	1995	Self-declared	13.5/19.2	
Büchel and Mertens (2004)	GSOEP	1985/87/89/97	Self-declared	12/14	West German males only
Buchel and Pollmann-Schult (2004)	German Life History Study	1998	Self-declared	9.3/9.0	West Germany
Greece:					
Patrinos (1997)	Special Wages and Salaries Survey	1977	Normative	16	Graduates
Lianos *et al*. (2004)	Center for Recognition of Titles of Foreign Universities	1999	Self-declared	27	Foreign educated graduates
Lianos (2007)	Employers submissions to Greek Public Employment Service (OAED)	1998-2000	Self-declared	Natives: 42.2/32.4 Immigrants: 63.1/67.9	Graduates

Table A1.1. **Incidence of over-qualification, studies by country** *(cont.)*

Country Author[a]	Database	Time Period	Method[b]	Incidence of over-qualification (male/female) %	Specific groups covered
Italy					
Di Pietro and Urwin (2006)	ISTAT - Italian National Statistical Institute	2001	Self-declared	32.3 22.2	Graduates
Cutillo and DiPietro (2006)	ISTAT	2001	Self-declared	32.2	Graduates
Japan					
Allen and De Weert (2007)	CHEERS - Careers after Higher Education European Research Study	1998	Self-declared	34.8	Graduates
Korea					
Ahn and Lee (2001)	KLIPS - Korean Labor and Income Panel Survey	1999	Self-declared	19.5	
Mexico					
Quinn and Rubb (2006)	MMP - Mexican Migration Project	1987-97	Mean Mode	17.2 39.9	Males only
Netherlands					
Groot (1993)	Brabant Survey	1983	Mean	16.1	
Hartog and Oosterbeck (1988)	Census and Labour Force Survey	1960/71/74	Normative Self-declared	1960: 7 1971: 13.6 1974: 17	
Van Smoorenburg and van der Velden (2000)	STOA - School Leavers Survey	1996	Self-declared	26	
Groot and Maassen van den Brink (2000b)	OSA Labour Market Survey	1994	Mean Normative Self-declared	11.5/12.2 12.3/19.5 8.7/13.6	
Van der Velden and van Smoorenburg (1997)	RUBS and HBO Surveys of Vocational Graduates	1994	Normative Self-declared	65 23	Aged 16-27
Allen and van der Velden (2001)	Higher Education and Graduate Employment in Europe Survey	1998	Self-declared	33	Graduates
Dekker *et al.* (2002)	Labour Force Survey	1992	Normative	Overall: 30.6 Age 15-29: 41.7 Age 30-44: 27 Age 49-64: 18	
Groeneveld and Hartog (2004)	Personnel records of a large firm	1995/98	Normative (set by firm)	1995: 19.2 1998: 18	
Northern Ireland					
McGuinness (2003a)	Survey of Graduates	1997/2000	Self-declared	First job: 29 Current job: 24	Graduates
McGuinness (2003b)	Survey of Graduates	1997/2000	Self-declared	First job: 31 Current job: 24	Graduates

Table A1.1. **Incidence of over-qualification, studies by country** *(cont.)*

Country Author[a]	Database	Time Period	Method[b]	Incidence of over-qualification (male/female) %	Specific groups covered
Portugal:					
Santos (1992)	Quadros de Pessoal Personnel Records of firms>1 paid employee Ministry of Employment	1985	Mean	15.4/20.0	
Kiker *et al.* (1997)	Quadros de Pessoal	1991	Mean Mode Normative	10.9/6.9 25.5/25.3 28.8/40.0	
Martins (2001)	Quadros de Pessoal	1991-1995	Mode	33.3	Chemical industry
Spain:					
Alba-Ramirez (1993)	ECVT - Quality of Life at Work Survey	1985	Self-declared	15.3/20.6	
Garcia-Serrano and Malo–Ocana (1996)	ECBC - Structure, Conscience and Biography of Class Survey	1991	Self-declared	26.9	
Beneito *et al.* (2002)	ECBC	1985/90	Mean Self-declared Self-declared	1990: 15.2 1985: 27.9 1990: 25.6	
Alba-Ramirez and Blazquez (2004)	ECHP Spain - European Commission Household Panel	1995	Self-declared	53.8	
Ramos and Sanromá (2004)	Family Budget Survey	1990-91	Mean	14.6	
Budria and Moro-Egido (2005)	ECHP Spain	2001	Self-declared	26.6/27.8	
Badillo-Amador *et al*. (2005)	Spanish Household Panel Survey (SHPS).	1998	Mode Self-declared	34 35	
Fernandez and Ortega (2006)	Spanish Labour Force Survey	1996-2005	Mean	Immigrants: 37.5/37.7 Natives:15/13.8	Immigrants
García-Espejo and Ibáñez (2006)	University of Oviedo Graduate Survey	2003	Self-declared	First job: 43.8 Current job: 31.2	Graduates
Sweden					
Böhlmark (2003)	LNU - Swedish Level of Living Surveys	1968-2000	Self-declared	1968: 12/9 1974:16/18 1981: 29/30 2000: 34/39	
Switzerland					
Wirz and Atukeren (2005)	Swiss Household Panel	1999	Self-declared	15/14.7	
Dorn and Sousa-Poza (2006)	Swiss Household Panel	1999-2003	Self-declared	13.3/13.5 Age 25-34: 15.7	

Table A1.1. **Incidence of over-qualification, studies by country** *(cont.)*

Country Author[a]	Database	Time Period	Method[b]	Incidence of over-qualification (male/female) %	Specific groups covered
United Kingdom:					
Groot (1996)	BHPS - British Household Panel Survey	1991	Mean	13.0/10.0	
Sloane *et al.* (1996)	SCELI - Social Change and Economic Life Initiative	1986	Self-declared	30.1/32.3	
Alpin *et al.* (1998)	Labour Force Survey	1995	Normative Mode	27 37.7	Graduates
Battu *et al.* (1999)	CHQWS - Careers of Highly Qualified Workers Survey	1986/91/96	Self-declared	1985 graduates 1986: 37.6/46.4 1991: 39.6/39.0 1996: 41.5/40.1 1990 graduates 1991: 41.6/45.3 1996: 41.3/39.3	Two graduate cohorts: 1985 and 1990
Green *et al.* (1999)	NCDS - National Child Development Study	1995	Self-declared	47.4	
Sloane *et al.* (1999)	SCELI	1986	Self-declared	30.1/32.3	
Dolton and Vignoles (2000)	National Survey of Graduates and Diplomates	1980/86	Self-declared	First job: 36/41 Final job: 29/31	Graduates
Dolton and Silles (2001)	University of Newcastle Alumni Survey	1998	Self-declared	First job:42.0 Current job: 22.0	Graduates
Chevalier (2003)	CHQWS	1996	Normative and self-declared using job satisfaction	16	Graduates
Battu and Sloane (2004)	National Survey of Ethnic Minorities	1994	Mode	29.4-39.2	Ethnic/Immigrants
Lindley (2009)	Labour Force Survey	1993-2003	Mean	Natives: 22.5/28.7 Immigrants: 27.3/32.8	Immigrants

Table A1.1. **Incidence of over-qualification, studies by country** *(cont.)*

Country Author[a]	Database	Time Period	Method[b]	Incidence of over-qualification (male/female) %	Specific groups covered
USA					
Duncan and Hoffman (1981)	PSID - Panel Study of Income Dynamics	1976	Self-declared	42	
Burris (1983)	National Sample Survey	1977/78	Normative	22.7/20.1	
Rumberger (1987)	Survey of Working Conditions	1969	Self-declared	1969 - 35.0	
	Quality of Working Life Surveys	1973/1977		1973: 27	
				1977: 32	
			Normative	1973: 57	
Verdugo and Verdugo (1989)	Census	1980	Mean	10.9	
Sicherman (1991)	PSID	1976/78	Self-declared	40.8	
Robst (1995a)	PSID	1976/78/85	Self-declared	36	Pooled all years
Hersch (1995)	Survey of employees of a private firm in Wyoming	1991	Self-declared	21	
Cohn and Kahn (1995)	PSID	1984	Self-declared	33	
			Mean	13	
McGoldrick and Robst (1996)	PSID	1985	Mean	15.8/9.3	
			Self-declared	30.1/31.5	
Daly *et al.* (2000)	PSID	1976/85	Self-declared	1976: 38.5/36.8	
				1985: 31.8/33.5	
Chiswick and Miller (2005)	Census	2000	Mode	Natives: 32.2	Males only
				Immigrants: 28.3	
			Mean	Natives:11.9	
				Immigrants:13.9	
Vaisey (2006)	General Social Survey	1972-2000	Normative	1972-1982: 11.6/9.4	
				1983-1992: 16.1/14.5	
				1993-2002: 20.3/19.8	

a) Full references can be found in the Bibliography.
b) Mean and Mode refer to the statistical approaches that measure required education in a given occupation using the mean and the mode, respectively, of the education distribution for that occupation.
Source: H. Battu (2007), "Overeducation amongst the young in the OECD: A Review", OECD, unpublished.

Table A1.2. **Returns to over-qualification, studies by country**

Country Author[a]	Dataset	Time Period	Method[b]	Earnings specification[c]	Return to required education[d] (male/female)%	Return to over-qualification[e] (male/female)%
Australia						
Kler (2003)	Households Sample Files Census	1991/96	Normative	1	1991:11/13 1996:11/13	1991: 3.2/4.2 1996: 4.1/5.2
Voon and Miller (2005)	Household Sample Files Census	1996	Mean	1	18.2/14.9	6.6/5.3
France:						
Moullet (2001)	French Employment Survey (Enquête Emploi)	1997	Mode	1	11.5 11 10.9	3.1 2.5 2.2
Denmark:						
Pohl Nielsen (2007)	Administrative registers	1995-2002	Median	1	Natives: 7.9 Immigrants: 7.7	Natives: 5.4 Immigrants: 2.3
Germany:						
Daly *et al.* (2000)	GSOEP - German Socio-Economic Panel	1984	Self-declared	1	9.0/9.0	4.9/6.6
Bauer (2002)	GSOEP	1984/98	Mean Modal	1	10.7/12.5 8.4/8.7	9.0/5.2 6.6/4.5
Greece:						
Patrinos (1997)	Special Wages and Salaries Survey	1977	Normative	2		-9.4
Italy						
DiPietro and Urwin (2006)	ISTAT - Italian National Statistical Institute	2001	Self-declared	3		-4.7 to -5.9
Mexico						
Quinn and Rubb (2006)	MMP - Mexican Migration Project	1987-199	Mean Modal OLS	1	8.5 7.6 9	4.3 4.8 4.9
Netherlands:						
Hartog and Oosterbeck (1988)	Census and Labour Force Survey	1982	Self-declared	1	7.6/5.2	6.5/3.7
Groot (1993)	Brabant Survey	1983	Mean	4		-7.4
Van der Velden and van Smoorenburg (1997)	RUBS and HBO Surveys of Vocational Graduates	1994	Normative Self-declared 1 Self-declared 2	1	6.7 6.7 6.6	5.4 4.7 4.7
Allen and van der Velden (2001)	Higher Education and Graduate Employment in Europe Survey	1998	Self-declared	5		-8.1
Groeneveld and Hartog (2004)	Personnel records of a large firm	1995/98	Normative	1	8.7	2.5

Table A1.2. **Returns to over-qualification, studies by country** *(cont.)*

Country Author[a]	Dataset	Time Period	Method[b]	Earnings specification[c]	Return to required education[d] (male/female)%	Return to over-qualification[e] (male/female)%
Portugal:						
Santos (1992)	Quadros de Pessoal Personnel Records of firms>1 paid employee Ministry of Employment	1985	Mean	1	3.5/3.4	1.5/0.9
Kiker *et al.* (1997)	Quadros de Pessoal	1991	Mean	6	6.4/5.6	-9.5/-3.6
			Modal	1	8.1/6.7	4.4/5.6
			Normative	1	10/10.4	3.4/3.0
Mendes de Oliveira *et al*. (2000)	Quadros de Pessoal	1991	Modal	1	10	4.3
Hartog *et al*. (2001)	Quadros de Pessoal	1982/86/92	Normative	1	7.2/5.4	3.9/3.1
					7.3/5.8	4.1/3.3
					8.5/7.7	4.1/4.7
Martins (2001)	Quadros de Pessoal	1991-1995	Modal	1	10/11	9/10
Spain:						
Alba-Ramirez (1993)	ECVT - Quality of Life at Work Survey	1985	Self-declared	1	9.2	4
Badillo-Amador *et al*. (2005)	ECHP Spain - European Commission Household Panel	1998	Modal Self-declared	6		-3
Sweden						
Böhlmark (2003)	LNU - Swedish Level of Living Surveys	1968-2000	Self-declared	1	5.4-9.6	1.4-2.9
United Kingdom						
Groot (1996)	BHPS	1991	Mean	1	7.9/9.4	-2.6/3
Green *et al*. (1999)	UK Skills Survey	1995	Self-declared	7		-5/-12
Sloane *et al*. (1999)	SCELI - Social Change and Economic Life Initiative	1986	Self-declared	8	Dummies ranging from 8-46/6-46 (5 levels of required education)	3.3/2.5
Dolton and Vignoles (2000)	National Survey of Graduates and Diplomates	1980/86	Self-declared	2		-2.4 to -8.4/-4.3 to -14.6
Dolton and Silles (2001)	University of Newcastle Alumni Survey	1998	Self-declared	2		First job: -17.6 Current job: -30.8
Chevalier (2003)	CHQWS - Careers of Highly Qualified Workers Survey	1996	Normative and self-declared based on satisfaction	2		-22 to -26 (genuine over-qualification) -5 to -11 (apparent over-qualification)
Battu and Sloane (2004)	National Survey of Ethnic Minorities	1994	Modal	9	Immigrants (non-white): 17.8 Natives (non-white): 11.9 Natives (white): 20.7	Immigrants (non-white): 7.3 Natives (non-white): 4.9 Natives (white): 12.9

Table A1.2. **Returns to over-qualification, studies by country** *(cont.)*

Country Author[a]	Dataset	Time Period	Method[b]	Earnings specification[c]	Return to required education[d] (male/female)%	Return to over-qualification[e] (male/female)%
USA:						
Duncan and Hoffman (1981)	PSID - Panel Study of Income Dynamics	1976	Self-declared	1	6.3-10.5	2.9-5.2
Rumberger (1987)	Survey of Working Conditions	1969/73/77	Self-declared	1	1969: 7.7/9.2	1969: 5.4/6.8
	Quality of Working Life Surveys		Normative		1973:5.2/10 1977:6.6/9.2	1973:3.1/5.7 1977:4.3/5.9
Verdugo and Verdugo (1989)	Census	1980	Mean	10		-13
Sicherman (1991)	PSID	1976/78	Self-declared	1	4.8	3.9
Cohn and Kahn (1995)	PSID	1984	Self-declared	1	7.7	4.9
			Mean		8.4	5.9
Daly *et al.* (2000)	PSID	1976/85	Self-declared	1	1976: 6.1/9.0 1985: 7.8/10.9	1976: 4.5/6.1 1985: 5.4/8.6
Chiswick and Miller (2005)	Census	2000	Mean	1	Natives:16.6 Immigrants: 15.7	Natives: 5.2 Immmigrants:4.2
Vaisey (2006)	General Social Survey	1972-2000	Normative	1	11.6	5.6

a) Full references can be found in the Bibliography.

b) Mean and Mode refer to the statistical approaches that measure required education in a given occupation using the mean and the mode, respectively, of the education distribution for that occupation.

c) 1. Years of required education, years of over-qualification and years of under-qualification; 2. Dummy for education attained and dummy for over-qualification; 3. Dummy for actual education and dummies for over-qualification and under-qualification ; 4. Years of actual education, years of over-qualification and years of under-qualification ; 5. Dummies for actual education and years of over-qualification and years of under-qualification; 6. Years of education and dummies for over-qualification and under-qualification ; 7. Dummies for actual education and measures of the extent of over and under-qualification; 8. Dummies for required education and measures of the extent of over and under-qualification; 9. Level of required education and dummies for over-qualification and under-qualification; 10. Level of actual education and dummies for over and under-qualification .

d) Returns to the years of education required by the job.

e) Returns to over-qualification: in earnings specifications 1, 8 and 9, the coefficient on over-qualification measures the return to surplus education relative to a well-matched individual doing a job with the same years of required education; in the other earnings specifications, the coefficient on over-qualification measures the return to surplus education relative to a well matched individual with the same qualifications.

Source: H. Battu (2007), "Overeducation amongst the young in the OECD: A Review", OECD, unpublished.