



RESEARCH PAPER

No 21

Skill mismatch

The role of the enterprise

Luxembourg:

Publications Office of the European Union, 2012



Skill mismatch

The role of the enterprise

A great deal of additional information on the European Union is available on the Internet.

It can be accessed through the Europa server (<http://europa.eu>).

Cataloguing data can be found at the end of this publication.

Luxembourg: Publications Office of the European Union, 2012

ISBN 978-92-896-0918-0

ISSN 1831-5680

doi: 10.2801/7930

© European Centre for the Development of Vocational Training (Cedefop), 2012
All rights reserved.

The **European Centre for the Development of Vocational Training** (Cedefop) is the European Union's reference centre for vocational education and training. We provide information on and analyses of vocational education and training systems, policies, research and practice. Cedefop was established in 1975 by Council Regulation (EEC) No 337/75.

Europe 123, 570 01 Thessaloniki (Pylea), GREECE
PO Box 22427, 551 02 Thessaloniki, GREECE
Tel. +30 2310490111, Fax +30 2310490020
E-mail: info@cedefop.europa.eu
www.cedefop.europa.eu

Christian F. Lettmayr, *Acting Director*
Hermann Nehls, *Chair of the Governing Board*

Foreword

Understanding the dynamics of skill mismatch, with analysis of the link between the skill needs and skill supply, is important for policies that aim to reduce inefficiencies in the European labour market. After setting priorities for skill mismatch research in 2008 (Cedefop, 2009a), a series of research reports have provided an overview (Cedefop, 2010b), plus analyses of the impact of skill mismatch on vulnerable population groups: ageing workers (Cedefop, 2010c), migrants and ethnic minorities (Cedefop, 2011b).

While most research to date has focused on the determinants and consequences of skill mismatch for individuals, this report is the first attempt by Cedefop to broaden the agenda by exploring the role of enterprises. The report summarises the theoretical and empirical findings on skill mismatch from the firm perspective. Specific attention is given to the role of human resource practices (e.g. recruitment, training, performance monitoring, pay schemes, career development, job design, employee representation) and of firm characteristics in influencing skill mismatch. The evidence paves the way for taking a closer look at the causes and consequences of skill mismatch at the workplace. It provides insights into how firms can contribute to the policy goal of anticipating and matching skill needs, thus informing the policy agenda of key European Commission initiatives such as New skills for new jobs and the Agenda for new skills and jobs.

At the time of writing Europe is facing major economic and financial difficulties. During this period, several sectors and occupations have experienced significant reorganisation of work practices; new skills will be required and existing skills will be made redundant. Skill mismatch is likely to be exacerbated in this restructuring process, leading to structural unemployment and both overeducation and skill shortages. The notion that higher education and vocational education and training systems should equip graduates with skills that match the demands of the labour market lies at the heart of strategies for overcoming skill mismatch. However, enterprises also have a critical role in this and should ensure, via workplace learning and continuing adult training, that mismatches are avoided. With cuts in public sector budgets and diminishing public expenditure, cooperation between governments and social partners (enterprises, employee representatives) and a common understanding of 'shared responsibility' will be essential to meeting the Europe 2020 education and training targets.

We hope that this report will contribute to better understanding and stimulate further research into the challenges that enterprises and policy-makers face. It should also provide a basis for policies and strategies to strengthen the match between the skills of the workforce and the requirements of the labour market.

Christian F. Lettmayr
Acting Director

Acknowledgments

This report reflects Cedefop's efforts to broaden the research agenda on skill mismatch and to raise recognition of the contribution of employers and human resource policies for reducing skill mismatch. Konstantinos Pouliakas, Cedefop expert, wrote the report and undertook the desk research and analysis on which it is based. The research was undertaken under the supervision of Pascaline Descy (Head of Research and Policy Analysis, Cedefop) and of Jasper van Loo (Cedefop expert). Special thanks also go to Katja Nestler (Cedefop), Grethe Haugoy (Cedefop), Alexandra Dehmel (Cedefop) and Joel Marsden (Cedefop), who provided comments and suggestions.

Table of contents

Acknowledgments	3
Executive summary	6
1. Skill mismatch and the importance of the enterprise.....	10
2. Current skill mismatch knowledge	15
3. Skill mismatch and firm productivity	18
4. Personnel policies and skill mismatch	21
4.1. Recruitment and selection	22
4.1.1. Recruitment difficulties and the cost of mismatch	22
4.1.2. Sources of mismatch during hiring	26
4.1.3. Hiring mismatched workers	29
4.1.4. Heterogeneous recruitment and skill mismatch.....	30
4.1.5. Recent recruitment policy developments.....	34
4.2. Training and skills development.....	37
4.3. Performance management and appraisal.....	46
4.4. Wage policies.....	48
4.5. Career development	53
4.6. Job design.....	57
4.7. Industrial relations.....	60
5. Company characteristics and skill mismatch.....	62
6. Addressing skill mismatch at enterprise level.....	66
7. Mismatch and current European skills policy	69
8. Conclusion: the way forward in skill mismatch research?	72
List of abbreviations	74
References	75
ANNEX European data sources on skill mismatch at the enterprise	88

List of figures and boxes

Figures

1	Difficulties in recruiting staff for skilled jobs (EU-27; 2009)	23
2	Difficulties in recruiting staff for unskilled jobs (EU-27; 2009)	24
3	Difficulties in recruiting staff for skilled jobs by NACE sector (EU-27; 2009).....	24
4	Difficulties in recruiting staff for unskilled jobs by NACE sector EU-27; 2009).....	25
5	Difficulties in recruiting staff for skilled jobs by firm size (EU-27; 2009).....	25
6	Difficulties in recruiting staff for unskilled jobs by firm size (EU-27; 2009).....	26
7	Firms providing training in last 12 months (EU-27; 2009)	39
8	Motives of further training (EU-27; 2009)	40
9	Reasons for differences in pay levels (UK, 2004)	49

Boxes

1	Signalling, screening, adverse selection and moral hazard	27
2	Research questions on hiring strategies and skill mismatch.....	37
3	Research questions on enterprise training and skill mismatch	46
4	Research questions on performance appraisals and skill mismatch	48
5	Research questions on wage policies and skill mismatch	53
6	Research questions on career development and skill mismatch	57
7	Research questions on job design and skill mismatch.....	60
8	Research questions on industrial relations and skill mismatch	61

Executive summary

At the end of the first decade of the 21st century, Europe faces important challenges. Alongside demographic and climate challenges are the worst economic crisis and highest levels of unemployment since the depression in the 1920s. As geopolitical relationships and globalisation have become a reality, technological development is still accelerating and challenging the capacity of societies to adapt, change and innovate. To support a smart, sustainable and inclusive level of economic development, European policy-makers need to ensure not only that the necessary skills and competences are available, but also that these are fully used. One of the main goals of the Agenda for new skills and jobs, a flagship initiative of the Europe 2020 strategy, is to strengthen Europe's capacity to anticipate changing labour demands in the economy and to secure matching qualifications which increasingly have to come from an ageing labour force, rather than young people entering the labour market.

This report presents a strong case for considering the role of enterprises in skill mismatch. There are two main conclusions: developing suitable employer strategies and actions to tackle and prevent skill mismatch requires better understanding of the relationship between human resource policies and mismatch; and new research on mismatch at enterprise level can support the evidence base for skills policies in Europe.

Policy interest in skill mismatch has been strong in recent years, but almost all research has focused on individual-level determinants (e.g. age, ethnicity) and consequences (wages, job satisfaction). One form of mismatch is 'overeducation'. Evidence suggests that those who are overeducated work below their potential suffer from lower job satisfaction and exhibit a higher turnover rate compared to individuals who work in jobs matching their educational qualifications. There is disagreement on whether overeducation is a transitory or permanent phenomenon, with recent studies increasingly favouring the latter. Overeducation can be harmful for individuals, enterprises and societies.

Overeducation may, nonetheless, have some productivity advantages for firms. Firm-level data show a positive relationship between overskilling and firm productivity. Individuals with 'surplus' educational credentials may still receive a wage premium relative to appropriately educated colleagues in similar jobs. Available evidence also suggests that there is value-added in upgrading the skills of the undereducated. Their productivity normally lags behind that of matched colleagues who work in similar jobs but they have few incentives to engage in

skills improvement since they earn more than similarly-educated individuals who are in jobs that match their skills.

There has been little research on the importance of firm characteristics and of human resource practices (e.g. hiring, training, performance appraisal, remuneration, career development, job design, employee representation) for the incidence of skill mismatch, its consequences and its dynamic evolution. There is an important deficiency in our skill mismatch knowledge, given that firm personnel policies are likely to play a significant role in terms of ensuring that individual skills and competences are used in an optimal and productive way. This report emphasises the role of specific activities at firm level for skill mismatch, which can strengthen the competitiveness of enterprises and improve individual welfare. Policy tools that impact on the human resources practices of firms can influence skill mismatch.

Even though the process of hiring overeducated employees can entail a waste of potential and talent, it has been argued that their recruitment can be a deliberate hedging strategy to ensure a continuous and uninterrupted supply of high skills to a firm. Companies may also seek to exploit certain unobserved positive attributes that the overeducated are likely to possess. However, little is known at present about firm hiring and screening strategies, their relation with other firm characteristics and the overall causal effect on skill mismatch and firm performance (Oyer and Schaefer, 2011). More information is necessary regarding the preferences of employers for the optimal mix of knowledge, skills, competences and attitudes of graduates from education and initial VET. In a labour market characterised by imperfect information and high search costs, inefficient allocation of human resources may prevail. The type of recruitment channel (formal versus informal), the use of an internal or external market, the sector of economic activity, training and technological innovations are factors that ultimately influence the quality of a job match.

The capacity of firms to find employees that constitute a good 'fit' for the company depends critically on the ability of education and vocational education and training (VET) systems to respond by imparting to graduates the necessary knowledge, skills, competences and also attitudes. Firms subsequently need to invest in the continuing vocational training of their employees, so that their skills are adapted to the changing demands of the workplace. In an uncertain labour market socially suboptimal situations arise if, for example, employers demand graduates with higher educational qualifications than necessary (credentialism).

Generally, matching people's skills to their jobs depends on better understanding the skills they possess and the precise ways in which these can be developed and used via training. Modern organisations appear to attach more

value to 'soft skills' or 'key competences' than in the past (e.g. teamwork, interpersonal communication, initiative, creativity, entrepreneurship, leadership and management, presentation skills, ability to learn) along with 'hard' occupational skills. For high-performance work organisations (HPWOs), in particular, the critical aspect is not the quantity of training (i.e. provision of more courses) but linking training to performance objectives. Nevertheless, due to turnover costs, competitor raids on staff and other disincentives, firms and employees most in need of skills upgrading are typically those which do not participate in vocational training. For example, larger-sized firms or those with less severe financial constraints often invest in the training of workers that are already high-skilled or do not suffer from skills obsolescence (e.g. younger employees).

The responsiveness of the performance appraisal process and the type and structure of payment systems (e.g. fixed salary, performance-related pay, relative evaluations) can have an important impact on the incidence and consequences of skill mismatch within enterprises. By monitoring progress and offering feedback on staff performance, firms can use the available skills in their workforce as effectively as possible (CIPD, 2010). In many HPWOs, in particular, annual appraisal is specifically targeted to identifying further skill needs. Further, the mechanisms underlying the differentiation in the pay of over- and undereducated workers relative to those in matched jobs are not yet clearly understood. An important issue is whether the wage patterns observed for mismatched employees truly reflect their actual productivity, or whether non-market forces are at work (e.g. administrative pay scales, collective bargaining, search and hiring frictions, discrimination).

There has also been relatively little focus on post-hire matching and retention, and on the strategies that enterprises employ (e.g. probations) to filter out those employees whose skills do not fit with their job requirements. Firms often have to address issues linked to the retention of older employees, who are more susceptible to skills obsolescence. The role that workplace or job design plays in creating and sustaining skill mismatches has become more significant in recent years. More emphasis has been given (in particular within HPWOs) to encouraging worker empowerment via the provision of adequate levels of autonomy, task discretion, control and responsibility. This challenges employees at work and encourages them to use and further develop their skills.

An environment that promotes the strengthening of cooperation in VET among all stakeholders of the European economy, in the spirit of the Copenhagen declaration and of subsequent communiqués (Council and European Commission, 2004; 2006; 2008), is necessary. Social dialogue with

tripartite involvement (governments, employers and unions) can play a key role in developing a lifelong learning culture in the workplace, identifying skill shortages or surpluses within firms and helping employees to develop transferable and occupation-specific skills to increase employability and their career. Filling vacancies is likely to improve if there is better coordination between the recruitment strategies of firms and public employment services. Combating skill mismatch can be reinforced by closer coordination of EU employment (e.g. job quality, flexicurity) and education and training policies. The goals of job quality and skill matching are interlinked.

In all stages of the effort to combat skill mismatch in European labour markets, it should be considered that 'matching the right firms to the right workers (as well as matching workers to the most appropriate jobs within the firms) creates economic value of a magnitude that few other economic processes can' (Lazear and Oyer, 2009, p. 19).

CHAPTER 1.

Skill mismatch and the importance of the enterprise

In an increasingly globalised marketplace, Europe is faced with some important challenges: the growing importance of the knowledge economy; demographic and climate challenges; and the need to overcome and recover from the worldwide economic and financial crisis of 2008. There is, therefore, a need for European policy-makers to support a sustainable and innovative level of economic development by ensuring not only that the necessary skills and competences are available in the population, but also that these are fully used ⁽¹⁾. In this spirit, the Commission Communication New skills for new jobs stated in 2008 that a top priority for the EU is a better match between the supply of and demand for skills (European Commission, 2008) ⁽²⁾. Nevertheless, considering that different EU territories are characterised by marked differences in skills profiles and in the sectoral distribution of employment, matching the skills of European citizens with those required by enterprises is a difficult task ⁽³⁾.

This commitment by the Commission to raise employment while equipping the labour force with the right mix of skills to match enterprise demands was reaffirmed in its new Agenda for new skills and jobs, one of its flagship initiatives of the Europe 2020 strategy (European Commission, 2010a). Matching skills to labour market needs is imperative not only because of the need to confront the simultaneous occurrence of skill shortages and unemployment in various heterogeneous regions or industries of Europe. It is also a necessary strategy to avoid the potential underutilisation of the skills of a pool of highly-educated workers (and associated social costs, e.g. wasteful public funding of higher

⁽¹⁾ Although various definitions of the terms 'skills' and 'key competences' exist in European vocabulary (e.g. the European reference framework for key competences), these terms are used somewhat loosely in this report. This is because the definitions of skill mismatch are often dictated by the available data and survey questions at hand.

⁽²⁾ Despite the similarities in names, the New skills for new jobs initiative should not be confused with the Europe 2020 Strategy An agenda for new skills and jobs, the Commission's contribution to reaching the EU employment target by 2020.

⁽³⁾ Regular and systematic forecasting exercises, such as the one undertaken by Cedefop (2010a), are crucial in this respect, as they allow for early identification of potential labour market imbalances that may arise in Europe in the coming years.

education systems), given the rising educational attainment rates observed in most Member States in the last decades. A lack of correspondence between the skills emerging from EU universities and training systems and the demands of EU employers is also likely to affect the competitiveness of the latter. Businesses in the EU have a vested interest in investing in human capital and in improving their human resource management policies.

Literature on skill mismatch is large and burgeoning, where skill mismatch is usually defined either in terms of excess (over) or deficient (under) qualifications or skills possessed by individuals relative to job requirements⁽⁴⁾. Several comprehensive surveys have summarised the main findings of a plethora of international studies that have focused primarily on the wage and negative welfare effects of skill mismatch on individual employees (Hartog, 2000; Rubb, 2003; Sloane, 2003; McGuinness, 2006; Cedefop, 2010b; Leuven and Oosterbeek, 2011). Most of these studies have confirmed two stylised facts in relation to the impact of mismatch on pay, as suggested initially by Sicherman (1991). First, overeducated workers suffer from a wage penalty in relation to matched individuals with the same level of education, whereas they earn a premium over their matched colleagues in the same job. Second, the undereducated earn lower wages relative to colleagues whose qualifications match the requirements of the same job, but they earn more with respect to similarly-educated individuals who are properly matched in lower-level jobs. Another approach (known as ORU) breaks down the education level into three constituent components (over, required- and undereducation) (Duncan and Hoffman, 1981). Based on this methodology, Groot and Maasen van der Brink (2000) produce meta-analytical estimates of an average rate of return of 5.6% for attained years of education. Importantly, the return to surplus (3%) or deficient (-1.5%) years of education is significantly lower compared to the comparable return for required years of education (7.8%). The evidence suggests that, although the overeducated work below their potential due to some productivity ceiling (related to inferior skills and abilities or to particular firm and institutional characteristics), there is still some benefit to be enjoyed from the extra education (Rumberger, 1987). Similarly, there is scope for upskilling the undereducated, as their productivity is found to lag behind that of matched colleagues.

Another strand of literature has emphasised the potentially negative effects of skill mismatch for individual welfare and employee attitudes. It has been

⁽⁴⁾ Cedefop (2010b) provides clear-cut definitions and discusses the differences between the terms 'over(under)education' and 'over(under)skilling'. In this report the relevant terms are used somewhat loosely and depend on the context in which the nature of the skill mismatch is discussed.

argued that overqualified employees typically experience lower levels of job satisfaction, more health problems and higher rates of shirking or absenteeism than their correctly allocated colleagues (Battu et al., 1999; Fleming and Kler, 2008). They are also often found to exhibit a greater degree of job mobility and turnover, presumably because of agitation or the desire to find positions that are better suited to their formal qualifications and skills (Sicherman, 1991). Assuming that the above outcomes are proxies of individuals' productivity, a logical conclusion is that overqualification is potentially harmful for enterprises.

The results yield a somewhat contradictory picture with respect to the impact of skills mismatch on firm productivity (Büchel, 2002). On the one hand, some overeducated employees receive a (small) wage premium for the surplus component of their human capital. On the basis of human capital theory, which would argue that wages reflect the marginal product of labour in perfectly competitive job markets, this would indicate that overeducated workers have some minor positive effect on firm performance. On the other hand, the negative (longer-term) repercussions on various productivity-related dimensions of employee behaviour signify that it would be beneficial for firms to identify overeducated applicants and employees, as a means of safeguarding their hiring and training investments. A similar conclusion can be drawn for undereducated workers, as they are found to be less productive compared to matched colleagues within the same job and presumably have diluted incentives to engage in skills improvement (since they earn more than similarly-educated individuals in matched jobs).

Mainly dictated by data availability, almost all of the studies on skill mismatch have focused on individual determinants. Little research has been devoted to examining the importance of the impact of firm characteristics for the incidence of skill mismatch, its consequences, and its dynamic evolution. Further, although most European and Member States employer surveys focus on collecting information on skill shortages/gaps and the recruitment and training practices of firms (e.g. continuing vocational training survey, CVTS; UK employer skill survey; European company survey, ECS), there is little empirical research on the relationship between skill mismatch and the human resource practices of firms.

This is an important deficiency in our current state of knowledge on skill mismatch, given that the personnel policies (e.g. hiring, training, monitoring, performance appraisal, remuneration, incentives, career development, job design, industrial relations) are likely to play a significant role in ensuring that labour inputs are used in an optimal and productive way. As suggested by Tsang and Levin (1985), the ultimate welfare of firms is intricately tied to the welfare of

workers, so the productivity of the former is likely to suffer if over (under)education is detrimental to the performance of the latter. It is important for profit-maximising firms to identify workplace characteristics and labour practices that either minimise the incidence of over(under)education and/or alleviate their effects on earnings and job satisfaction (Belfield, 2010).

From a policy point of view, an implicit assumption behind the continued encouragement of expansion in education participation is that 'there is either unmet demand for graduate labour or employers hiring graduates will upgrade their production techniques in order to take advantage of a more educated labour force' (McGuinness, 2006, p. 387). The assumed continuous increase in demand for skilled labour inputs is based on the skilled-biased technological change hypothesis (Katz and Autor, 1999; Machin and Van Reenen, 2007). According to the proponents of skilled-biased technological change, the observed widening in skilled wage premiums in recent decades can be attributed to the technological innovations of the new knowledge-based economy (e.g. information and communication technologies) that are functionally dependent on the availability of highly skilled workers. The assumption that employers will automatically adjust their production processes to match the capacities of their employees also constitutes a central tenet of the theory of human capital.

Other researchers have recently paid more attention to the implications of new workplace practices employed by modern firms (e.g. decentralised decision-making, just-in-time operation, job rotation, continuous training, teamwork, incentive pay, multitasking, worker empowerment) for optimal allocation and use of human resources. This has become known as 'skill-biased organisational change' (Caroli and Van Reenen, 2001; Piva et al., 2005). The complementary premise of skill-biased organisational change highlights the importance of considering workplace attributes and policies when examining skill mismatch and its impact on firm performance.

Cedefop has undertaken an extensive review of literature on the impact of employers' human resource practices on skill mismatch within enterprises. This has revealed several important unexplored research questions as outlined below:

- (a) what is the relationship between skill mismatch and indicators of firm performance (e.g. labour productivity, profitability)? How is this relationship affected by the human resource practices adopted by firms?
- (b) how do different human resource practices used by employers affect the incidence of skill mismatch and its impact on core labour market outcomes (e.g. wages, job satisfaction, job mobility)?

- (c) how do institutional and other differences between EU Member States affect the empirical relationship between firm characteristics, human resource practices and the incidence and consequences of skill mismatch?
- (d) what are the implications of the findings for skill mismatch at enterprise level for the current European policy framework for skill needs and VET?

This report aims to provide answers to the above issues (where possible) and to identify potentially promising avenues for future research. It seeks to do so by examining the implications for skill mismatch of several important pillars of human resource management: recruitment and selection; training and skills development; performance management, monitoring and appraisal; compensation policies; career development; and industrial (employer-employee) relations. Particular attention is paid to the important role played by the human resources practices of firms with respect to exacerbating or lessening the occurrence and negative consequences of skill mismatch. The implications of these findings for the design of appropriate matching and skill development policies are discussed, focusing on the relevance of appropriate VET tools.

CHAPTER 2.

Current skill mismatch knowledge

Though the importance of firm characteristics for tackling skill mismatch was emphasised more than 25 years ago by Tsang and Levin (1985), most literature to date has focused on the incidence and implications of mismatch viewed from an individual perspective. This has been a natural consequence of the relative abundance of data sets based on individual responses (especially in Germany, the Netherlands, the UK and the US), and the limited availability of surveys from the employer's side. Most research paid particular attention to the following questions:

- (a) what is the incidence of over(under)education?
- (b) what is the most satisfactory method of defining and measuring skill mismatch?
- (c) how can one differentiate overeducation according to whether it is real/formal or genuine/apparent?
- (d) what is the impact of skill mismatch on important labour market outcomes (e.g. wages, job satisfaction, job mobility)?
- (e) is skill mismatch a transitory or a permanent state of affairs for the individuals concerned?
- (f) what type of theoretical framework can better explain the observed empirical regularities (e.g. human capital model, job competition model or assignment theory)?
- (g) what is the best way to tackle inadequate measurement techniques, omitted variables and the existence of unobserved individual heterogeneity within a standard wage equation framework?

Several surveys offer a comprehensive summary of the main findings on these questions. It is acknowledged that skill mismatch is a widespread phenomenon in Europe, with an average incidence of overeducation that affects around 30% of the population. The respective figure for undereducation is believed to be somewhat higher (Galasi, 2008). Subjective measures of the incidence of overeducation are found to exceed those obtained via objective (e.g. dictionary-based or empirical method) measures (McGoldrick and Robst, 1996; Groot and Maassen van den Brink, 2000). Nevertheless, the various approaches to estimating the incidence of and returns on overeducation yield broadly consistent conclusions (McGuinness, 2006). Investigating the 'true' cost of overeducation on individuals, enterprises and societies also hinges critically on

whether overqualification is accompanied by underutilisation of skills and abilities (real overeducation) (Green and Zhu, 2010) or by a negative effect on job satisfaction (genuine overeducation) (Chevalier, 2003).

The overeducated are typically found to suffer a wage penalty relative to those with the same qualifications (ranging from -8% to -27% with a mean of -15.3%). However, they are paid more than correctly allocated colleagues facing similar working conditions (with the reverse pattern observed for the undereducated) (McGuinness, 2006). Several studies have shown that these wage effects are dependent on various demographic and socioeconomic characteristics, such as age, level of education (Battu et al., 1999; Dolton and Vignoles, 2000) and race (Battu and Sloane, 2004). Also, overeducation has been linked to several adverse productivity-related phenomena, such as higher shirking or absenteeism, low job satisfaction (Tsang et al., 1991; Battu et al., 2000), lower participation in on-the-job training (Hersch, 1991) and greater quit and turnover rates (Tsang et al., 1991; Sloane et al., 1999).

There is disagreement on the extent to which mismatch is a temporary or permanent state of affairs. Several authors have stressed the career mobility hypothesis: overeducation is a temporary phenomenon that gradually dissipates as workers' labour market prospects improve with firm/occupational mobility (Sicherman, 1991) or with age and experience (Alba-Ramirez, 1993). Nevertheless, Battu et al. (2000) show that overeducation is likely to be a long-term problem, since there is no evidence of convergence over time in the earnings gap, job satisfaction, job characteristics and promotional prospects of overeducated graduates relative to those in matched employment. The overeducated are also more likely to be separated involuntarily from their jobs (Sloane et al., 1999), their status tends to perpetuate even in the face of mobility (McGuinness, 2003) and they often get trapped in low-level occupations if they are overeducated in their first job (Dolton and Silles, 2003).

The empirical evidence obtained on the ORU approach, a positive return to surplus years of education that is nonetheless smaller than the return to required education, is mostly in favour of the assignment model (Sattinger, 1993; McGuinness, 2006). According to this model both supply (i.e. the individual human capital) and demand characteristics (i.e. job requirements) determine wage levels within an overall general equilibrium framework, whereby heterogeneous workers and employers seek for an appropriate match. In contrast, there is less support for the standard theory of human capital (Becker, 1964; Mincer, 1974), which suggests that wages are determined in their entirety by the endowments of human capital, particularly years of education and experience. No distinction is made between the return to attained and required

years of education. Finally, there is little evidence to endorse the job competition model (Thurow, 1975), which asserts that marginal productivity resides in the job rather than the worker. In this model the role of education is to place workers at the front of a queue of jobs with fixed wage rates, as it serves as a signal of potential training costs to employers. Hence, any return to surplus or deficient years of education should be zero, as the wage rate is determined solely on the basis of the occupation.

A key issue in mismatch literature is that the above determinants and consequences of skill mismatch have been identified mostly in cross-sectional sets or short time-series of graduate cohorts. It has been argued that perceived mismatches based on the above data are partly a statistical artefact that reflects unobserved labour market sorting due to differences in individual abilities/skills within educational categories (Bauer, 2002; McGuinness, 2003; Frenette, 2004). The plausibility of this statement has been heightened in recent years, given the rapid expansion in tertiary education graduate numbers across many developed countries. Overeducation may, therefore, not be genuinely related to underutilisation of skills or abilities, since the additional investment in education may simply compensate for the lack of ability among individuals who appear to be mismatched (Green et al., 1999; Chevalier, 2003). For instance, Mavromaras et al. (2010) show, based on estimates from an Australian longitudinal data set (HILDA), that the magnitude of many coefficients based on cross-sectional data appear to be questionable. Using panel data methods that control for unobserved individual heterogeneity is, therefore, significant for identifying unbiased estimates of the effect of skill mismatch.

CHAPTER 3.

Skill mismatch and firm productivity

In reviewing future priorities for research on skill mismatch, Hartog (2000, p. 139) states that 'it would obviously be highly informative if we knew the effect of over and undereducation on productivity, rather than on wages'. Nevertheless, most of the available research has not been able to use firm-level data to address this issue, for lack of reliable (administrative) sources on total factor productivity and firm performance (e.g. output per head, value-added per worker). To infer the consequences of mismatch on productivity, researchers have relied instead on either examining earnings effects (human capital approach), or by exploiting several dimensions of employee behaviour that can act as correlates of productivity (e.g. job satisfaction, turnover, absenteeism).

For example, if workers' skills do not match the requirements of their jobs, then they may need training for which the firm will have to bear part of the cost. Also, given that overqualification is found to be associated with job dissatisfaction (Tsang and Levin, 1985; Battu et al., 1999; Kler, 2006; Verhaest and Omeij, 2010), this may result in lower worker effort, higher absenteeism and a greater propensity of disgruntled employees to leave the firm. It has also been pointed out that 'overeducated workers may impose significant negative externalities on co-workers, either undermining workplace morale or influencing workplace norms about effort' (Belfield, 2010, p. 237).

It is implied, based on these proxies of productivity, that firms may run the risk of lower competitiveness and profits as a result of their poor deployment of workers' capabilities. However, an important ambiguity arises, given that one would expect from the theory of human capital that over(under)educated workers are more (less) productive than their adequately allocated colleagues in similar jobs since they earn a wage premium (penalty). Nevertheless, a critical issue is whether the higher (lower) pay of overeducated (undereducated) workers relative to their matched colleagues is justified in terms of their higher (lower) productivity, or whether it is simply a reflection of credentialism and signalling (Spence, 1973), adherence to administrative pay scales or of imperfect labour markets (e.g. rent-sharing, search and recruiting frictions, discrimination) (Manning, 2003; Blanchflower and Bryson, 2010).

Hiring overeducated workers can be a deliberate strategy by firms to ensure the continuous and uninterrupted supply of high skills during periods of tight labour markets, or to exploit cyclical downturns to improve the average skill level

of their workforce (Gautier et al., 2002). Mendes de Oliveria et al. (2000) find that employers tend to value and prize overeducation and at the same time penalise undereducation; with prolonged tenure, overeducated workers follow an ascending path in their relative earnings, while undereducated workers see their relative position eroded. In addition, Büchel (2002) has found no evidence of a significant difference in job satisfaction between overeducated and adequately educated workers in Germany in low-skilled jobs. In contrast, he shows, using the German socioeconomic panel data set (GSOEP), that overeducated workers are more productive relative to matched colleagues in the same job. Rycx (2011) points out that a potential reason for the higher productivity of overeducated workers in relation to matched colleagues might be other unobserved attitudes and behaviours acquired through more schooling (e.g. better time management skills, persistence in accomplishing tasks, willingness to learn). He also observes that focusing on job satisfaction to deduce the productivity consequences of mismatch is potentially misleading. He argues that, in most available empirical studies by industrial psychologists, the correlation between job satisfaction and job performance rarely exceeds 0.3 (Iaffaldano and Muchinsky, 1985; Judge et al., 2001). Even if it is indeed true that overeducation leads to significantly lower job satisfaction, the extent to which this will affect firm productivity might be negligible.

On skill shortages and skill gaps, Cedefop (2010b) highlights the loss of competitiveness for firms when necessary skills are in short supply, given that wage rates are bid up and production bottlenecks occur. Evidence from the UK suggests that skill shortages reduced annual productivity growth in the UK by 0.4 percentage points over the period 1983-99 (Haskel and Martin, 1996). The fact that the undereducated are paid less than matched individuals in the same job indirectly suggests that firms employing the former type of workers may suffer from some productivity penalty. Finegold and Soskice (1988), Redding (1996) and Haskel and Holt (1999) also focus on the possibility that coordination failures between firms and workers and a shortage of available skilled labour may result in the economy converging to a low-skill equilibrium from which it is difficult to recover.

A comprehensive analysis that decouples the short-term from the long-term consequences of skill mismatch can be obtained via an investigation of the productivity of individual companies. However, very few studies exist that have used firm-level data as part of their analysis. Until recently, Tsang's (1987) study had been the only attempt to measure productivity effects using this approach. After examining data on the employees of 22 companies within the US Bell Corporation, he used a Cobb-Douglas production function approach to

demonstrate that overeducation has a negative effect on firm output that is caused via its detrimental impact on job satisfaction.

More recently, Jones et al. (2009) examine the effect of an overskilling variable on five indicators of firm performance (absence, quits, financial performance, labour productivity and product quality), using the 2004 British workplace employment relations survey. Some evidence is found of a positive relationship between overskilling and some productivity aggregates. Consistent with human capital theory, higher average education levels and 'excess' skills are found to be positively related to higher labour productivity. Nevertheless, this positive productivity effect is muted by the significant positive impact of overskilling on quit rates.

Rycx (2011) relies on an ORU specification aggregated at firm level. He employs a dynamic empirical methodology to examine the impact of mismatch on mean firm-level value added per worker, using a representative linked employer-employee panel data set for Belgium covering the years 1999-2006. His empirical methodology allows several important econometric issues to be considered. For example, it is plausible that firms with a lower level of labour productivity will be more inclined to employ overeducated workers during periods of slack labour markets as a strategy for improving their skills base. This leads to an endogeneity problem between educational mismatch and firm productivity, which inhibits the identification of the exact causal nature of the relationship. To tackle this, the author exploits the panel element of his data set to investigate the lagged impact of skill mismatch on current productivity levels. His longitudinal data set also allows him to control for the existence of firm fixed effects (i.e. firm characteristics that are not observed in the data but remain constant over time) and for state dependence of firm productivity (i.e. the fact that a firm's current performance is likely to be highly related to its productivity in the past). He also tests for age-related differences in the effect of skill mismatch on firm productivity, given that discrepancies between the qualification obtained and those required in a job are likely to be more pronounced at younger ages (Verhaest and Omeij, 2010).

Overall, the results indicate that an increase in the average years of required education within a firm has a positive and significant impact on firm productivity. This is also the case for the proportion of overeducated workers within a firm, while the reverse holds for the undereducated. Although the rough empirical relationship between firm productivity and skill mismatch decreases sharply once time-invariant unobserved workplace characteristics are accounted for in the empirical estimation, it remains statistically significant. Also, productivity depends significantly and positively (negatively) on the share of young over (under)educated workers within firms, whereas the effects for older over (under)educated workers are insignificant.

CHAPTER 4.

Personnel policies and skill mismatch

Research on the implications of (observed and unobserved) variation in firm characteristics for skill mismatch is scarce. The firm's influence on skill mismatches has traditionally been viewed in terms of a black box, where it is merely assumed that it wishes to maximise the discrepancy between worker productivity and wages. Most economic research on job matching has also focused primarily on the search behaviour of workers (Stigler, 1961, 1962; Phelps et al., 1970; McCall, 1970; Mortensen, 1986; Pissarides, 2000). More recently, significant theoretical progress has been made on 'equilibrium search models' that simultaneously account for wage distributions, job offer/destruction rates and firm-level vacancy durations offered by employers (Burdett and Mortensen, 1980; Mortensen and Pissarides, 1999). Explicit consideration of the interaction between firm practices/characteristics and the incidence and consequences of skill mismatch has been more problematic; this may be because labour is the most heterogeneous of all inputs in production functions, so this makes matching firms with workers a difficult process. Yet, 'matching the right firms to the right workers (as well as matching workers to the most appropriate jobs within the firms) creates economic value of a magnitude that few other economic processes can' (Lazear and Oyer, 2009, p. 19).

A crucial ingredient in maximising the quality of an employment match is firms' human resource management. Bloom and Van Reenen (2007, 2011), for instance, have conducted international surveys in 17 countries on a broad range of best management practices used by firms. They ask about the firms' attitudes to attracting and retaining human capital, promotion and reward systems adopted by managers and whether they deal with underperformers through training and effective sanctions, all of which are likely to be correlated with the incidence and impact of skill mismatch. The results of the surveys show that good management practices are positively associated with various measures of firm performance, such as productivity, profitability and sales growth.

The discussion in this section, therefore, focuses on how various key personnel management practices (e.g. recruitment, training, monitoring, compensation, incentives, job design and industrial relations) can be designed in a way that succeeds in ensuring that an employment relationship is characterised by the best possible fit. Such a condition is defined as one where worker skills (broadly defined) are matched to the firms that value them the most.

4.1. Recruitment and selection

Although the implications for skill mismatch of hiring and screening strategies are wide-ranging, investigation of the role of employers and their techniques in sourcing workers with the right profiles (i.e. mix of competences, knowledge and experience) is relatively limited. Due to the scarcity of appropriate data, very little is known about the distribution of the hiring and screening strategies of employers, their relation with other firm characteristics and the overall causal effect on skill mismatch and firm performance (Oyer and Schaefer, 2011). It is also unclear what underlies the propensity of firms to hire overqualified workers (Freeman, 1976; Borghans and de Grip, 2000; Hartog, 2000), what is their perceived added value to the organisation, or how the hiring of underqualified workers is related to skill shortages in the labour market and to cycles of economic activity. Obtaining a clearer understanding of these issues is important, given that it is widely acknowledged that, in an uncertain labour market that is fiercely competing for scarce talent, the success of modern organisations is tightly linked to the effectiveness of their recruitment and screening policies. A better knowledge of the hiring and matching process from the firms' side can contribute more to our understanding of how to prevent skill mismatch by improving labour market search.

4.1.1. Recruitment difficulties and the cost of mismatch

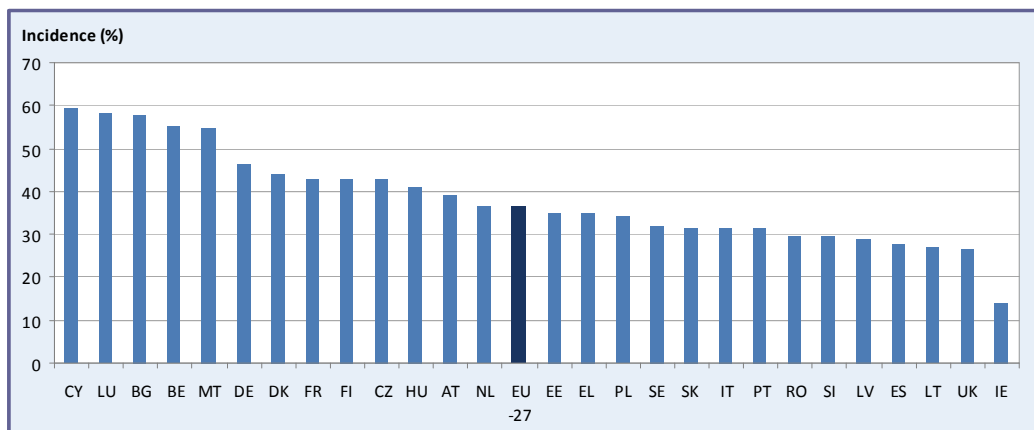
Firms will only be capable of achieving their true productivity potential and succeed in accomplishing their strategic objectives if they manage to find people with the right skills and behaviours who fit into their work culture. Nevertheless, as Figures 1 and 2 show, many firms in the EU-27 experience recruitment difficulties⁽⁵⁾. A sizeable 36% of enterprises in Europe declare that they experience problems in finding staff for skilled jobs, while a smaller percentage (10%) has difficulty in attracting people for unskilled or low-skilled positions. These average figures hide marked differences between countries, sectors and organisational characteristics (Figures 3-6). For example, around 60% of firms in Cyprus state that they are facing a shortage of skilled workers as opposed to only 18% in Ireland. A shortage of high-skilled employees is also predominantly evident in the production sector (41%), in contrast to the public (33%) and private (35%) services sectors, and is more prominent among larger-sized firms. The

⁽⁵⁾ These figures are based on data obtained from the 2009 wave of the European company survey (ECS), which was administered on behalf of the European Foundation for the Improvement of Living and Working Conditions (Eurofound) (www.eurofound.europa.eu).

industry experiencing the greatest difficulty in finding skilled personnel is in the construction sector, followed by hotels and restaurants and manufacturing. The health sector also experiences difficulty in skilled personnel recruitment. At the other end of the skills spectrum, the hotels and restaurant sector is the one that suffers the most from an inability to find suitable staff for low-skilled or unskilled positions.

It has been argued that the overall impact of a poor hiring decision that results in a bad fit can be substantial, as ‘it can cost an employer anywhere between 30 and 200% of an employee’s salary to replace them’ ⁽⁶⁾ (Drake International, 2011). This includes not only the immediate costs resulting from lost productivity, the need for continuing training, recurring hiring costs, severance settlements and legal liability, but also the long-term negative consequences such as staff dissatisfaction, damaged client relationships and disruption to core business activities. Therefore, a potential error in the suitability of the people who are hired may ultimately affect an organisation’s credibility, financial viability, customer service and overall business fortune.

Figure 1 **Difficulties in recruiting staff for skilled jobs (EU-27; 2009)**

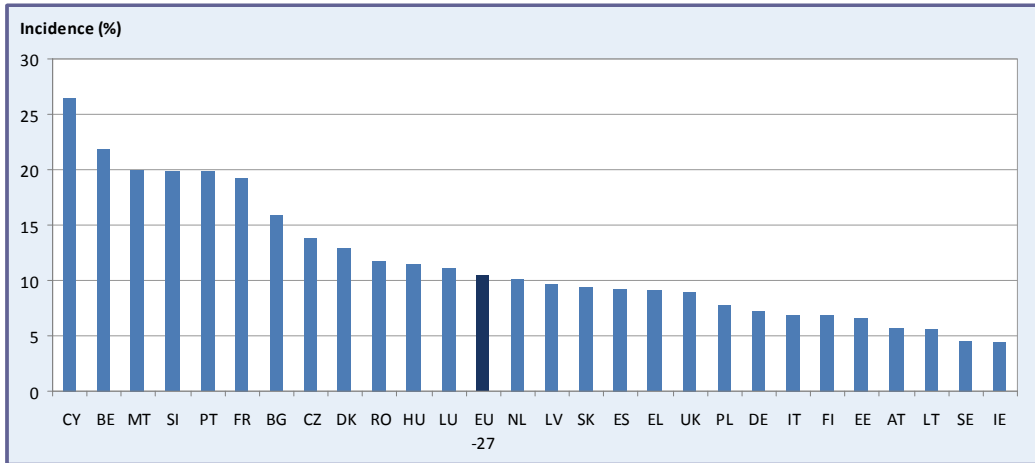


NB: Establishment weights used.

Source: ECS; Eurofound.

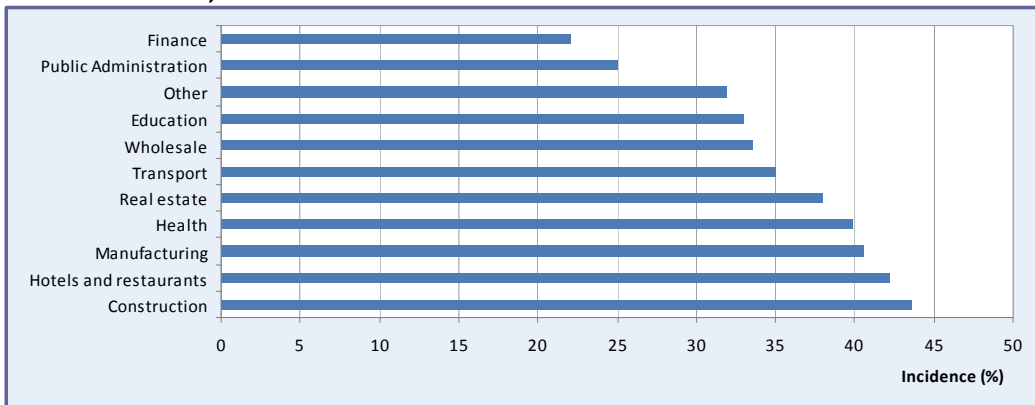
⁽⁶⁾ The severity of the costs and liability to the organisation will vary according to the seniority of the position, the type of work involved, the level of skills required and length of service in the same position (Drake International, 2011).

Figure 2 Difficulties in recruiting staff for unskilled jobs (EU-27; 2009)



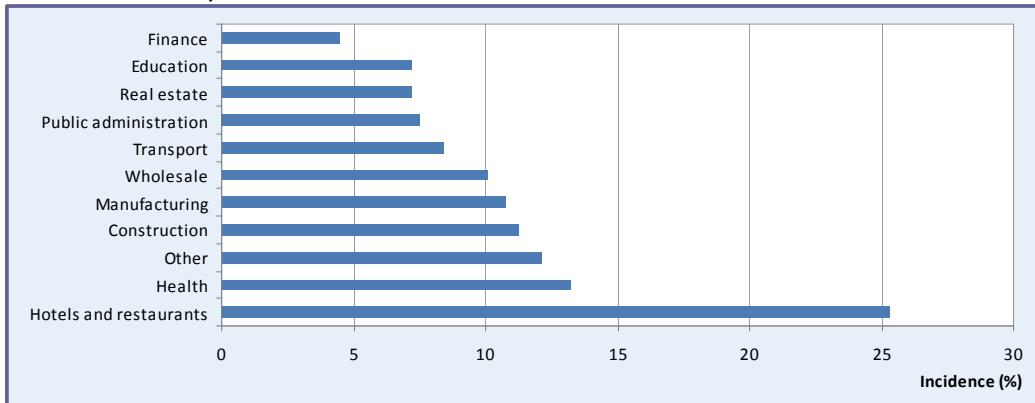
NB: Establishment weights used.
Source: ECS; Eurofound.

Figure 3 Difficulties in recruiting staff for skilled jobs by NACE sector (EU-27; 2009)



NB: Establishment weights used.
Source: ECS; Eurofound.

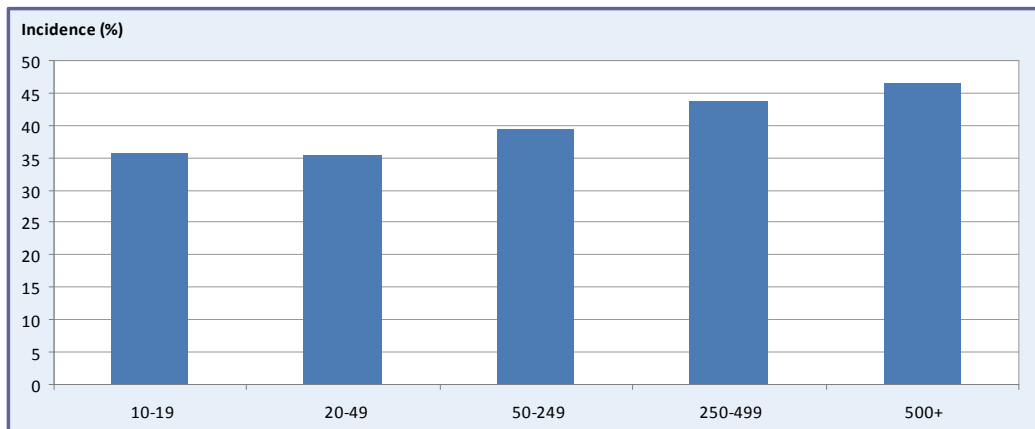
Figure 4 **Difficulties in recruiting staff for unskilled jobs by NACE sector (EU-27; 2009)**



NB: Establishment weights used.

Source: ECS; Eurofound.

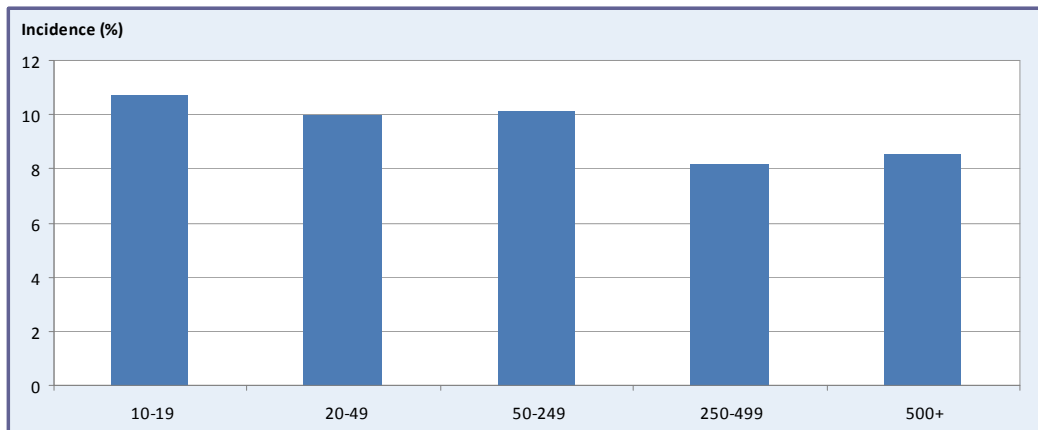
Figure 5 **Difficulties in recruiting staff for skilled jobs by firm size (EU-27; 2009)**



NB: Establishment weights used.

Source: ECS; Eurofound.

Figure 6 **Difficulties in recruiting staff for unskilled jobs by firm size (EU-27; 2009)**



NB: Establishment weights used.
Source: ECS; Eurofound.

4.1.2. Sources of mismatch during hiring

Due to high search costs and bilateral asymmetric information in the labour market, there is a need for individuals to signal their abilities and talents and for employers using different technologies to screen for suitable candidates (Jovanovic, 1979). With imperfect information a firm is likely to face an adverse selection of available job-seekers (i.e. lower-skilled employees may apply for jobs that exceed their skills requirements, thus lowering the average quality of the applicant pool). Inefficient allocation of human resources may prevail, resulting in skill mismatches affecting both parties in an employment relationship (see Box 1 for clarification of the theory and key terms).

Several factors can account for inadequate match between job-seekers and employers (Oyer and Schaefer, 2011). One of the most important is lack of complementarity between the attributes of the two parties, in particular with respect to the suitability of particular skills for certain production technologies. For instance, the essence of the skilled-biased technological change hypothesis is that high skill levels and digital literacy are necessary components for efficient execution of tasks related to information and communication technologies (ICT). Lack of proficiency in digital and computing skills in the workforce can, therefore, impair successful job match in high-technology companies. The fitness of the skills possessed by individuals in a modern knowledge-based economy hinges critically on the ability of vocational and higher education systems to be flexible and responsive to the technological needs of employers ⁽⁷⁾.

⁽⁷⁾ This requires changes in curricula design (in strategic partnerships with enterprises), a focus upon competence based learning, and better understanding of the optimal mix of skills, competences and attitudes that employers require from higher education graduates (European Commission, 2010b).

Box 1 **Signalling, screening, adverse selection and moral hazard**

A major development in microeconomics was the acknowledgement that the operation of perfectly competitive labour markets is likely to be inhibited by the existence of asymmetric information between the parties that engage in an economic transaction. The pioneering contributions of Akerlof (1970), Spence (1973) and Rothschild and Stiglitz (1976) (for which these authors were awarded the Nobel Prize in Economics several years later) clearly showed that when one party of the economic relationship is in possession of superior information relative to the other, this may result in an inefficient market.

The most cited example of this is Akerlof's (1970) market for lemons. A lemon is a car that is sold in the second-hand market, with a high probability of proving to be faulty to its new owner. This is in contrast to plums, which are solid cars that are sold by their owners for reasons that are unrelated to 'quality'. Buyers in this market cannot be certain of the underlying motives of the sellers, particularly since an offer of a high price on their behalf is likely to attract many dishonest owners of lemons. In the jargon used in literature, they are likely to face an adverse selection of cars. Thus, this will lower the price that buyers are willing to pay for the average second hand car. But as this average price is likely to be lower than the lowest price at which owners of plums are willing to sell their cars, good cars will be withdrawn from the market. This will lower the average quality of used cars further, thus triggering a downward price-quality spiral in the market. In the end, only lemons are likely to be sold in this market as bad cars will have driven out the good.

Numerous applications of the above example can be found in many market settings, most notably in the labour market. In particular, there is a high probability that employers who offer high wages will attract a pool of applicants that is of a lower average quality. Two solutions to this problem involve the use of signalling on behalf of high-ability employees or of screening by the firm. Employees that are of higher ability may wish to distinguish themselves to employers by obtaining an appropriate signal that is costly for lower-ability individuals to acquire (Spence, 1973). An example of such a signal is an educational qualification, such as a university degree (or a warranty in the case of the market for lemons example). As it is presumably more difficult for lower-ability individuals to graduate from university, the possession of a university degree by individuals may signal to firms that they are more suitable for filling in a high-skilled position.

Alternatively, firms may design contracts that will seek to provide appropriate incentives to employees to reveal their true abilities (Rothschild and Stiglitz, 1976). This process of revealing private information is known as screening, and is based on the notion that firms are constrained in the design of employment contracts by two considerations: first, they must match workers' outside offer or their reservation wage (participation constraint); second, it must not be profitable for lower-ability workers to try to mask their true potential to apply for a higher-paid post that, nonetheless, requires high-skilled individuals (incentive compatibility constraint). Many examples of such contracts have been proposed in literature, with deferred compensation wage profiles being the most advocated. Deferred compensation contracts attempt to filter out workers of inferior quality in the initial stages of an employment relationship, by offering wages that are below their productivity. Nevertheless, higher-skilled employees still have an incentive to apply and remain within the firm, due to its promise to pay higher wages in the future once the true quality of the workers has been revealed.

After employees are hired, another prominent problem employers are likely to face is moral hazard. Moral hazard is a well-known term in the insurance industry. It refers to the fact that when individuals are insured against the probability of an event taking place, they are more likely as a consequence to take actions that will enhance (or forgo taking actions to prevent) the likelihood of that event actually occurring. In a labour market context it is argued that workers who receive a fixed wage that offers them full insurance against all possible contingencies will be unwilling to exert effort beyond a minimum amount (though this argument does not consider that some individuals may be driven by an intrinsic motivation to perform a job that they enjoy). In that case, firms are obliged to formulate employment contracts that balance the need to insure risk-averse workers against variability in their incomes, while simultaneously providing them with sufficient incentives to work harder. The offer of contracts that tie workers' pay to their performance is the most marked example of this practice.

Lazear (2009) emphasises that another potential cause of mismatch is that firms are likely to value various bundles of skills possessed by individuals, rather than to require a particular type of skill (e.g. general or occupation-specific). This theory may explain why some workers who consider themselves to be overskilled suffer a wage penalty relative to adequately matched individuals. A further issue for employers to consider when hiring workers is not only the range of skills that they possess, but also the uncertainty of the future realisation of the suitability of these skills for firm productivity (Lazear, 1998). Turnover costs and raids/poaching by other employers, for instance, may prevent firms from extracting the whole future surplus of a risky worker, who has an option value of proving to be a star employee in the future (typically younger individuals). In this case, even if it is in the firms' interest to hire the risky worker, some may resort to hiring a safer option instead. Finally, employers of high-skilled positions may simply request higher educational credentials than necessary in a job advertisement simply as a strategy to weed out unsuitable candidates.

Given asymmetry of information in labour markets, it has also been asserted that unintentional hiring mistakes may occur that are related to lack of hiring expertise and insufficient resources devoted to the recruitment process. For example, much attention has been given to the deficiencies in traditional methods and techniques of recruitment, such as job advertisements, resumes and a basic interview, that increase the likelihood of making costly hiring mistakes. Many firms 'use very informal and poorly defined hiring procedures and interview protocol, have inadequate job descriptions and allocate inadequate resources to the job' (Drake International, 2011). This is particularly the case for smaller-sized firms in which deficiencies in experience and capabilities are accentuated. Such hiring mistakes are particularly likely to lead to the employment of underskilled

employees, as firms may overestimate the potential qualities of selected applicants at the recruitment stage.

A common, yet not explored, problem is the falsification and misrepresentation of the quality of job seekers and (less commonly) of firms as a trading partner. Potential employees are known to polish resumes or fabricate credentials, and firms may choose at times to downplay or conceal unpleasant aspects of jobs. Of job seekers, 70% admit that they distort the information they supply, and only nominate references they know will speak positively about them (Drake International, 2011). This problem is often magnified by the inability of employers to take successful legal action that proves that applicants have engaged in dishonest conduct during recruitment. In particular, it is often claimed by individuals in court that the apparent falsification regarding possession of certain skills is simply a reflection of revealed 'mismatch' in the current employment that could not have been foreseen. This highlights the need for firms to engage in work-related tests that determine candidate readiness, fitness for training and suitability for hiring. It also emphasises the importance of ensuring that qualification frameworks across Europe are as transparent as possible (e.g. the European qualifications framework; European quality assurance reference framework for VET) and of the use of important standardised tools describing people's credentials (e.g. Europass; European credit system for VET).

4.1.3. Hiring mismatched workers

Some researchers asserted that overeducation may be grounds for firms to reject job applicants, due to the anticipated negative impact on job satisfaction, absenteeism and turnover (Franz, 1991). However, empirical findings show employment of overeducated workers as a potential deliberate strategy, which seems puzzling (Borghans and de Grip, 2000; Hartog, 2000). Employers will hire overeducated or overskilled workers if they believe that their extra productivity is not outweighed by the higher wages required to attract them (relative to other workers in similar jobs) plus the higher risk of job quits⁽⁸⁾. Similarly, they will hire undereducated workers if their lower wage costs justify their lower level of productivity, or if such workers compensate with a higher level of innate ability or skills and greater loyalty to the firm. In addition, Büchel (2002) has shown using German panel data that hiring overqualified applicants and the wage premium received relative to correctly allocated colleagues is justified, since these workers appear to be healthier, more strongly work- and career-minded, more likely to

⁽⁸⁾ The importance of firm compensation policies as a form of attracting, screening, retaining and motivating workers is discussed in more detail in Section 4.4.

participate in on-the-job training and have longer periods of tenure with the same employer.

Dupuy and de Grip (2002) have suggested that overeducation is related to the hiring policy of large firms. By hiring overeducated workers when the supply of highly educated individuals exceeds demand for their services, large firms can increase their opportunities to substitute high-skill for low-skill in times when the former is in short-supply. Further, such an insurance strategy (otherwise known as 'hedging') has been argued to be a necessary ingredient for encouraging skilled-biased technological change (Acemoglu, 2002). Bulmahn and Krakel (2002) advocate a similar approach to justify the frequency of hiring overeducated workers by enterprises. According to them, overeducated workers are preferred by firms as they can act as a shield during periods of crisis. Specifically, overeducated employees can quickly offer improvised solutions and save firms from incurring costs. They empirically validate the predictions of their model with industry panel data from Germany, though they are forced to use proxy variables due to the unavailability of individual-level information necessary to test their approach.

The extent to which firms will hire undereducated or underskilled workers is likely to vary depending on the underlying causes of the mismatch itself. If undereducation is related to an inability to hire suitably qualified workers, i.e. a skill shortage, then the duration of undereducation within the firm will be highly correlated with the persistence of the skill shortage within the economy generally. Moreover, it is often the case that in many industries characterised by low wages and bad working conditions (e.g. hotels and restaurants, commerce and tourism sectors), firms are induced to employ underqualified personnel in the absence of interest by more suitable candidates. The cost of employing an underskilled worker will also depend on the capability of the firm to amend a bad hiring decision *ex post*, which is intrinsically linked to employment protection legislation. For instance, Lazear (1998) indicates that with high firing costs firms will be induced to hire safer, rather than riskier, workers, even though the latter might prove to be a better match in the long term.

4.1.4. Heterogeneous recruitment and skill mismatch

Most of the available research on the reasons for recruitment difficulties has typically emphasised cyclical vacancy rates, regional or sectoral specificities as regards skill supply and demand, the duration of filling vacancies and the differences in the recruitment channels that enterprises may use to attract suitable individuals (Barron et al., 1987; Holzer, 1994; Lindeboom et al., 1994; Gorter and van Ommeren, 1999; Brown et al., 1999; Manning, 2000; Behrenz, 2001; Gorter et al., 2003; Abowd and Kramarz, 2003). Nevertheless, as argued

by Oyer and Schaefer (2011) in their comprehensive review in the *Handbook of labour economics*, 'while the fundamental economic problem in hiring is well understood, the methods that firms use to solve hiring problems still need a lot more research'. It is also somewhat less clear how these hiring strategies are related to the development or to the avoidance of skill mismatches.

Considerable attention has been devoted to the importance of the type of recruitment channel in skill mismatches (Rees, 1966). Though most organisations traditionally use formal methods (e.g. job advertisements, public employment services, recruitment agencies) as a means of screening for potentially suitable candidates, some rely on informal methods or social networks (e.g. word-of-mouth recommendations, approaching competitor staff or employing family members and friends) as a means of saving on time and on recruitment costs. In a survey of employers carried out by the European Employment Observatory (1998), around 29% of employers were found to recruit labour exclusively via informal channels. When excluding the proportion of recruits who had previously worked for the company, this figure still remains at a smaller yet sizeable 10% of total recruitments. Nonetheless, the number and type of channels used has been found to depend on various factors, such as personnel management (Russo et al., 1997), labour market conditions (Russo et al., 2001), size of the firm (Barron et al., 1987) and sector or types of positions being filled (Ruffini and Torre, 2009).

Several economic and sociological studies, mostly conducted in the US, have highlighted that when social ties are an effective transmitter of otherwise hidden information, they can potentially result in 'better matches' (i.e. higher productivity, higher wages, lower turnover) between employers and employees as they resolve search frictions in a more effective fashion (Corcoran et al., 1980; Datcher, 1983; Montgomery, 1991; Simon and Warner, 1992; Holzer, 1997; Rosenbaum et al., 1999; Marmaros and Sacerdote, 2002). Fernandez and Weinberg (1997), for instance, who studied hiring processes for entry-level jobs in a retail bank in the 1990s, find that referred candidates are more likely to fit into the skill profile desired by the firm. In contrast, recent evidence from Europe has tended to find that when personal contacts are used in recruitment it is more likely that mismatches occur (Pistaferri, 1999; Addison and Portugal, 2002; Delattre and Sabatier, 2007; Pellizzari, 2010). Informal channels of approaching potential employees are less effective for many firms, particularly smaller ones, since no real 'skills' or behavioural assessment is conducted while a potentially untapped pool of more appropriate candidates is ignored. Sylos Labini (2004) and Bentolila et al. (2010) stress that when the availability of social networks and acquaintances is present, a worker may be convinced to sacrifice some of his

productive comparative advantage by accepting a lower wage in return for the security of being hired and the reduced search costs (a finding that is compatible with the wage penalty experienced by overeducated workers). Recently, Meliciani and Radiccia (2011), using data collected through a new survey by the Italian Institute for the Development of the Vocational Training of Workers (ISFOL), illustrate that overeducation is related to the use of family channels in the Italian labour market. They also find that, in contrast to employees recruited via 'professional ties', those who are recruited via 'family and friends' suffer from lower wages at the time of entry and a lower return on education even though they save on entry time. The problem is that informal hiring processes may result in competent workers being 'trapped' into occupations that do not exploit their true potential. Further, Albrecht and van Ours (2006), using a Dutch vacancy survey, find that employers are more likely to lower education standards when hiring workers via an informal recruitment channel, while they rely mostly on education as a signalling device when there is greater uncertainty about applicants. One would therefore expect that the incidence of formal underskilling will be higher when educational standards are lowered *ex ante* (as the workers' skills will not be compatible with the 'true' superior education requirements of the job *ex post*). Differences in recruitment methods can potentially account for much of the overall variation in wages across employees of similar educational credentials.

It has been further established by several authors that there is a negative relationship between the duration of a vacancy and informal recruitment methods. The European Employment Observatory survey mentioned above indicates that vacancies are filled more quickly by means of informal channels, followed by 'passive recruitments' (i.e. when applicants get in direct contact with employers), whereas the use of formal channels lasts the longest. Russo et al. (2001) show that the probability of a vacancy being filled peaks rather quickly and then drops to zero when informal channels are used, thus implying that employers either fill the vacancy quickly or it is declared void. In contrast, the likelihood that a vacancy is filled when job advertisements are used reaches its peak a couple of weeks later and then drops to a non-zero level. This allows for the possibility of filling a vacancy even after the peak period has past. The probability of vacancy filling has also been found to be sensitive to the business cycle, to educational requirements, firm size and to the duration of screening (van Ours and Ridder, 1991; 1992; 1993).

The incidence of skill mismatch is likely to depend on whether internal or external applicants are the preferred source for vacancies. Alternative forms of manpower strategy are likely to be used in different sectors of the economy,

particularly with respect to preference for the internal or external labour market. Employers in seasonal occupations or jobs requiring temporary labour will tend to rely on external recruits, dealing with competitors in the market. In contrast, when the cost of labour turnover is high, firms may attempt to protect their recruitment and training investments by using the internal labour market. In such cases, the pricing and the allocation of labour is governed by a set of administrative rules and procedures, such as promotions and seniority pay scales (Doeringer and Piore, 1971). Only at the lowest levels (the ports of entry) are candidates from the external market employed. The type of recruitment strategy may have implications for the development of skill mismatches. Since the internal labour market tends to encourage long-term relationships between firms and their workers, most of the uncertainty of matching vanishes with the passing of time as the aptitudes and abilities of workers are revealed. In contrast, the hiring of external candidates entails a greater degree of uncertainty and is more prone to the development of skill mismatches⁽⁹⁾. In reality, the wage setting and hiring patterns of most firms are likely to be affected by both internal and external forces (Lazear and Oyer, 2004).

Following this line of thinking, Pelizzari (2011) shows that the matching process is less efficient at the bottom the job distribution than the top. Using data from the UK workplace employment relations survey he finds that suboptimal matches among blue-collar workers are more frequent than among white-collar workers and managers. He argues that this is because the cost to the firm of a bad match is greater the higher is the productivity of the job, so, since screening workers is a costly activity, employers screen less intensively when recruiting for low-productivity jobs. This lower level of screening is unavoidably associated with the probability of a bad match occurring. In a similar spirit, Barron et al. (1985) find that firms are likely to expend more time on the search process when a job requires higher training expenditure; this highlights the explicit link between the hiring and training policies of enterprises and the likelihood of skill mismatches.

While most of the above literature has tended to view the different hiring options available to firms as substitutes, Casella and Hanaki (2006, 2008) provide a more comprehensive theory. They acknowledge that real firms face a portfolio of choices over how to recruit (e.g. networks and signals) and do not

⁽⁹⁾ Chan (1996) has argued that another reason why firms tend to give preference to insiders over outsiders is because hiring the latter may dilute the incentive structure of the internal promotion mechanism. This might also explain the evidence that those from outside firms enjoy a faster track record than the typical insider in the same post, since internal candidates are only sidestepped if significantly better candidates from the external market are found.

only focus on a single hiring practice. It is hence asserted that firms may prefer referrals to more formal credentials since the former avenue allows firms to enjoy an informational advantage (or ‘monopsony’ in economic jargon) whereas the latter is public information. However, Fernandez and Weinberg (1997) have illustrated that referred candidates disproportionately apply for jobs where there are fewer candidates, so an important question is whether this preference of employers persists even in tight labour markets (Oyer and Schaefer, 2011).

A particularly interesting issue (also discussed in the context of firms’ decisions to offer training to their workers in Section 4.2) is the common practice of filling vacancies by resorting to ‘raids’ or ‘poaching’ from other employers ⁽¹⁰⁾. It is expected that recruitment via employer-to-employer transitions has certain benefits in terms of the revealing of the unobserved suitability of job candidates for various posts, which is not necessarily the case for jobless job seekers. However, this depends on whether information about the productivity of workers is symmetric or asymmetric, since in the latter the between-employer flows can be impeded (Oyer and Schaefer, 2011). With asymmetric information, permitting rival firms only to make inferences about the productivity of a worker from job assignment, it is plausible to expect that the incentives to raid a potentially overeducated/overskilled worker from incumbent firms are muted ⁽¹¹⁾.

4.1.5. Recent recruitment policy developments

The advent of the Internet has brought more ingenious methods of employee recruitment, taking advantage of the fact that the web has enabled the minimisation of search costs (Autor, 2001a) ⁽¹²⁾. However, an issue of concern for skill mismatch is that electronic communication has made it much easier for workers to apply for multiple jobs. This is likely to have exacerbated the adverse selection problem that firms face when trying to find suitable employees for a

⁽¹⁰⁾ Fallick and Fleischman (2004) highlight the important role of on-the-job search by reporting that almost 40% of the new jobs that started between 1994 and 2003 in the US were employer-to-employer transitions.

⁽¹¹⁾ Hiring workers from another firm ‘is sometimes called the “winner’s curse”, since, more often than not, the workers who are easy to steal are the ones not worth stealing’ (Lazear and Gibbs, 2009, p. 77).

⁽¹²⁾ An example is the hiring strategy of Google, a leading high-technology company, which has resorted to the adoption of unusual techniques to screen for employees that will fit with the firm’s distinct organisational culture. An example of Google’s practices is the insertion of an aptitude test in technology magazines, which includes questions such as ‘How many different ways can you colour an icosahedron with one of three colours on each face?’ Those who provide a correct answer are automatically directed to a website seeking resumes of job applicants (Lazear and Gibbs, 2009).

post, although there is also a substantial benefit attached to online recruitment given the significant economies of scale that firms enjoy (Oyer and Schaefer, 2011).

Another important issue regarding methods of recruitment is their interface with intermediaries (e.g. temporary agencies and executive search firms). Firms that employ such practices effectively outsource the screening function to these intermediate companies, which raises interesting questions about the effectiveness of such methods in avoiding the emergence of potential skill mismatches. Nevertheless, empirical literature on this issue is scarce (Oyer and Schaefer, 2011).

A particular issue of concern among contemporary human resource managers is whether traditional selection tools (e.g. resumes, interviews and reference checks) are suitable for assessing the competences of candidates as required by modern organisations: the ability of new recruits to handle a rapid pace of work, to manage tight deadlines, to engage in decentralised decision-making and work patterns, and to exhibit social skills by working within the context of teams and via horizontal hierarchical structures. To be effective in these tasks, workers require strong skills in areas such as customer service, communication, leadership, team-building, strategic thinking and the ability to motivate other staff members. 'Someone might have all the right skills, qualifications and experience for a position but are used to working in a highly structured environment with clearly defined lines of communication and authority. Now put that person in a position where they need to think on their own and make greater decisions for themselves and they may flounder and be unable to cope with situations that aren't managed for them by others' (Drake International, 2011, p. 7). To gain more insight into the underlying reasons for skill mismatches it is essential for future research to focus on the interaction between workers' skills, their past work experiences and the changing nature of the tasks that they are required to perform in their current posts ⁽¹³⁾.

The greater adoption of new high performance workplace practices (HPWPs) by enterprises has been seen as an effective response to changing work demands. For example, Bresnahan et al. (2002) assert that firms cannot benefit fully from investments in ICT without also reorganising work practices in a way that uses high-involvement human resources policies. HPWPs are

⁽¹³⁾ The piloting by Cedefop of an employer survey on changing tasks and skill requirements in Europe may provide useful information in this respect. Cedefop's new survey instrument uses an innovative task-related approach to skill needs measurement to gain more insight into the future (generic and occupation-specific) skill needs of enterprises in various sectors and countries.

essentially a bundle of human resources practices (targeted recruitment, continuous training, job rotation, teamwork, motivation, employee involvement, etc.) that encourage the development and utilisation of staff skills by organising work measurably, rewarding performance and involving employees in a flat decision-making process. HPWPs are believed to strengthen firm productivity and performance via the development of a strong organisational culture that relies on effective staff involvement and commitment and a sense of overall job satisfaction. Using data from the 2000 wave of the European survey of working conditions covering all EU Member States, Bauer (2004) has shown that the shift to more flexible work systems and enhanced work autonomy is associated with higher job satisfaction among employees. Firms relying on HPWPs often implement specific job design, hiring, training, communication and performance management measures to ensure that they possess a highly skilled workforce that fully uses its skills in the workplace. It has been asserted that 'organisations that require HPW but do not implement it effectively often have workforces with underutilised skills, overeducated workers and poor working relationships' (AssetSkills, 2011, p. 4). In contrast, organisations that rely on HPWPs have very focused skill induction programmes and development policies tailored to their specific demands rather than on mere technical skills. Common HPWPs used in recruitment are reviewing vacancies in relation to business strategy and the use of formal assessment tools for assessing the competences, attitudes and values of employees (e.g. personality and motivation tests) (DTI and CIPD, 2006).

Critical to preventing skill mismatches is the extent to which firms engage in the evaluation (forecasting) of their future staffing requirements; data from the third European continuing vocational training survey (CVTS3) indicate that only 26% of enterprises assess their future skill needs and data from the UK workplace employment relations survey suggest that only 34% of firms attempt to foresee the emergence of potential skill mismatches within their available staff. Private sector firms, larger-sized establishments and those with other types of hiring policies (e.g. personality tests) appear to be more likely to engage in such a forward-looking assessment exercise.

Given that some authors have found that ethnic minorities have a higher likelihood of overeducation (Battu and Sloane, 2004; Lindley, 2009; Cedefop, 2011a), equal opportunity policies and the tackling of discrimination by firms assumes an important role in tackling skill mismatch. Developing literature on organisational demography (Oyer and Schaefer, 2011) indicates that the race or ethnicity of a hiring manager can play a significant role with respect to the demographic composition of new hires (Giuliano et al., 2009). It is also reasonable to expect that these mechanisms might affect the probability of the

perpetuation of overeducation (via the distortion of the promotions channel or the non-suitable allocation of tasks to employees as decided by biased managers). They might also encourage the presence of undereducation/underskilling by using informal social networks during recruitment or because of favouritism.

Box 2 Research questions on hiring strategies and skill mismatch

- (a) What are the determinants of recruitment difficulties faced by firms? How do these differ by (high- or low-skilled) occupations, by sectors and according to the different labour market institutional and regulatory policies of EU Member States?
- (b) What type of recruitment strategies used by firms are the most efficient in terms of avoiding skill mismatch? What is the optimal mix of recruitment strategies that can be used for that purpose?
- (c) What optimal bundle of knowledge, skills, competences and attitudes do employers require when hiring education graduates and employees? How do these differ according to the nature of production, industry and firm characteristics?
- (d) Are the hiring strategies employed by high performance workplace organisations (HPWOs) more or less effective in tackling skill mismatches relative to firms utilising more traditional organisational structures?
- (e) Is there a complementarity between the hiring and training policies of firms with respect to their overall effect on the likelihood of skill mismatch?

4.2. Training and skills development

In a competitive and rapidly changing world, workforces need to be capable of continuously adapting to shifting job requirements and organisation procedures related to new skill-intensive technologies. Lifelong learning has therefore become an issue of paramount concern for modern organisations and policy-makers. Lifelong learning is a priority in the EU Commission's strategic framework for cooperation in education and training (ET 2020) ⁽¹⁴⁾ and in its lifelong learning programme ⁽¹⁵⁾. What is clear from these initiatives is that modern organisations play a vital role in the process of skills acquisition and upgrading. This is typically achieved via continuing vocational education and training (CVET) provided, and largely financed, by enterprises. Employers also have a crucial role to play in terms of shared responsibility and partnership with

⁽¹⁴⁾ http://ec.europa.eu/education/lifelong-learning-policy/doc28_en.htm [cited 8.12.2011].

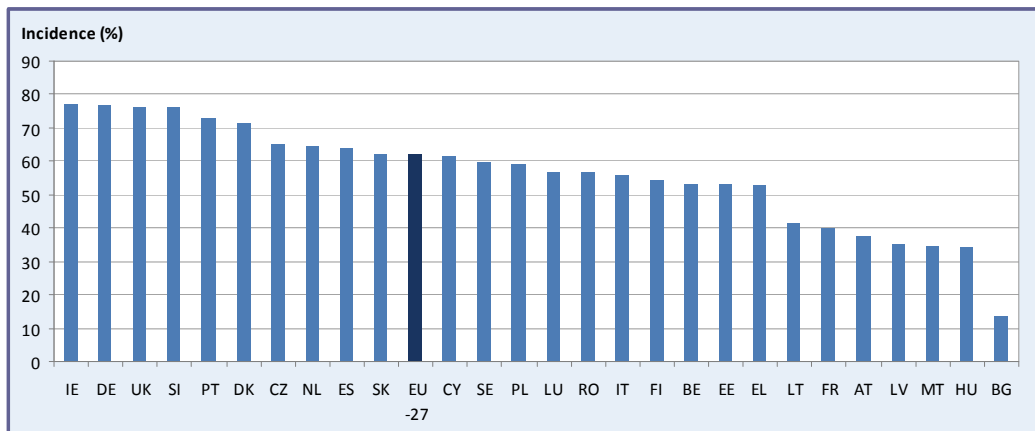
⁽¹⁵⁾ http://ec.europa.eu/education/lifelong-learning-programme/doc78_en.htm [cited 8.12.2011].

respect to the provision of initial VET (IVET) (e.g. via apprenticeships and traineeship placements, representation in VET school boards). Several studies have emphasised that training can have a positive effect on company performance by raising labour productivity, improving organisational culture and encouraging innovation (Cedefop, 2009c). For example, Cedefop (2011b) reported that Austrian companies that doubled their investment in training increased their productivity by 4% and pay higher wages ⁽¹⁶⁾. However, although most of the attention in literature has focused on the need for skills upgrading, much less emphasis has been given to the training strategies that firms must pursue to avoid underutilisation of workers' existing skills.

Despite the critical role of continued investment in vocational-oriented learning, many EU firms do not provide training to their employees. Data from the CVTS3 reveal that a sizeable 40% of private firms did not provide any type of continuing training in 2005 (though this figure varies depending on whether firms are permanent or incidental non-trainers). Using a different methodology, the 2009 European company survey (ECS), which surveys a smaller sample of European establishments, also indicates that 38% of firms provide no training. Important cross-country differences in the incidence of non-training establishments are reported (Figure 7), with smaller firms generally found to be less likely to offer training. Much attention has also been given recently to the important practice of enterprises anticipating their skill and training needs as a means of preventing the emergence of future skill imbalances. Only 26% of all firms were detected to assess their future manpower and/or skill needs in the CVTS3 (Cedefop, 2010d). This proportion is considerably higher among establishments that provide training and in larger-sized firms. The limited awareness of future skill needs by European companies is worrying as it can contribute to prospective skill mismatches, especially in smaller and medium-sized enterprises (SMEs).

⁽¹⁶⁾ Though overemphasis on training can result in inefficiencies for firms and individuals, such as an inflation of salaries or encouragement of a 'qualification spiral', as has been suggested for Portugal (Cedefop, 2011b, p. 15).

Figure 7 Firms providing training in last 12 months (EU-27; 2009)



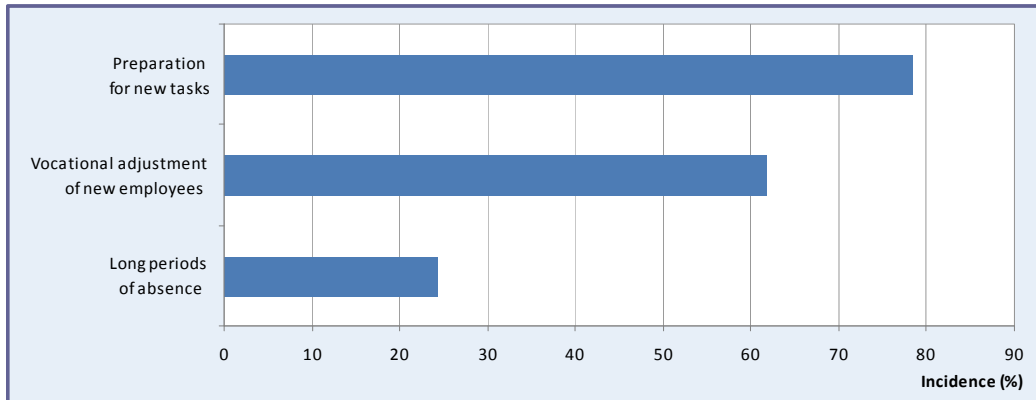
NB: Percentage of firms in EU-27 with employees given time off normal duties in last 12 months to undergo further training; establishment weights used.

Source: ECS; Eurofound.

An issue of particular concern in the relationship between training and skill mismatches is the motivation for firms to provide training. The respondents of the 2009 ECS were asked about the important drivers of the application of training measures by European firms. The first option, that further training is provided for vocational adjustment for new employees, is a proxy for measures taken to address mismatches in hiring. This option can also be regarded as a surrogate for the suitability of the skills that individuals acquire via their participation in general education and/or IVET and CVET. The second option, referring to the preparation of employees for new tasks, is indicative of skill gaps among existing employees, which might have arisen because of the introduction of new processes and technologies. The third option, training after periods of long absence by employees, is mostly related to skills obsolescence: the skills of workers have become less relevant over time and need to be replenished.

Figure 8 shows that a significant proportion of training establishments in the EU-27 are motivated by the need to engage in skills upgrading of employees (79%), followed by their vocational adjustment (63%). Of European firms 24% on average also offer the possibility of training to employees that have returned to work after long periods of absence. Significant cross-country differences are observed in these patterns.

Figure 8 **Motives of further training (EU-27; 2009)**



NB: Motives of further training that are important drivers of application of training measures by firms in EU-27; establishment weights used.

Source: ECS; Eurofound.

Equally important are the reasons why enterprises do not provide continuing training to their employees. The 2005 CVTS findings indicate that, in addition to time and cost constraints, a substantial proportion of firms do not believe that there is any need to invest further in workforce skills. In the CVTS3, 74% of the non-training establishments in the EU-27 indicated that ‘the existing skills and competences of the persons employed corresponded to the current needs of the enterprise’ (Cedefop, 2010d); 53% of these firms resort to filling competence gaps via recruitment. These patterns are particularly worrisome, since it is expected that, with an ageing population, skill mismatches are bound to materialise if workers do not update and broaden their skills. More research is necessary to confirm that non-training firms do not suffer from skill mismatches, given that it is likely that the survey responses might simply be a reflection of social desirability bias by smaller-sized firms.

The theory of human capital states that workers will accumulate skills in the aftermath of formal education via (non-formal or informal) training and work experience. Depending on whether the skills acquired by employees are of a general nature or are more specific to the firm, this can have some important implications for which party of the employment relationship will bear the training investment cost (Becker, 1964). As either the worker or the firm may renege on their commitments once the other party has borne the training costs (the ‘hold-up’ problem), workers are more likely to pay for general training whereas the two parties will preferably split the cost of firm-specific investment in human capital accumulation. Both cases imply that, while acquiring new knowledge and skills, there will be an initial period whereby workers will be paid a wage that is lower than their actual productivity. The type of training is also likely to determine the

shape of workers' wage profiles, their turnover patterns and overall career prospects in the post-training period. In particular, a greater specificity of human capital implies that both employers and employees have an incentive to foster a long-term working relationship. The accumulation of firm-specific human capital and the desire by firms and workers to shield their investment is therefore believed to underlie the empirical phenomena of rising rates of return on tenure (Medoff and Abraham, 1980; Topel, 1991) and the existence of internal labour markets. Workers with general skills are more likely to benefit from rising returns on overall work experience and to exhibit less stable turnover and career paths. However, most studies do not distinguish convincingly the part of the return on tenure that can be attributed to skills development during the working life from the part which is merely due to the revelation of match-specific productivity over time (Abraham and Farber, 1987; Altonji and Shakotko, 1987; Heckman et al., 2006).

What is clear from the studies referred to above is that the incidence and consequences of skill mismatch will depend on whether firms engage in training, the type of training provided and on the interaction of training with other characteristics of the firm. It is expected that the proportion of mismatched workers will be lower in training firms, as the skills of workers will be adjusted during the training process so that they are in line with job requirements (Belfield, 2010). Overeducated workers, for instance, can follow firm-specific training courses that will align their 'surplus' skills to those required by the specific organisation in which they are employed. Further, since skill gaps are intrinsic in a firm's current workforce, these can be eradicated through firm-sponsored training or by providing individuals with relevant incentives to participate in upskilling. Formal courses or on-the-job training can also benefit those suffering from skills obsolescence due to ageing or after a prolonged period of absence from the job market.

Despite the expectation that vocational training may benefit mismatched workers, training firms have to confront a number of significant complications. For example, neither workers nor firms may be willing to invest in enhancing the firm-specific human capital of overeducated workers, given that their behaviour with respect to turnover is more erratic relative to their matched colleagues (Mendes de Oliveira et al., 2000). The undereducated or underskilled, who are paid more than those with the same level of education in matching jobs, might also lack the incentive to update their skills or seek to move to more suitable posts. Finally, older workers may be reluctant to engage in training activities due to the smaller time period over which they would expect to amortise their investment in new skills, or because of other time or cost constraints.

Firm characteristics, such as size and the nature of production, are critical factors in the relationship between skill mismatch and training. For example, in industries that are dominated by spot-market type transactions (e.g. tourism), the incentive for firm-specific training is muted and skill mismatches will unavoidably be more probable. In addition, the ability of smaller-sized establishments to tackle any skill discrepancies in their personnel via the provision of training is likely to be compromised due to the dearer credit constraints that they face. Yet the absence of suitable data sets has not allowed researchers to fully investigate and understand the complementarity between various firm attributes, training policies and their ultimate effect on the incidence of skill mismatch.

Training has important implications for the salaries of over- and undereducated workers. It is commonly asserted that the wage patterns observed for mismatched workers are not necessarily contradictory to the predictions of human capital theory, given that most researchers are unable to control for the stock of non-formal/informal human capital (e.g. experience, on-the-job training, etc.) that workers possess. According to the substitution hypothesis, the well-documented wage penalty of overeducated workers relative to similarly-educated individuals is a reflection of the lower level of ability, skills and experience of the former (McGuinness, 2006, p. 410). Once this level of non-formal or informal human capital is considered, the wages of overeducated workers should merely reflect their true worth to the firm and the wage gap should be lessened. Similarly, it is argued that overeducation is a temporary phenomenon that dissipates with occupational mobility and exists only for as long as it takes workers to find an appropriate match. Therefore, the evolution of skill mismatch over time is dependent on workers' accumulation of skills and experience during their careers. The level of general training will determine the degree of workers' job mobility (manifested either as voluntary resignations or as poaching by alternative employers), and hence their likelihood of finding a suitable job that is in tandem with their skills. In contrast, the extent of firm-specific human capital is a crucial component of the internal mobility of workers, their promotion prospects and their overall assignment to appropriate posts within the organisation (Prendergast, 1993).

Though several studies confirm that overeducated workers have lower levels of experience, tenure and/or training (Duncan and Hoffman, 1981; Sicherman, 1991; Sloane et al., 1996; Sloane et al., 1999; Daly et al., 2000), that they are less likely to be promoted and that their turnover is more frequently characterised by involuntary separations from the firm (Sloane et al., 1999), there is considerable evidence against the substitutability hypothesis (Duncan and Hoffman, 1981; Groot, 1993). Studies based on cohorts of graduates from a

given year have indicated that individuals with similar levels of experience exhibit significant differences in the incidence and impact of overeducation once they have entered the job market (Dolton and Vignoles, 2000). Verhaest and Omeij (2006), using a survey of school leavers in Flanders (Belgium) conducted in 1999 and 2002, find no robust results regarding the impact of overeducation on training participation. Alba-Ramirez (1993) fails to detect any significant alteration in the wage penalty of overeducation after controlling for the incidence of on-the-job training by employees. Groot (1996) reports that this negative wage effect increases over time for men, so that there is no evidence to support that overeducated workers are temporarily less productive due to their lower levels of experience or job tenure. Nevertheless, it remains unclear whether the dynamic evolution of the wage gap of overeducated workers differs according to the training status of the enterprise in which they are employed.

There has been more focus recently on understanding the seemingly paradoxical observation of firms bearing a significant fraction of the cost of general training investments in real life labour markets. This reality is at odds with Becker's (1964) argument that firms will not be able to recoup their expenditure on general training in competitive labour markets. However, a series of research papers have emphasised that it is sometimes in the best interest of firms to pay for the acquisition of general human capital, as this can provide them with informational advantage (Lazear and Oyer, 2009, p. 36). In particular, in imperfectly competitive labour markets specific rents associated with training and retaining workers can be pervasive. Therefore, firms can enjoy higher profits on their better-trained workers for a sufficient period of time to justify their initial training outlay.

The most cited example of firm-sponsored general training comes from the US temporary help service industry (Autor, 2001b). Temporary help service firms typically provide temporary workers to firms on short-term contracts in exchange for a fraction of their wages as commission. Yet, as indicated by a survey of the Bureau of labour statistics in 1994, 78 (65)% of temporary help service establishments were found to offer some form of free general skills (computer skills) training up front during workers' unpaid hours (Garibaldi, 2006, p. 181). Autor (2001b) illustrates further that these training establishments offer lower mean wages relative to firms that do not provide courses on basic skills, all other things equal. It can be observed that temporary help service workers are normally first offered lower-wage, lower-skill assignments and subsequently better placements, as they demonstrate success (Garibaldi, 2006). Autor justifies his findings by arguing that the process of training can serve a dual role. First, it can give firms asymmetric information about the ability of temporary workers. Second,

if training and worker ability are complements, training can offer useful screening, with high ability workers more likely to self-select into training establishments⁽¹⁷⁾. Therefore, the provision of training by firms can play a critical role in the prevention and sorting out of skill mismatches.

These arguments are important as they come closer to acknowledging an important yet somewhat neglected fact in prior studies, namely that some types of skills development course offered by firms are considered a positive non-monetary job attribute by many employees. Training can, therefore, be conceptualised within a 'hedonic' framework (Rosen, 1986). According to the theory of 'equalising' or 'compensating' differences, the preferences of employees (who value training) and the technologies of firms (which dictate the cost of training provision) will be sorted in an overall matching equilibrium. Hence, in a competitive labour market some workers will be willing to accept a lower wage relative to similarly-educated individuals, as compensation for their participation in a training enterprise. There is a need for research to investigate more closely whether employees value training and what sort of trade-offs in their earnings they are willing to make to enjoy the option of being employed by a training enterprise⁽¹⁸⁾.

In a global and competitive economic environment there is ever-increasing recognition by firms of the continuously changing skill demands within occupations. Cedefop (2008) points out that modern organisations seem to attach more value to 'soft skills' than in the past (e.g. teamwork, interpersonal communication, initiative, creativity, entrepreneurship, leadership and management, presentation skills, ability to learn). They are also more willing to

⁽¹⁷⁾ There are several alternative explanations for the willingness of firms to sponsor general training. Most of these focus on the potential monopolistic power (monopsony) that employers have over workers due to search and transaction costs, which allow for the wage of trained workers to remain below their actual productivity within a firm (Acemoglu and Pischke, 1998; Stevens, 1994; 2001). Acemoglu and Pischke (1999) have also emphasised that even without information asymmetry, firms may still finance general training if there is wage compression in the labour market due to institutional factors (e.g. unionisation, minimum wages, etc.). Recently, Cedefop (2009b) has investigated the importance of financing instruments that can support broad VET training, such as the use of payback clauses and of other financial incentives.

⁽¹⁸⁾ The Epicurus project (financed by the Commission of the EU via the fifth framework programme), made a first attempt to quantify such trade-offs. Using a unique conjoint analysis approach the researchers investigated the underlying preferences of employees from seven EU Member States for various job attributes. In this manner, they managed to calculate the percentage of their wage that workers are willing to forgo in exchange for more days of training provided in their employment (Pouliakas and Theodossiou, 2010).

invest in improving such skills through employee training. High-performance work organisations (HPWOs) provide a notable example, since training and continuous employee development is a 'given' in such enterprises (DTI and CIPD, 2006). For HPWOs the critical aspect is not the quantity of training (i.e. provision of more courses) but its link to performance objectives. Also, in most HPWOs tacit skills and institutional knowledge are more important than technical skills. Common training methods used by HPWOs include annual reviews of employer training needs, training to perform multiple jobs, continuous skills development programmes and 'structured' induction training.

Generally, success in matching people's skills to their jobs hinges on better understanding the skills that people possess and the precise ways in which these can be developed and used via training. Researchers have shifted their initial focus on the effects of over or undereducation towards examination of the incidence and consequences of skill mismatches (over and underskilling). It has been found that the negative effect of skill mismatches on job satisfaction and wages is often greater and more significant than the impact of overeducation (Allen and van der Velden, 2001; Green and Zhu, 2010; Mavromaras et al., 2009). However, the absence of reliable data sources on skills and competences has hindered efforts to measure accurately the nature of skill mismatches and their consequences for the welfare of employees and firms. Further information on the evolution of skill needs and of job tasks within particular sectors and occupations in European labour markets (as examined, for instance, via Cedefop's employer survey) is a key prerequisite for future research on skill mismatch.

Box 3 Research questions on enterprise training and skill mismatch

- (a) How does the incidence of skill mismatch vary between training and non-training enterprises in Europe, and what is the role of other company characteristics?
- (b) How does the effect of skill mismatch on core labour market outcomes (wages, well-being, job mobility) differ between training and non-training enterprises in Europe?
- (c) How effective is employer partnership in IVET and provision of CVET in tackling skill mismatch?
- (d) What are the optimal training initiatives when firms have simultaneously to train both overskilled and underskilled employees?
- (e) What effect does firm-sponsored training have on the evolution of skill mismatches over time?
- (f) What impact does the growing interaction between firms and private/public sources of skills development (e.g. temporary help services, general education system) have on skill mismatch?

4.3. Performance management and appraisal

In many firms the responsibility for monitoring and appraising the performance of workers is delegated to a supervisor or manager. This person is generally responsible for in-depth evaluations of the behaviour of employees based on some fairly accurate (yet sometimes non-verifiable) signals of productivity. The process, in particular in private sector firms, is often linked to various rewards, such as wage raises, subjectively determined bonuses and promotions. Subjective performance evaluation is sometimes considered necessary as it sidesteps many of the difficulties associated with obtaining objective measures of worker performance and is thought to paint a more holistic picture of their contribution to the firm (Prendergast, 1999).

The responsiveness of performance appraisal is crucial for counteracting the prevalence and perpetuation of skill mismatch within enterprises. Based on the search and career mobility hypotheses, mismatch at the initial stages of individuals' careers is a systemic feature of labour markets. Nevertheless, by monitoring progress and offering feedback on staff performance, employees and their superiors can be constantly alerted to potential problems in the organisational fit and in task allocation. This ensures effective skills utilisation and personal development in the workplace (CIPD, 2010). In many HPWOs, in particular, annual appraisal and formal feedback is specifically targeted to identifying the need for further workforce skill development through appropriate vocational training measures (DTI and CIPD, 2006). With careful performance appraisal, firms may also identify which workers are over or underskilled and alter

their job requirements or adjust their pay accordingly if it deviates from their marginal product due to non-competitive forces. Appraisal is also crucial for redeploying or promoting workers to positions with matching skill demands, minimising the potential turnover of unsatisfied employees.

However, many authors have emphasised the possible deficiencies of subjective performance evaluations. For example, given that they cannot be verified by outsiders, there is scope for manipulating performance measurements. For instance, subjective performance evaluation may give rise to rent-seeking behaviour by workers who aim to influence the judgment of their supervisors and hence derive personal advantage (Milgrom, 1988). There is also considerable evidence that supervisors tend to be more lenient in their ratings to avoid conflicts with disgruntled subordinates (Prendergast, 1999; McLeod, 2003). The negligible difference in ratings across workers tends to undermine the value of subjective assessments. Moreover, the efficiency of performance appraisals is dependent on the trust employees and their superiors have in the reliability of the process. More specifically, a lack of supervisory favouritism (Prendergast and Topel, 1996) and firm commitment not to renege on what are inherently implicit contracts in the future (Baker et al., 1994; Bull, 1987; MacLeod and Malcomson, 1989) are necessary. Prendergast (1999) notes that as other influences tend to cloud the relationship between appraisal and performance, firms deliberately decouple it from pay setting. Instead, they use appraisals primarily for skills assessment and training purposes. Fairburn and Malcomson (2001) also point out the need to offer sufficient monetary incentive to managers to make them resistant to influence when engaging in promotion decisions. All of the above arguments highlight the difficulty of using performance appraisals as a tool for achieving a more efficient matching of workers to jobs.

Despite this intuition, empirical investigations of the influence of appraisal on skill mismatch are in short supply. A notable exception is the study by Belfield (2010), who reports evidence that appraisal programmes play a significant role in ameliorating the incidence of overeducation in UK firms. The significance of this relationship is found to be particularly strong for the public sector, presumably because public sector organisations tend to rely less on financial forms of incentivising workers (e.g. variable pay schemes) and more on performance monitoring (Burgess et al., 2002).

Box 4 **Research questions on performance appraisals and skill mismatch**

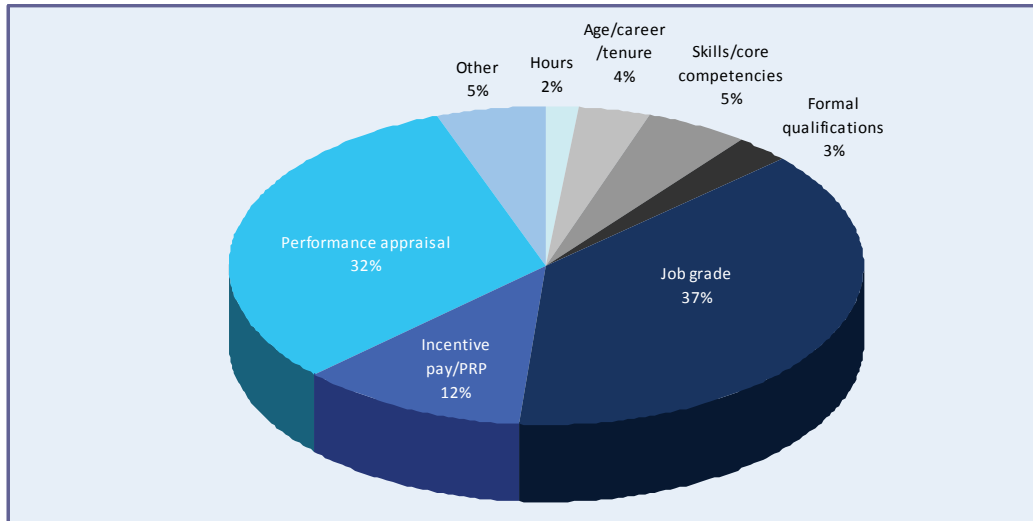
- (a) Is the incidence of skill mismatch affected by whether firms engage in performance monitoring and appraisal and by its intensity?
- (b) What is the role of performance monitoring in encouraging the provision of the right type of vocational training by enterprises, and does their interaction affect the incidence of skill mismatch?

4.4. **Wage policies**

A core problem for human resource managers is to construct appropriate wage schemes that will not only attract the right type of workers to the firm, but will also motivate them to make the best use of their skills and to continue developing them throughout their careers. As shown in Figure 9, different factors can contribute to the difference in pay rates of workers in similar occupational groups within a firm. Literature has focused on understanding how appropriate wage compensation mechanisms can be devised to align the conflicting interests of firms (that wish to maximise profits) with those of workers (for whom it is assumed that the exertion of more effort becomes increasingly costly for their welfare)⁽¹⁹⁾. Little attention has been given to the fact that the type and structure of payment systems (e.g. fixed salary, performance-related pay, relative evaluation) can also have an important bearing on the incidence and consequences of skill mismatch. In addition, the mechanisms which differentiate the pay of over- and undereducated workers relative to those in matched jobs are not yet clearly understood.

⁽¹⁹⁾ This theoretical framework is widely known as the principal-agent or agency problem. The paradigm is based on the premise that when employees possess asymmetric information about the amount of effort that they put forth, and thus can engage in hidden actions (e.g. shirking), a fixed wage is likely to spur the problem of moral hazard (Rothschild and Stiglitz, 1976; Holmstrom, 1979). In this case, it is essential for firms to provide incentives to workers via the design of more efficient remuneration policies.

Figure 9 **Reasons for differences in pay levels (UK, 2004)**



NB: Reasons for differences in pay levels of full-time workers in largest occupational group at workplace.
Source: UK workplace employment relations survey, 2004.

An important issue is whether the wage patterns observed for mismatched employees truly reflect their actual productivity, or whether other forces are at work. In a competitive job market firms will decide how much pay to offer after recruitment based on observable signals of employee productivity: education credentials, work experience, references, interview performance, and screening. According to the standard human capital model (Becker, 1964; Mincer, 1974), the wages of workers will subsequently reflect their marginal productivity, which is a function of their schooling and post-schooling experience and training⁽²⁰⁾. Nevertheless, the human capital model cannot be easily reconciled with the fact that the wages of mismatched workers diverge from those of similarly-educated yet matched individuals. This is particularly the case in the face of evidence showing that the wage penalty suffered by overeducated workers persists over time (McGuinness, 2006). This would suggest that either overeducated workers are inherently less productive than those in matched employment (because of inferior abilities or skills), or that their skills are somehow underutilised due to workplace constraints and required tasks. Similarly, the human capital model cannot easily account for the fact that the wage benefit to overeducation relative to colleagues in the same position diminishes with additional labour market

⁽²⁰⁾ The 'learning models of human capital' also emphasise that the level of pay will more closely mirror workers' marginal product over time as their true ability is revealed to the firm after recruitment (Farber and Gibbons, 1996).

experience (Cedefop, 2010b). Such a trend appears to be consistent instead with 'sheepskin effects', whereby initial pay is determined by certification, but workers are eventually sorted into their most appropriate job based on performance. In this respect, qualifications become less significant as time progresses.

Also, differences in pay may be driven by adherence to administrative pay scales and the influence of imperfect (monopsonistic) labour markets (e.g. rent seeking, search and hiring frictions, discrimination) (Manning, 2003; Blanchflower and Bryson, 2010). In imperfectly competitive labour markets overeducated workers might be willing to accept a lower wage relative to their productivity if financial constraints bring search to an end. Also, various institutional arrangements (national pay agreements, contract indexation, forward wage bargaining) may be rigid, and thus prevent firms from adjusting pay rates to match the marginal productivity of workers.

Organisations tend to use different financial incentives to employee effort. These commonly take the form of explicit contracts that tie pay to observable measures of performance (e.g. piece rates, bonuses, merit pay, stock options, profit pay), relative evaluations (e.g. promotions), or more long-term remuneration strategies (e.g. deferred compensation wage schemes or seniority pay scales) (Prendergast, 1999). These are discussed below.

Variable pay: performance-related pay (e.g. piece rates, individual or group bonuses, merit pay, profit pay and stock ownership) is a powerful wage scheme that firms have increasingly used in recent years to reward workers for greater effort (Pouliakas and Theodossiou, 2009; Pouliakas, 2010). Performance-related pay schemes are also considered an integral component of HPWPs, as they are used to support stake-holding and to foster a greater sense of belonging and commitment to an organisation (DTI and CIPD, 2006). Such pay systems also serve a sorting purpose, offering a means of attracting and retaining valuable labour to the firm (Lazear, 1986, 2000), so skill mismatch should be smaller in firms using performance-related pay schemes. Also, if it is true that the productivity of overeducated workers is somehow constrained by the nature of their tasks, one would expect to observe a smaller wage penalty for those overeducated workers whose pay is linked to performance. The widening dispersion in earnings observed within firms or groups of individuals with similar measurable characteristics (e.g. education, experience, etc.) since the late 1970s in many developed nations has also been partly attributed to the predominance of performance-related pay schemes (Katz and Autor, 1999; Barth et al., 2011).

Job competition and tournaments: some researchers have stressed that the actual dynamics of wages are driven largely by the jobs that people hold. The job competition model (Thurow, 1975) is an example of this approach, focusing

on how wages are determined by the training costs faced by firms. In this model, education merely serves as a signalling mechanism that places individuals at the front of a job queue. Thus, the differences between the wages of mismatched employees and those who are in suitable positions are a reflection of the constraints of the job tasks and of the workplace. In this sense, the proper remedy for eradicating skill mismatches is largely about finding the right job that matches people's skills and qualities, rather than finding the right pay rate when different people perform similar jobs.

Most organisations have hierarchical management structures, with a fairly narrow band of possible wage offers within job grades. In such firms salaries tend to exhibit discrete jumps between levels of the hierarchy through promotion rather than some absolute measure of worker performance. A reward system that relies on the allocation of a fixed prize to a group of people based on their relative performance is known as a tournament (Lazear and Rosen, 1981). Perhaps one of the most important reasons for which promotions are used is to sort workers on the basis of their talents (Rosen, 1982; Prendergast, 1999): the internal labour market assumes an important role in this respect. It follows that if firms have rigid worker deployment mechanisms over time this may then inhibit the allocation of workers to proper tasks and positions that fit with their skills, perpetuating any initial hiring mistakes. The theory of tournaments also draws attention to the fact that part of the wage differential between mismatched and matched employees with the same level of education can be attributed to their relative placements on a firm's job ladder. Nonetheless, it cannot explain the observed variation in pay between individuals in similar jobs who differ in terms of their mismatch status.

Wages over longer time horizons: when account is taken of the fact that most employment relationships are dynamic in nature, it becomes evident that pay can be structured in a multi-period framework. For example, a suitable remuneration plan can entail the payment of a wage that is less than a worker's marginal product at the early stages of his/her career, with the wage rate exceeding productivity at later periods. This deferred compensation scheme is believed to aid self-selection into particular jobs by encouraging turnover of less suitable workers during the initial phases of employment (Salop and Salop, 1976). It may also encourage long-term relationships, investment in firm-specific capital and provide more efficient incentives and risk-bearing to workers (Lazear, 1979). It is plausible that part of the wage differential observed between overeducated and suitably matched workers can be attributed to the sorting of the former into firms that use the above compensation scheme.

Similarly, sometimes enterprises may offer a higher level of pay and benefits relative to that of competitors or of the 'going rate' (Akerlof, 1982; Shapiro and

Stiglitz, 1984). Known as an 'efficiency wage', the offer of such a 'gift' to workers is espoused as a method of attracting and retaining high quality labour. It also provides discipline for workers as they have an incentive to consider the loss of the wage premium if they are caught shirking (Akerlof and Yellen, 1986). The offer of efficiency wages could, therefore, explain the wage premium that overeducated workers enjoy relative to colleagues in similar positions.

Equilibrium models of compensation: in the assignment model both individual and job characteristics are important factors for the distribution of earnings, so the human capital and job competition theories are encompassed within this broader framework (Sattinger, 1993). The mismatch in this model arises because of an allocation problem, whereby heterogeneous workers need to be paired with heterogeneous jobs. Since the predictions of assignment theory imply that the magnitude of the return on each year of mismatch is likely to be smaller than the respective return on the required years of education within a job, it is well-placed to account for the empirical regularities reported in literature.

Even among similarly-educated workers some individuals may choose to be employed in lower-(higher-)paid occupations as the job attributes in those occupations are more (less) desirable. In addition to salary, many firms rely on the offer of particular amenities or fringe benefits (e.g. training courses, health care, retirement benefits, child care, pleasant work environment) as a means of attracting and retaining workers. This offer by firms differs to the extent to which they enjoy a comparative advantage in the provision of particular non-monetary benefits due to their cost structure, tax incentives or economies of scale. On the other side of the market, heterogeneous individuals also differ in their preferences over a particular wage-benefits trade-off. In the long term, firms that enjoy a comparative advantage in offering a superior benefit package might be expected also to afford to attract a desirable pool of employees who value those benefits by offering, on average, lower wages (all other things equal) ⁽²¹⁾.

Fairness and equity: Frank (1984) offers an alternative explanation for why workers may not be paid according to their marginal product and why wages are thought to be more compressed than productivity. He argues that, if workers care about their pay relative to their peers within the firm, high ability workers will be willing to take a wage discount for the value that they get from being near the top of the pay scale. It is also the case that some firms may prefer to rely on some degree of pay compression in setting their wage policy, as a greater degree of

⁽²¹⁾ This framework, known as the hedonic wage model, has been argued to constitute the 'fundamental long-run market equilibrium construct in labour economics' (Rosen, 1986).

equity or fairness in compensation may be related to higher productivity outcomes (Mahy et al., 2011).

Box 5 Research questions on wage policies and skill mismatch

- (a) How do employers differentiate the pay of workers according to mismatch status? Are the wage premiums/deficits observed for mismatched workers a reflection of productivity differences or do they arise because of non-competitive forces?
- (b) Is tying the wages of employees to training and skill development beneficial for the reduction in the incidence of skill mismatch?
- (c) What trade-offs between remuneration and fringe benefits (in particular, the offer of vocational training) are over(under)educated workers willing to make, and how do these contribute to the existence of skill mismatches within firms?

4.5. Career development

Though the importance of recruitment, training and of the structure of the compensation package for inducing the right ‘fit’ of workers’ skills to their jobs has been emphasised, post-hire matching is also important. Labour market matching is continuous, as firms decide who to retain, promote or displace and workers decide whether to engage in on-the-job search. Most of the empirical evidence tends to suggest that the likelihood of worker/firm separations decreases with job tenure (Farber, 1999). However, literature has struggled to find a convincing answer as to whether this observed tenure effect can be attributed to the accumulation of firm-specific human capital or to the enhancement of match-specific productivity over time (Jovanovich, 1979). While there is much literature on the effect of job loss, there is relatively little on firms’ strategies regarding retaining and displacing workers (Lazear and Oyer, 2009).

As discussed in Chapter 2, the higher level of labour market turnover among overeducated workers is well-documented, as is the negative effect that this mobility might entail for the training decisions of firms who wish to tackle the mismatch. There is disagreement about whether the promotion prospects and wage growth of overeducated and adequately matched employees converge over time (Sicherman, 1991; Robst, 1995; Sloane et al., 1999), and on whether mismatch is a persistent phenomenon. Groeneveld and Hartog (2004) report that career development within the internal labour market is much more substantially enhanced (impeded) by the process of overeducation (undereducation) relative to the external labour market, and that this affects younger ages in particular. In any case, it may be in the interest of firms to identify mismatched employees and

to either avoid retaining them, if they wish to avoid any potential adverse productivity impacts in the long term, or to invest more in their career growth.

One way of filtering those employees whose skills do not fit with their job requirements after hiring is through a probationary period, whereby a worker's performance is tested on the job itself⁽²²⁾. Though the expectation is that firms that employ probation as a screening tool will suffer less from skill mismatch in the long term, empirical evidence is limited. Interesting questions do not appear to have been addressed in literature: whether probation is effective at mitigating potential skill mismatches by weeding out wrongfully hired individuals; whether the criteria of assessing the skills and competences of workers during the probation period differ relative to those requested during recruitment; or whether the strictness or the duration of the probationary period are likely to enhance the quality of a job match. It has also been argued that, due to high regulation and termination costs, many firms have either outsourced responsibility for sorting and screening to temporary help agencies in recent years or have made greater use of temporary (fixed-term) contracts (Lazear and Gibbs, 2009). However, the effectiveness of these measures in terms of mitigating the prevalence and negative effects of skill mismatch is yet to be assessed. For temporary contracts in particular, there is a need to distinguish between two opposing effects on skill mismatch: while such contracts have a potential filtering effect by assessing worker suitability during the initial stages of a career, there is a negative impact on mismatch due to the diminution of job security, higher turnover and lack of incentives to invest in firm-specific training.

Retaining employees who are a good match for the firm is also crucial. According to data from the 2009 ECS, approximately 10% of companies in the EU-27 face difficulties in retaining staff. The opportunities offered to employees on behalf of the firm (e.g. flexibility in working hours, new training, job enrichment, early promotion, performance-related pay) may play a critical role in safeguarding the organisation from the emergence of skill mismatches due to employee turnover. However, firms often have to face an important problem retaining elderly employees. Often, older workers are more susceptible to skills obsolescence. Firms are also less likely to hire older-aged workers due to their higher wage and social security costs to the company, age discrimination and the fact that retraining them is not profitable due to the shorter amortisation period of the investment. It is apparent that, in the face of European demographic

⁽²²⁾ Up-or-out contracts, which state that workers who are not promoted are required to leave a firm, are also believed to serve a useful screening purpose for the company (Waldman, 1990).

developments leading to an ageing workforce, there is a need for appropriate policy measures and incentives to encourage employers to retain their older employees.

Firms with a greater turnover rate may be more susceptible to the existence of skill mismatches due to the loss of investment in employee skills that correspond to the particular needs of a business. In contrast, a greater level of turnover may enhance the odds of a firm locating better matches as they sift through a greater pool of talented candidates. Which of the two forces predominates is likely to differ according to the industry concerned. For instance, finding new blood via high turnover is likely to be more valuable in firms requiring young talent that is in sync with new technologies and developments (e.g. ICT) or those undergoing organisational restructuring.

Various approaches are used to protect the average level of skills within the firm in the face of high turnover. Some companies use 'knowledge management' strategies, setting up procedures for knowledge to be documented so that it can be reused by other workers following the departure of key employees. They also involve knowledge transfer among team members (cross-training). The purpose is to allow for easier transition of skills and knowledge between employees, perhaps reducing the incidence of skill mismatch among new and inexperienced recruits. Another example of an instrument that may safeguard the level of human capital within the firm is using payback clauses (Cedefop, 2009b). By requesting that part of the cost of training be returned to the employer in case of employee departure, payback clauses not only provide an incentive to firms to offer (general) training, but also serve to encourage longer-term employment relationships. This may strengthen the match between workers with newly acquired skills and firms that need such skills. Despite the theories, empirical investigation of such mechanisms and their relationship with skills mismatch has been constrained by the absence of data.

Most corporations operate hierarchical management structures with positions higher up in the ladder filled in via promotion. Though the offer of promotion is typically used to instigate greater effort by workers who are the lower ranks of the hierarchy (Lazear and Rosen, 1981), reallocation of employees to more appropriate posts assumes a crucial role for tackling skill mismatch and encouraging skills development in an organisation. The impact of external competition and the labour market is important. Waldman (1984) emphasises the crucial inefficiency that may ensue when there is asymmetric information regarding the ability of current employees. He shows that when incumbent firms are in possession of superior information regarding the productivity of their workforce, and when outside employers use the task assignments of workers as

signals of their ability, current employers may strategically assign their most valuable workers to jobs that are not commensurate with their skills and abilities. This can lead to or perpetuate skill mismatch within the firm. For a similar reason, some managers may be promoted to positions that are no longer appropriate for their skill levels (this is known in literature as the 'Peter principle') (Lazear, 2004).

A significant source of the implicit incentive for workers to engage in skills development and to exert more effort can be traced back to their desire to make a good impression on their employers and to build a good reputation, thereby affecting their future chances of promotion and career progression. As the pioneering career concerns model of Fama (1980) and Holmstrom (1999) illustrates, firms may sometimes eschew the use of explicit incentives (e.g. performance-related pay) if current performance is related to future prospects. This highlights the important role of the dynamic nature of employment relationships and the fact that there may be age-based variations in the need of firms and workers to invest in the strengthening of the skills component of a job match.

The incidence of skill mismatch within firms is likely to be affected by the overall composition of the workforce. The relative share of workers within the organisation is shaped by the firm's layoff, dismissal and displacement policies. Though it may be in the best interest of firms to fire workers who were hiring mistakes or are not paid according to their marginal product, dismissal typically involves a significant loss of firm-specific human capital and match productivity when it is done due to adverse economic shocks. Sicherman (1991) reported that, although undereducation is a good match for workers but bad from the perspective of employers, empirical evidence fails to find any indication that there is a higher incidence of dismissals among the undereducated. Laws on wrongful termination and employment protection legislation also play an important role in affecting the incidence, nature and frequency of dismissals. Lazear (1998) shows that when firms face barriers to laying off workers due to legal or other institutional impediments (e.g. powerful trade unions), this may compromise the quality of the workers that are eventually displaced. Most studies in literature have not paid enough attention to distinguishing between the separate roles that layoffs, firings and quits may play with respect to skill mismatch. However, the availability of large matched employer-employee data sets has the potential to generate insights into the displacement strategies of firms. This can be accomplished via the retrieval of information on a worker's match in the next job or to unemployment records, which may help narrow down the potential reasons for leaving a firm.

Box 6 **Research questions on career development and skill mismatch**

- (a) What type of vocational adjustment training measures do firms need to employ during the probationary period to enhance the quality of a job match?
- (b) What mechanisms do firms use to learn and adjust their workers' competences and skills during the post-recruitment phase?
- (c) Are non-permanent contractual arrangements conducive to skill mismatch due to diminished incentives for firms to invest in vocational training?
- (d) Is investment in vocational training beneficial to retaining older employees? Does this investment lead to a lower incidence of skill mismatch among ageing workers?
- (e) What is the impact of employment protection legislation laws on the occurrence of skill mismatch within firms? How do these relate to the displacement strategies of firms and to their long-term willingness to train their workforce?

4.6. Job design

A relatively neglected aspect in mismatch literature is the role that the organisation of work plays in creating and sustaining skill mismatches. Yet, the phenomenon of skill mismatch can be viewed in terms of the flip side of the same coin; it is not a reflection of people possessing a higher/lower level of skills relative to job requirements, but the nature of the job tasks is not suitably designed to fit with their skills. As Weststar (2009) suggests, attention should be shifted away from education reform towards considering the impact of workplace or job design. Firms generally do not allocate similarly-defined tasks to all workers. Employers pay considerable attention to job design, i.e. the charting and tailoring of a set of tasks to match the skills and abilities of a heterogeneous group of employees. In other words, firms have to decide 'who does what, who works with whom, and who works for whom' (Lazear and Oyer, 2009, p. 38).

Most companies beyond a particular size threshold use organisational charts that bundle jobs into a well-defined composite of pay grades and task responsibilities. Prominent theories of job design stress the interaction between human capital, incentives and job design when firms have to decide how to allocate tasks into jobs (Lazear, 1992; Prendergast, 1995). It is generally acknowledged that job design can be a key element of ensuring that workers do not feel that their skills do not correspond to the demands of the job. When firms have the ability to learn about the difficulty of the tasks that workers engage in, they are induced to give them more discretion and weaker incentives (Lazear and Oyer, 2009). More emphasis has thus been placed in recent years (in particular within HPWOs) on encouraging worker empowerment via the provision of adequate levels of autonomy, task discretion, control and responsibility. It is

argued that this can make employees feel challenged at work, recognised for their achievements and encouraged to use fully their knowledge and skills (CIPD, 2008).

The nature of modern production has also increased cross-task complementarity, whereby workers are now typically required to be proficient in several multiple tasks within the same job grade. This has magnified the difficulty for managers to identify and measure the main duties and skills needed for a position within their organisation. A particularly interesting subset of assignment models that acknowledges the fact that workers might have different efficiencies in dissimilar tasks includes the matching models (Rosen, 1978; Gibbons et al., 2005). These focus on worker heterogeneity and on the fact that the matching of the tasks required by firms is done on those workers who have a comparative advantage in performing them. Unfortunately, empirical evidence on these models has been hindered by 'the lack of good empirical proxies for how firms assign tasks to jobs' (Lazear and Oyer, 2009, p. 40). The new Cedefop employer survey, which focuses on identifying the trends in generic tasks within occupations and in the overall preparedness of workers to address these changing task requirements, may cast some light on this issue.

There has been a notable shift in modern organisations towards a greater use of teams and of worker interaction⁽²³⁾. This has arisen out of growing recognition that the complementarity of workers' skills has marked efficiencies in the production of new technologies, which tends to outweigh potential free-riding problems (i.e. where the incentives of individuals to exert effort are diluted since any payoffs are evenly split across the members of the team). Groups allow for people's inputs and skills to interact in a more constructive fashion in economic processes that have become increasingly reliant on the application of a multiplicity of skills. Research has shown that a positive spillover effect is usually observed in teams with diverse workers, since lower productivity team members tend to benefit from the higher productivity of some of their peers (Lazear and Oyer, 2009).

The increasing predominance of teamwork highlights the fact that firms should pay closer attention to identifying the team-working skills of individuals at the time of hiring or during career management. It has also been argued that a possible explanation for the tendency of firms to hire overeducated workers is because they can bring leadership, adaptability, knowledge of new techniques

⁽²³⁾ For example, in the US the share of large firms that have more than 20% of their workers in problem-solving teams rose from 37% to 66% from 1987 to 1996 (Lazear and Shaw, 2007). Similarly, according to ECS data (2009), autonomous teamwork is applied in 22% of European establishments.

and processes and innovation into a group of less qualified workers within the same team, ultimately acting as part-time teachers. 'When workers interact on the job, a worker's contribution to output includes the effect on co-worker output. As a result, it pays to hire better qualified workers when output is interdependent' (Lazear and Gibbs, 2009, p. 13). In contrast, Belfield (2010) has cautioned against the fact that overeducated workers may impose negative externalities on colleagues either by undermining workplace morale or by influencing workplace norms about effort. Even though the existence and importance of social pressure and norms in the workplace environment is widely understood and documented (e.g. Ichino and Maggi, 2000; Falk and Ichino, 2006), the nature of interaction between members of the same team has not been adequately studied as it requires 'insider' information that is not easily obtained via conventional data sets. However, this would allow us to understand better the underlying reasons for the wage premium enjoyed by overeducated workers relative to matched individuals in similar jobs.

Another important determinant of skill mismatch that has not yet been adequately investigated is the impact of the organisational structure on the use of talent and the distribution of decision-making within the firm. When companies are structured in a manner that separates their processes into functional organisational units and subunits (e.g. research and development, sales, production, etc.), there is scope for economies of scale in skills development as workers tend to perform a limited set of tasks that are closely related to the knowledge and skills needed for them to be executed. Narrowly defined jobs can be designed that are more compatible with narrowly focused human capital (Lazear and Gibbs, 2009). Also, more accurate performance evaluations and worker cooperation can ensue, since there is a more tightly-knit skills spectrum within the defined units, so this can be beneficial in avoiding skill mismatches. This link between company structure and skills development has become increasingly evident in the last two decades, given that many firms (in particular, HPWOs) have been flattening their hierarchical structures, with subsequent emphasis on decentralised decision-making (Rajan and Wulf, 2006).

Box 7 **Research questions on job design and skill mismatch**

- (a) How does the process of job design, the assignment of tasks to jobs and skills development initiatives affect the existence and persistence of skill mismatch?
- (b) Do relative peer comparisons, workplace norms and teamwork provide sufficient incentives for skills development, and do they affect the incidence of skill mismatch?

4.7. **Industrial relations**

The quality of the relationship between a firm's upper levels of management and employee representatives can have a significant impact on the incidence of skill mismatch. Typically organised within staff committees or trade unions, employee representatives are often in a position to use political leverage in collective bargaining procedures, influencing employment and human resource planning, wage setting and career development. According to data from the 2009 wave of the ECS, 49.7% of enterprises in the EU-27 state that employee representatives have a strong influence on employment and human resource planning, 36.1% on pay determination and 45.7% on career management. At times of contract negotiations or through industrial action, trade unions or associations may restrict the supply of workers by demands for hiring or firing standards, or negotiation of inflexible wage contracts ⁽²⁴⁾. In these instances, employers may have to make small changes in their existing workforce and/or to pay wages that do not truly reflect the marginal productivity of certain classes of workers.

In a fast-changing labour market, the role of employee representation has also changed in recent years. When addressing skill mismatches, employee representatives play a much more active role in the training efforts of an organisation. According to the 2009 ECS, more than 69.2% of EU-27 firms consult or negotiate with employee representatives on rules for access to training. Unions also often participate in the formulation of training policies and regulations, in the planning and implementation of training programmes (often via their own training centres), and negotiate preferential rights for access to training leave and wage benefits related to training. Important examples of employer-trade union consortia can now be found in several European countries, whose

⁽²⁴⁾ A typical example is the resistance by some unions to the employment of apprentices in various European countries, given that the apprenticeship system has sometimes become synonymous with the employment of low-cost and vulnerable labour without any form of social security protection.

purpose is to improve vocational training and guidance and to link training supply to enterprise needs ⁽²⁵⁾. Unions can also play a key role in developing a lifelong learning culture in the workplace, in identifying skill shortages or surpluses within companies and in helping employees to develop transferable skills to increase employability and readiness to progress within the job market (Cedefop, 2011c).

Box 8 Research questions on industrial relations and skill mismatch

Is a partnership between enterprises and employee representatives in the design of training initiatives effective at reducing the incidence and consequences of skill mismatch?

⁽²⁵⁾ E.g. Italy (bilateral training organisation between the employer organisation Confindustria and trade unions), Ireland (emphasis on social dialogue in policies for investment in continued training), Germany (tripartite collaboration in training) and France (administrative councils composed of both employers and trade unions deciding on training funds).

CHAPTER 5.

Company characteristics and skill mismatch

Although Chapter 4 has emphasised the important theoretical links between heterogeneity in firm characteristics and the incidence and consequences of skill mismatch, existing research is limited due to the unavailability of appropriate matched employer-employee data sets with a sufficiently long time element.

Belfield (2010) uses the UK's 2004 workplace employment relations survey, which is a matched employer-employee data set, to investigate the effect of important firm characteristics on skill mismatch⁽²⁶⁾. The data allow consideration of the effect of a range of labour management practices and the influence of overeducation on wages and job satisfaction. The author examines the impact of various hiring practices, such as hiring tests for aptitude and competence and induction programmes for new recruits. He also investigates the importance of policies on deployment of workers, such as whether firms use internal hiring to reassign workers, if the firm performs appraisals, if it has a recognised union and whether it offers training programmes.

The author first estimates a simple worker-level wage equation, and finds that the well-known overeducation penalty is associated only with those who report having skills much higher than required. In particular, he finds large wage gaps between those who are genuinely overeducated and those who are appropriately matched, in the order of -7.9% for the public sector and -5.8% in the private sector. He also finds a significant negative relationship between overeducation and job satisfaction with the work itself and with job contentment, with about 12-15% of overeducated workers predicted to be less satisfied than those who are correctly allocated.

When including controls for workplace characteristics and labour practices, the wage penalty falls to 4-7%, compared to 6-8% which was the case without these controls. The wage penalty is reduced further to 3-6% when workplace fixed effects are considered, thus suggesting that 'firm attributes are driving one-quarter to one-half of the overeducation wage penalty' (Belfield, 2010, p. 241). A similar exercise for job satisfaction regressions indicates a more muted effect of the role of the workplace. These above findings lead to the conclusion that

⁽²⁶⁾ In the employee component of the survey, workers are asked about whether their skills are higher than required for their job, with three possible responses i.e. 'much higher', 'somewhat higher', and 'appropriate'.

overall workplace differences appear to offset some of the labour market consequences of overeducation. Nevertheless, the assertion that company fixed effects are the sole drivers of overeducation penalties is rejected.

The nature of the matched employer-employee data set permits examination of the correlation between the proportion of overeducated workers within an establishment and other measures of workplace performance, such as the average level of pay, workplace relations and workplace effort (annual proportion of days lost due to absenteeism, percentage of workers that quit last year). Belfield (2010) finds that enterprises with a greater proportion of overeducated workers are more likely to face adverse consequences for their profitability, such as a significantly lower level of average earnings, lower workplace morale and higher personnel costs due to higher absenteeism and quit rates (particularly in the private sector). The difference in the magnitude of the mean level of pay between firms that have no overeducated workers and those in which all workers are overeducated (ranging between 13-26%) is indicative of the presence of negative externalities from having overeducated workers in the firm.

Finally, the author highlights the importance of workplace characteristics and of workplace composition for the likelihood that workers are overeducated. Hiring tests and induction programmes can ameliorate the likelihood of overeducation, particularly in the private sector; appraisal programmes play a role in the public sector. Workers who receive more training report lower levels of overeducation. However, preferences for internal hiring on behalf of managers of the firms, which is best interpreted as evidence of promotion and worker redeployment, is not statistically significant. A workplace with a recognised union strongly raises overeducation in the public sector, even after considering the worker's own union status. This suggests that union skill demarcation rules may impair the ability of firms to reduce overeducation levels over time. In contrast, structural and market characteristics (e.g. age/size of workplace, market competitiveness, capital-labour ratio) are not found to play an important role with respect to the prevalence of overeducation.

Böheim et al. (2008) investigate the differences in the incidence and determinants of skill mismatch among Member States (Czech Republic, Spain, Poland and Slovakia) using the 2002 European structure of earnings survey data set, a pan-European matched employer-employee survey. The structure of earning survey enables the aggregation of workers' characteristics for each workplace⁽²⁷⁾. In particular, the proportion of mismatched individuals (i.e. the 'intensity' of skill mismatch) may be related to firms' characteristics, thus

⁽²⁷⁾ See the Annex for a detailed description of the structure of earnings survey.

obtaining a clearer understanding of what types of firm are more likely to experience skill mismatch. The structure of the earning survey enables the construction of measures describing the employee composition of the workplace (e.g. share of female workers, part-time employees, manual workers, low-paid), but it also permits the consideration of the size of a firm, the industrial classification (one-digit NACE) and the sector (public-private) to which the establishment belongs.

Though the data set does not contain a direct question on educational mismatch, Böheim et al. (2008) follow the methodology proposed by Gottschalk and Hansen (2003). They use as an indicator of overeducation the percentage of workers with an academic degree who are employed in non-academic occupations. They classify as undereducated the percentage of individuals without an academic degree who work in graduate occupations. The occupational groups (three-digit ISCO) are classed as graduate occupations if two conditions hold: concentration of individuals with an academic degree exceeds 90% of the total population within the occupation; and the estimated wage premium from a standard Mincer earnings equation is statistically significant and exceeds 10%. From this, the probability that a graduate is employed in a non-graduate occupation can be estimated, considering the individual's gender and the yearly graduate unemployment rate.

A major finding of the analysis is that 'there is skill mismatch in the European labour market, however, the number of workers who – according to scientific conventions – are underqualified is much greater than the number of workers who appear overqualified' (Böheim et al., 2008, p. 25). This highlights the important role that training and upskilling policies can play in reducing the prevalence of skill mismatch in Europe. Important cross-country differences in individual and firm characteristics are determinants of skill mismatch, so the significant associations found for each country cannot easily be generalised.

For example, while it is found that women are more likely to be overeducated in the Czech Republic, this does not hold for Slovakia and Spain. When firm and industry effects are considered, the considerable gender segregation in Spain appears to be a culprit that can potentially explain international differences. Nevertheless, important similarities are also observed between the countries, such as the positive association of overeducation with unemployment and the fact that workers in small firms are more likely to be overeducated. The latter finding may indicate that similar constraining forces operate in terms of the recruitment costs faced by smaller enterprises in all countries.

Other interesting findings at company level include the fact that an older workforce is associated with less undereducation, while the occupational composition of an enterprise is an important determinant of the extent of undereducation. For instance, a higher share of managerial, professional and administrative workers is associated with a greater proportion of undereducated workers, with the opposite being true for low skilled manual occupations.

CHAPTER 6.

Addressing skill mismatch at enterprise level

Several important issues on the interaction between firm characteristics and human resource practices, and the prevalence and consequences of skill mismatch, merit further investigation. In many instances data limitations and empirical difficulties also need to be overcome so that a clearer understanding of how to tackle skill mismatch from the enterprise side can be obtained.

Most studies on skill mismatch have relied on questions regarding the discrepancy between workers' education and skills and the requirements of the job performed. However, there has been little focus on decomposing the nature of the mismatch into the particular type of skills (e.g. generic, occupation-specific, etc.) that are more likely to be conducive to its existence. Green et al. (1999), for instance, show that the overeducated have lower mathematical abilities but better prose and documentation skills. They suggest that part of the difference between the adequately matched and the overeducated can be attributed more readily to variations in the nature of the education undertaken and to the particular skills obtained within alternative educational pathways (e.g. the field of study). Therefore, a pertinent question is the extent to which mismatch in different types of skills is more or less likely to be harmful to firm performance.

It is also critical to understand what particular types of skills have a higher likelihood of being valued by employers, given the characteristics of the firm (e.g. the type of technology, the product market segment). Little research has contrasted the potentially divergent perceptions of managers and of individual workers regarding the state of mismatch in the skills of the latter. For example, Lazear (2009) has emphasised that there is firm-level heterogeneity in the weight attached to different combinations of skills that individuals possess and in the willingness of employers to pay for these skills. Abowd et al. (2007) have also asserted that certain specific skills are made obsolete by new technological developments, so this compromises the relative demand for experienced workers within firms that invest in new technologies. Firm-level differences in endowments or in other factors of production can therefore explain a significant part of the incidence of skill mismatch and of the different returns on dissimilar skills, 'but connections between, for example, product-market differentiation and skill-weight labour-market differentiation have yet to be drawn out' (Oyer and Schaefer, 2011, p. 24).

Current literature does not provide a good picture of where employers spend their resources, what are their recruitment method preferences and which hiring investments have proven to be most successful on various occasions. Firms face a portfolio of choices over how to recruit. If we are to understand firm-level variation in hiring strategies, we need more models in which firms must choose how to access the labour market (Oyer and Schaefer, 2011). There is a need to investigate firm-level differences in specific hiring strategies at greater depth. Most large, nationally representative data sets contain little information that could be used for comparisons of employees hired via different means. This makes it difficult to rule out unobserved firm effects as an explanation of differences in match quality across disparate hiring methods. Moreover, studies of firms' personnel records, often performed by sociologists, suffer from potential limits on generalisability.

Researchers who have wished to examine how the success of vacancy filling varies with characteristics of the job/firm have also generally been constrained to using one-off surveys. This inhibits investigation of the mechanism by which a vacancy is filled (e.g. assessing the importance of internet recruiting channels in lowering search costs over time), and how this is related to job tenure, wage growth and other measures of match success. For these reasons, it is necessary for future research to rely more heavily on matched employer-employee data sets or on longitudinal firm data. Case studies of single firms or small groups of firms could also inform research and practice as regards the selection and matching procedures used by enterprises. These should include in-depth examination of the recruitment methods used, the characteristics of job applicants, the reasons for offering the posts to particular candidates and the characteristics of those individuals who were either offered the job but did not accept or who eventually accepted (and the reasons for doing so).

Empirical research on the importance of individuals' skills, firm effects and match-specific productivity has become more feasible as rich employer-employee data sets have become available, and could shed more light on how the matching process takes place and how much value it creates (Lazear and Oyer, 2009). Nevertheless, measuring the impact of human resource practices on skill mismatch and productivity is generally difficult for several reasons: measuring productivity is difficult; human resource practices tend to be adopted endogenously; and the effectiveness of one particular human resource practice is often dependent on its complementarity with other important firm policies (e.g. simultaneously adopting teamwork with group incentive pay is likely to be more effective than either practice implemented on its own). Due to the above complications it is often difficult to make causal statements about the relationship

between human resource practices and firm performance (Bloom and Van Reenen, 2011). Nevertheless, the use of field experiments can shed some new light on long-standing research questions relating to firm behaviour. This is because carefully designed field experiments can uncover the causal nature of important relationships by exogenously varying key inputs such as labour, physical and managerial capital (Bandiera et al., 2011).

More research is needed to understand the impact of employing mismatched workers on firm productivity and profitability and how these firms fare over time. It is also necessary to investigate in more detail the relationship between various firm characteristics and the incidence and effects of skill mismatch. Better understanding is needed of the effectiveness of different firm policies and strategies in tackling skill mismatch (e.g. promotions, performance evaluation, incentive pay).

More relevant for policy purposes is the conclusion by Boheim et al. (2008), who conclude that institutional settings (such as access to education, government education policies or the transition from school to work) may potentially explain the different nature of skill mismatches within Europe. Brunello et al. (2007) also argue that employment protection legislation might increase the extent of skill mismatch by making it harder for individuals to obtain their first job and more difficult for firms to reduce staff because of restrictions on hiring. Using the 1994-2001 waves of the European Community Household Panel data set, they find a positive association between skill mismatch and employment protection legislation, with important differences observed between countries. In contrast, Daly et al. (2000) fail to find a significant difference in the wage effects of skill mismatch between the United States and Germany. The authors conclude that education mismatch is not correlated with institutional issues such as differences in education systems or in labour market flexibility, which supports a universalistic view of labour markets. The association between institutions and skill mismatch is an area that remains unclear and requires further research.

Finally, even though matching concerns are first order determinants of the decision by firms on how to design jobs, there is generally a lack of good empirical proxies of the assignment of tasks to jobs. 'This makes it difficult to assess the relative importance of assignment models that emphasise an optimal matching of heterogeneous workers to tasks' (Lazear and Oyer, 2009, p. 40). Important theoretical questions regarding job design also remain, such as detecting the optimal mix of human resource policies to be used by firms when they are simultaneously faced with multiple forms of skill mismatch (i.e. both overeducation and undereducation).

CHAPTER 7.

Mismatch and current European skills policy

Matching the supply and demand for skills is a priority of the EU Commission's *New skills for new jobs initiative* and is a central component of the *Agenda for new skills and jobs*, one of the flagship initiatives of the Europe 2020 strategy. Inspired by this goal, this report has emphasised the important role that firm-specific activities can play in terms of affecting the incidence of skill mismatch, thereby influencing the competitiveness of enterprises and of individual worker welfare. Human resource policies (hiring procedures, training, monitoring, compensation and career progression) used by enterprises in Europe can determine whether skill mismatches emerge and persist over time. Policy tools that affect such practices might be subsequently well-placed to influence the phenomenon of skill mismatch.

For example, filling of vacancies is likely to improve if there is better coordination between recruitment strategies in firms and those of public employment services and other private providers (e.g. temporary help service agencies), as the availability and suitability of the potential applicant pool available to firms is likely to be improved. There needs to be better transmission of information, guidance and counselling services regarding the particular skills that employers demand and how these contrast with the skills of jobseekers. There is also a need for better dialogue between businesses, education and training providers and recruitment specialists, which will aim to bridge the potential skill mismatch between the education and training systems of Member States and the demands of the world of work.

More information is needed on the mix of knowledge, skills, competences and attitudes of graduates from education and IVET streams preferred by employers when hiring new recruits. This is likely to lead to better understanding of how to combat the emergence of skill mismatches during the critical transition from school to work. Enterprises also have a crucial role to play in terms of enhancing the pathways between education and training systems and the labour market by informing the design of curricula, taking active part in the assessment of learning outcomes and offering training placements and apprenticeships. A particular challenge for policy-makers is to ensure that these traineeships can lead to quality-assured qualifications that certify workers' non-formal and informal learning outcomes, as this will also strengthen the attractiveness of the vocational training stream as a viable option for securing employment. Work-based learning

also needs to ensure that workers have key competences (communication, self-management, team working, creativeness and ability to take initiative, ability to keep on learning and to manage change) along with more specific or 'hard' professional/vocational skills, as the former are the foundation for successful career transitions and adaptability during the course of working life (Cedefop, 2011c).

The importance of work-based learning and of public-private partnerships in training tailored to enterprises skill needs is also likely to become more important in the coming years, given the fast-changing economic environment and the budgetary constraints in public spending faced by most Member States (Eurofound, 2011). The increasing future role of the private sector in the provision of education and training courses in Europe via own company 'academies' and collaborations with education institutions is also likely to be crucial to the success of lifelong learning. Nevertheless, there exist important barriers to efficient and socially inclusive provision of VET by enterprises in Europe, particularly for those individuals who are affected by skills obsolescence due to rapid technological/organisational developments (e.g. older employees) and those with diminished incentives to engage in upskilling (e.g. the underskilled). As illustrated by Cedefop (2011c), training provided by employers is unevenly and unequally distributed, as it tends to concentrate on employees who are already highly-skilled, of a younger age or employed via long-term contracts.

Successful implementation of training initiatives is, therefore, likely to be dependent on the provision of adequate financial incentives and instruments to employers (Cedefop, 2009b), or via the development of more innovative and productive learning organisations, where learning and skill development are integrated into daily management and production processes for all employees. It also requires an enabling environment that promotes greater cooperation in VET among all key European economy stakeholders (governments, employers and unions), in the spirit of the Copenhagen declaration and of subsequent communiqués (Council and European Commission, 2004; 2006; 2008). In particular, it is necessary to pursue initiatives that broaden representation and social dialogue and to organise training efforts with a specific eye to tackling skill mismatch.

To pursue more efficient policies on skill mismatch, it is necessary not only to improve knowledge of future labour market demands, in the form of quantitative models of the European economy (Cedefop, 2010a) and employer survey tools, but also to promote the awareness and involvement of businesses (most notably SMEs) in forecasting future skills needs. The cooperation of

businesses with the new European sector councils on employment and skills and with other key stakeholders can be a positive step in this direction.

Cooperation in collective wage bargaining is a potentially crucial ingredient for addressing the emergence of skill mismatches, as wage flexibility is often impeded by non-competitive forces and other administrative hurdles. This results in higher employee dissatisfaction and labour market turnover among mismatched employees, and can potentially hinder career progression. It is necessary for policy-makers and the social partners to assess whether more flexible and decentralised tools of pay at enterprise level can contribute to reducing some of the adverse consequences associated with skill mismatch, or whether more coordinated regional/sectoral wage policies are necessary to tackle skill shortages/surpluses at macro level.

Finally, in the battle against skill mismatch there is a need to exploit important complementarities between the different pillars of the *Agenda for new skills and jobs*, such as the use of flexicurity policies, the goal of reducing skill mismatch and the improvement of job quality. Labour market policies promoting the reconciliation of work and life via flexible work organisations have a crucial role to play in increasing the participation of workers in training, but successful implementation is contingent on the consensual efforts of employers. For example, it has been argued that the policy of publicly sponsored short-time working arrangements has helped Member States to weather the consequences of the recent economic crisis of 2008. This has been achieved by motivating employers to retain the skills of firm-specific workers during the business cycle downturn. Such a strategy is also likely to have been beneficial in reducing the occurrence of skill mismatch within European enterprises by protecting and hoarding valuable labour. Similarly, continuing training is a necessary prerequisite for the successful implementation of the flexicurity agenda, given that skills development allows workers to transfer more easily across career paths and jobs. Further, the quality of working conditions is increasingly shaped by the determination of modern organisations to invest in the upskilling and vocational adjustment of their workforce. Policies that empower employees with the task of developing and utilising their skills in line with organisational goals are also progressively pursued in tandem with other human resource practices. As these policies are likely to be conducive to strengthening job match, they need to be contextualised within an overall framework whereby the aim of combating skill mismatch is reinforced by improving job quality.

CHAPTER 8.

Conclusion: the way forward in skill mismatch research?

On top of the specific research questions identified in this report, several generic conclusions can be drawn. These will inform debate on the main challenges faced by policy-makers in addressing future skill mismatch problems. They also aim to steer researchers seeking to understand the dynamics of skill mismatches within enterprises.

An important paradox can be found in the empirical literature on skill mismatch. On the basis of individual survey data, overeducated workers are found to be less productive workers relative to those who are appropriately-matched: they experience lower wage and job satisfaction, higher absenteeism rates and greater job turnover. However, preliminary evidence from enterprise surveys is supportive of a positive association between the percentage of overeducated workers within enterprises and firm productivity. The potential productivity synergies associated with the presence of overeducated workers in the workplace are not yet adequately identified.

Future research needs to focus more on differentiating the processes of educational mismatch (e.g. overeducation/undereducation) and of skill mismatch (e.g. overskilling/underskilling), and on investigating how these two different types of mismatch interact. More effort is required to detect the specific type of skills (e.g. generic, occupation-specific) that are likely to be conducive to the existence of skill mismatch in the labour market.

Although rich theoretical literature underlies the potential relationship between human resource practices and skill mismatch, empirical evidence is limited. This is due to the scarcity of appropriate data sources (e.g. employer surveys containing questions on skill mismatch; matched employer-employee data sets with questions on mismatch from both sides of the employment relationship; administrative data on firm performance; longitudinal employer information). With new data sources increasingly made available in recent years, and a renewed focus in the scientific literature on investigating 'within-company' dynamics (e.g. field experiments, 'insider econometrics'), the scope for future research on skill mismatch within enterprises is promising.

At policy level, in-company training and CVET are likely to be key ingredients in combating the phenomenon of skill mismatch. However, key processes used by firms to ensure that workers are a suitable fit, such as

identifying mismatched workers at pre- and post-hiring stages; financing and carrying out their training activities efficiently and inclusively and engaging in the career development of workers, are not yet well understood.

It is not clear what is the best firm strategy for training mismatched workers. Undereducated workers lack incentives to engage in skills upgrading (since they get paid more than similarly-educated individuals), while firms tend to focus more on training already high-skilled employees, as opposed to those who are most in need of up-skilling (e.g. temporary employees, low-skilled, older workers).

There is a contradiction between public policies seeking to promote lifelong learning and flexicurity as a shield against the more frequent career transitions experienced by employees in modern job markets, and lack of incentives for enterprises when investing in vocational training that bestows transferable rather than firm-specific skills.

List of abbreviations

CVET	continuing vocational education and training
CVTS	continuing vocational training survey
CVTS3	third continuing vocational training survey (2005)
ECS	European company survey
HPWO	high-performance work organisation
HPWP	high performance workplace practice
IVET	initial vocational education and training
VET	vocational education and training

References

- Abowd, J.M. et al. (2007). *Technology and the demand for skill: an analysis of within and between firm differences*. Cambridge, MA: National Bureau of Economic Research (NBER Working papers; 13043).
- Abowd, J.M.; Kramarz, F. (2003). The costs of hiring and separations. *Labour economics*, Vol. 10, No 5, p. 499-530.
- Abraham, K.G.; Farber, H.S. (1987). Job duration, seniority and earnings. *American economic review*, Vol. 77, p. 278-297.
- Acemoglu, D. (2002). Technical change, inequality and the labour market. *Journal of economic literature*, Vol. 40, No 1, p. 7-72.
- Acemoglu, D.; Pischke, J.S. (1998). Why do firms train? Theory and evidence. *Quarterly journal of economics*, Vol. 113, No 1, p. 78-118.
- Acemoglu, D.; Pischke, J.S. (1999). The structure of wages and investment in general training. *Journal of political economy*, Vol. 107, No 3, p. 539-572.
- Addison, J.; Portugal, P. (2002). Job search methods and outcomes. *Oxford economic papers*, Vol. 54, Issue 3, p. 505-533.
- Akerlof, G.A. (1970). The market for 'lemons': quality uncertainty and the market mechanism. *Quarterly journal of economics*, Vol. 84, No 3, p. 488-500.
- Akerlof, G.A. (1982). Labour contracts as partial gift exchange. *Quarterly journal of economics*, Vol. 97, No 4, p. 543-569.
- Akerlof, G.A.; Yellen, J.L. (eds) (1986). *Efficiency wage models of the labour market*. Cambridge: Cambridge University Press.
- Alba-Ramirez, A. (1993). Mismatch in the Spanish labour market. *Journal of human resources*, Vol. 28, No 2, p. 259-278.
- Albrecht, J.W.; van Ours, J.C. (2006). Using employer hiring behaviour to test the educational signalling hypothesis. *Scandinavian journal of economics*, Vol. 108, No 3, p. 361-372.
- Allen, J.; van der Velden, R. (2001). Educational mismatches versus skill mismatches: effects on wages, job satisfaction, and on-the-job search. *Oxford economic papers*, Vol. 53, No 3, p. 434-452.
- Altonji, J.G.; Shakotko, R.A. (1987). Do wages rise with job seniority? *Review of economic studies*, Vol. 54, p. 437-459.
- Asset skills (2011). *High performance working (HPW)* (Intelligence papers, Issue 12).
- Autor, D.H. (2001a). Wiring the labour market. *Journal of economic perspectives*, Vol. 15, p. 25-40.
- Autor, D.H. (2001b). Why do temporary help firms provide free general skills training? *Quarterly journal of economics*, Vol. 116, No 4, p. 1409-1448.

- Baker, G. et al. (1994). Subjective performance measures in optimal incentive contracts. *Quarterly journal of economics*, Vol. 109, p. 1125-1156.
- Bandiera O. et al. (2011). *Field experiments with firms*. Bonn: Institute for the study of labour, IZA Discussion paper series; No 5723.
- Barron, J.M. et al. (1985). Employer search: the interviewing and hiring of new employees. *Review of economics and statistics*, Vol. 67, p. 43-52.
- Barron, M.J. et al. (1987). Employer size: the implications for search, training, capital investment and wage growth. *Journal of labor economics*, Vol. 5, No 1, p. 76-89.
- Barth, E. et al. (2011). Performance pay, union bargaining and within-firm wage inequality. *Oxford bulletin of economics and statistics* (doi: 10.1111/j.1468-0084.2011.00656.x).
- Battu, H. et al. (2000). How well can we measure graduate overeducation and its effects? *National institute economic review*, Vol. 171, No 1, p. 82-93.
- Battu, H. et al. (1999). Overeducation among graduates: a cohort view. *Education economics*, Vol. 7, No 1, p. 21-38.
- Battu, H.; Sloane, P.J. (2004). Overeducation and ethnic minorities in Britain. *Manchester school*, Vol. 72, No 4, p. 535-559.
- Bauer, T. (2004). High performance workplace practices and job satisfaction: evidence from Europe. *RWI-Mitteilungen*, Vol. 54/55, No 1, p. 57-85.
- Bauer, T.K. (2002). Educational mismatch and wages: a panel analysis. *Economics of education review*, Vol. 21, No 3, p. 221-229.
- Becker, G. (1964). *Human capital: a theoretical and empirical analysis with special reference to education*. Irvington, NY: Columbia University Press.
- Behrenz, L. (2001). Who gets the job and why? An explorative study of employers' recruitment behaviour. *Journal of applied economics*, Vol. 2, No 4, p. 255-278.
- Belfield, C. (2010). Overeducation: what influence does the workplace have? *Economics of education review*, Vol. 29, No 2, p. 236-245.
- Bentolila, S. et al. (2010). Social contacts and occupational choice. *Economica*, Vol. 77, No 305, p. 20-45.
- Blanchflower, D.G.; Bryson, A. (2010). The wage impact of trade unions in the UK public and private sectors. *Economica*, Vol. 77, No 305, p. 92-109.
- Bloom, N.; Van Reenen, J.V. (2007). Measuring and explaining management practices across firms and countries. *Quarterly journal of economics*, Vol. 122, No 4, p. 1351-1408.
- Bloom, N.; Van Reenen, J. (2011). Human resource management and productivity. In: Ashenfelter, O.C.; Card, D. (eds). *Handbook of labor economics*. Elsevier, Vol. 4, Part 2, p. 1697-1767.

- Böheim, R. et al. (2008). *Skill mismatch in Europe*. Study and conference on European labour market analysis using firm-level and linked employer-employee data. European Commission, DG Employment, Task 1: Labour turnover flows and mobility.
- Borghans, L.; de Grip, A. (2000). The debate in economics about skill utilisation. In: de Grip, A. ; Borghans, L. (eds). *The overeducated worker. The economics of skill utilisation*. Cheltenham: Edward Elgar, p. 3-26. Available from: http://www.uva-aiaas.net/uploaded_files/regular/bookcontents-overeducated-1.pdf [accessed 1.3.2012].
- Bresnahan, T. et al. (2002). Information technology workplace organisation and demand for skilled labour: firm level evidence. *Quarterly journal of economics*, Vol. 117, No 1, p. 339-376.
- Brown, D., et al. (1999). *Everything under a fiver: recruitment and retention in lower paying labour markets*. York: Joseph Rowntree Foundation.
- Brunello, G. et al. (eds) (2007). *Education and training in Europe*. Oxford: Oxford University Press.
- Büchel, F. (2002). The effects of overeducation on productivity in Germany: the firms' viewpoint. *Economics of education review*, Vol. 21, No 3, p. 263-275.
- Bull, C. (1987). The existence of self-enforcing implicit contracts. *Quarterly journal of economics*, Vol. 102, p. 147-149.
- Bulmahn, G.; Kräkel, M. (2002). Overeducated workers as an insurance device. *Labour*, Vol. 16, No 2, p. 383-402.
- Burdett, K.; Mortensen, D.T. (1980). Search, layoffs, and labour market equilibrium. *Journal of political economy*, Vol. 88, No 4, p. 652-672.
- Burgess, S. et al. (2002). *Does performance monitoring work? A review of the evidence from the UK public sector, excluding health care*. Bristol: CMPO, Centre for market and public organisation, University of Bristol (Working paper; 02/049).
- Caroli, E.; Van Reenen, J. (2001). Skill-biased organisational change? Evidence from a panel of British and French establishments. *Quarterly journal of economics*, Vol. 116, No 4, p. 1449-1492.
- Casella, A.; Hanaki, N. (2006). Why personal ties cannot be bought. *American economic review*, Vol. 96, No 2, p. 261-264.
- Casella, A.; Hanaki, N. (2008). Information channels in labour markets: on the resilience of referral hiring. *Journal of economic behavior and organization*, Vol. 66, Issue 3-4, p. 492-513.
- Cedefop (2008). Skill shortages. In: Cedefop. *Modernising vocational education and training: fourth report on vocational education and training research in Europe: background report*. Luxembourg: Publications Office, Cedefop Reference series; 69, Vol. 1.
- Cedefop (2009a). *Skill mismatch: identifying priorities for future research*. Thessaloniki: Cedefop. Cedefop working paper; No 3.

- Cedefop (2009b). *Using tax incentives to promote education and training*. Luxembourg: Publications Office. Cedefop Panorama series.
- Cedefop (2009c). Skill needs in enterprises. In: Cedefop. *Skills for Europe's future: anticipating occupational skills needs*. Luxembourg: Publications Office. Cedefop Panorama series, p. 122-165.
- Cedefop (2010a). *Skills supply and demand in Europe: medium-term forecast up to 2020*. Luxembourg: Publications Office.
- Cedefop (2010b). *The skill matching challenge: analysing skill mismatch and policy implications*. Luxembourg: Publications Office.
- Cedefop (2010c). *The right skills for silver workers: an empirical analysis*. Luxembourg: Publications Office. Cedefop Research paper; No 8.
- Cedefop (2010d). *Employer-provided vocational training in Europe: evaluation and interpretation of the third continuing vocational training survey*. Luxembourg: Publications Office. Cedefop Research paper; No 2.
- Cedefop (2011a). *Migrants, minorities, mismatch? Skill mismatch among migrants and ethnic minorities in Europe*. Luxembourg: Publications Office. Cedefop Research paper; No 16.
- Cedefop (2011b). *The benefits of vocational education and training*. Luxembourg: Publications Office. Cedefop Research paper; No 10.
- Cedefop (2011c). *Learning while working: success stories on workplace learning in Europe*. Luxembourg: Publications Office.
- Chan, W. (1996). External recruitment versus internal promotion. *Journal of labor economics*, Vol. 14, p. 555-570.
- Chevalier, A. (2003). Measuring overeducation. *Economica*, Vol. 70, No 279, p. 509-531.
- CIPD (2008). *Smart working: the impact of work organisation and job design*. London: CIPD, Chartered institute of personnel and development, research insight.
- CIPD (2010). *Employee Communication*. London: CIPD, Chartered Institute of Personnel and Development.
- Council of the European Union; European Commission (2004). *The Maastricht Communiqué on the future priorities of enhanced European cooperation in vocational education and training (VET)*. Available from: http://www.bologna-bergen2005.no/Docs/00-Main_doc/041214_Maastricht_com_en.pdf [accessed 1.3.2012].
- Council of the European Union; European Commission (2006). *The Helsinki Communiqué on enhanced European cooperation in vocational education and training*. Available from: http://www.cedefop.europa.eu/EN/Files/helsinkicom_en.pdf [accessed 1.3.2012].
- Council of the European Union; European Commission (2008). *The Bordeaux communiqué on enhanced European cooperation in vocational education*

- and training*. Available from: http://ec.europa.eu/education/lifelong-learning-policy/doc/bordeaux_en.pdf [accessed 1.3.2012].
- Corcoran, M. et al. (1980). Most workers find jobs through word of mouth. *Monthly labour review*, August, p. 33-35.
- Daly, M. et al. (2000). Premiums and penalties for surplus and deficit education: evidence from the United States and Germany. *Economics of education review*, Vol. 19, Issue 2, p. 169-178.
- Datcher, L. (1983). The impact of informal networks on quit behaviour. *Review of economics and statistics*, Vol. 55, p. 491-495.
- Delattre, E.; Sabatier, M. (2007). Social capital and wages: an econometric evaluation of social networking's effects, *Labour*, Vol. 21, No 2, p. 209-236.
- Doeringer, P.; Piore, M.J. (1971). *Internal labour markets and manpower analysis*. Lexington, Mass.: Heath Lexington Books.
- Dolton, P.; Vignoles, A. (2000). The incidence and effects of overeducation in the UK graduate labour market. *Economics of education review*, Vol. 19, No 2, p. 179-198.
- Dolton, P.; Silles, M. (2003). The determinants and consequences of overeducation. In Büchel, F. et al. (eds). *Overeducation in Europe*. Cheltenham: Edward Elgar, p. 189-217.
- Drake International (2011). *Effective hiring: innovative recruiting and behavioural-based testing to ensure your future success*. [online]. Available from: <http://www.drakeint.com> [accessed 1.3.2012].
- DTI; CIPD (2006). *High performance work practices: linking strategy and skills to performance outcomes*. Westminster: DTI, Department of Trade and Industry.
- Duncan, G.J.; Hoffman, S.D. (1981). The incidence and wage effects of overeducation. *Economics of education review*, Vol. 1, No 1, p. 75-86.
- Dupuy, A.; de Grip, A. (2002). *Do large firms have more opportunities to substitute between skill categories than small firms?* Aarhus: Centre for labour market and social research, Working paper; 02-01.
- Eurofound (2011). *Educational and training services: anticipating the challenges: overview report*. Dublin: Eurofound.
- European Commission (2008). *New skills for new jobs: anticipating and matching labour market needs: communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions*. COM(2008) 868 final. Available from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0868:FIN:EN:PDF> [accessed 1.3.2012].
- European Commission (2010a). *Europe 2020: a strategy for smart, sustainable and inclusive growth: communication from the Commission*. COM(2010) 2020 final. Available from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:EN:PDF> [accessed 1.3.2012].

- European Commission (2010b). *Employer's perception of graduate employability: analytical report* (Flash Eurobarometer 304). Available from: http://ec.europa.eu/public_opinion/flash/fl_304_en.pdf [accessed 1.3.2012].
- European Employment Observatory (1998). Employers' recruiting methods. *InforMISEP policies edition No 62*. Available from: http://www.eu-employment-observatory.net/en/documents/doc05_02.htm [accessed 1.3.2012].
- Fairburn, J.A.; Malcomson, J.M. (2001). Performance, promotion, and the Peter principle. *Review of economic studies*, Vol. 68, No 1, p. 45-66.
- Falk, A.; Ichino, A. (2006). Clean evidence on peer effects. *Journal of labour economics*, Vol. 24, No 1, p. 39-58.
- Fallick, B.; Fleischman, C.A. (2004). *Employer-to-employer flows in the US labour market: the complete picture of gross worker flows*. New York: Board of Governors of the Federal Reserve System (US), Finance and Economics Discussion series; 2004-34.
- Fama, E.F. (1980). Agency problems and the theory of the firm. *Journal of political economy*, Vol. 88, No 2, p. 288-307.
- Farber, H.S. (1999). Mobility and stability: the dynamics of job change in labour markets. In: Ashenfelter, O.C.; Card, D. (eds). *Handbook of labour economics*. Amsterdam: Elsevier, Vol. 3, Part 2, p. 2439-2483.
- Farber, H.S.; Gibbons, R. (1996). Learning and wage dynamics. *Quarterly journal of economics*, Vol. 111, p. 1007-1047.
- Fernandez, R.M.; Weinberg, N. (1997). Sifting and sorting: personal contacts and hiring in a retail bank. *American sociological review*, Vol. 62, No 6, p. 883-902.
- Finegold, D.; Soskice, D. (1988). The failure of training in Britain: analysis and prescription. *Oxford review of economic policy*, Vol. 4, No 3, p. 21-52.
- Fleming, C.M.; Kler, P. (2008). I'm too clever for this job: a bivariate probit analysis on overeducation and job satisfaction in Australia. *Applied economics*, Vol. 40, No 9, p. 1123-1138.
- Frank, R.H. (1984). Are workers paid their marginal products? *American economic review*, Vol. 74, No 4, p. 549-571.
- Franz, W. (1991). *Arbeitsmarktökonomik [labour market economics]*. Berlin: Springer.
- Freeman, R.B. (1976). *The overeducated American*. New York: Academic Press.
- Frenette, M. (2004). The overqualified Canadian graduate: the role of the academic programme in the incidence, persistence, and economic returns to overqualification. *Economics of education review*, Vol. 23, No 1, p. 29-45.
- Galasi, P. (2008). *The effects of educational mismatch on wages for 25 countries*. Budapest: Corvinus University, Working papers on the labour market; BWP 2008/8.

- Garibaldi, P. (2006). *Personnel economics in imperfect labour markets*. Oxford: Oxford University Press.
- Gautier, P. et al. (2002). Worker turnover at the firm level and crowding out of lower educated workers. *European economic review*, Vol. 46, No 3, p. 523-538.
- Gibbons, R. et al. (2005). Comparative advantage, learning, and sectoral wage determination. *Journal of labor economics*, Vol. 23, No 4, p. 681-723.
- Giuliano, L. et al. (2009). Manager race and the race of new hires. *Journal of labor economics*, Vol. 27, No 4, p. 589-632.
- Gorter, C.; van Ommeren, J. (1999). Sequencing, timing and filling rates of recruitment channels. *Applied economics*, Vol. 31, No 10, p. 1149-1160.
- Gorter, C. et al. (2003). The structure of hiring and labour market tightness. *Economics letters*, Vol. 80, Issue 1, p. 99-103.
- Gottschalk, P.; Hansen, M. (2003). Is the proportion of college workers in non-college jobs increasing? *Journal of labor economics*, Vol. 21, No 2, p. 409-448.
- Green, F. et al. (1999). *Overeducation and skills: clarifying the concepts*. London: Centre for economic performance.
- Green, F.; Zhu, Y. (2010). Overqualification, job dissatisfaction, and increasing dispersion in the returns to graduate education. *Oxford economic papers*, Vol. 62, No 4, p. 740-763.
- Groeneveld, S.; Hartog, J. (2004). Overeducation, wages and promotions within the firm. *Labour economics*, Vol. 11, No 6, p. 701-714.
- Groot, W. (1993). Overeducation and the returns to enterprise-related schooling. *Economics of education review*, Vol. 17, No 4, p. 299-309.
- Groot, W. (1996). The incidence and returns to overeducation in the UK. *Applied Economics*, Vol. 28, p. 1345-1350.
- Groot, W.; Maassen van den Brink, H. (2000). Overeducation in the labour market: a meta-analysis. *Economics of education review*, Vol. 19, No 2, p. 149-158.
- Hartog, J. (2000). Overeducation and earnings: where are we, where should we go? *Economics of education review*, Vol. 19, No 2, p. 131-147.
- Haskel, J.; Martin, C. (1996). Skill shortages, productivity growth and wage inflation. In: Booth, A.; Snower, D. (eds). *Acquiring skills: market failures: their symptoms and policy responses*. Cambridge: University Press, p. 147-174.
- Haskel, J.; Holt, R. (1999). *Anticipating future skill needs: can it be done? Does it need to be done?* Sudbury: DfEE, Skills task force research group, Research paper; 1.
- Heckman, J. J. et al. (2006). Earnings functions, rates of return and treatment effects: the Mincer equation and beyond. In: Hanushek, E.; Welch, F. (eds). *Handbook of the economics of education*. Amsterdam: Elsevier, Vol. 1, p. 307-458.
- Hersch, J. (1991). Education and job match. *Review of economics and statistics*, No 79, p. 140-144.

- Holmstrom, B. (1979). Moral hazard and observability. *Bell journal of economics*, Vol. 9, p. 74-91.
- Holmstrom, B. (1999). Managerial incentive problems: a dynamic perspective. *Review of economic studies*, Vol. 66, No 1, p. 169-182.
- Holzer, H.J. (1994). Job vacancy rates in the firm: an empirical analysis. *Economica*, Vol. 61, No 241, p. 17-36.
- Holzer, H. (1997) Hiring procedures in the firm: their economic determinants and outcomes. In: Kleiner, M. et al. (eds). *Human resources and the performance of the firm*. Madison, WI: Industrial relations research association (IRRA).
- Iaffaldano, M.T.; Muchinsky, P.M. (1985). Job satisfaction and job performance: a meta-analysis. *Psychological bulletin*, Vol. 97, Issue 2, p. 251-273.
- Ichino, A.; Maggi, G. (2000). Work environment and individual background: explaining regional shirking differentials in a large Italian firm. *Quarterly journal of economics*, Vol. 115, No 3, p. 1057-1090.
- Jones, M.K. et al. (2009). Training, job satisfaction and workplace performance in Britain: evidence from WERS 2004. *Labour*, Vol. 23, p. 139-175.
- Jovanovic, B. (1979). Job matching and the theory of turnover. *Journal of political economy*, Vol. 87, No 5, p. 972-990.
- Judge, T.A. et al. (2001). The job satisfaction job performance relationship: a qualitative and quantitative review. *Psychological bulletin*, Vol. 127, p. 376-407.
- Katz, L.F.; Autor, D.H. (1999). Changes in the wage structure and earnings inequality. In: Ashenfelter, O.C; David, C. (eds). *Handbook of labor economics*. Amsterdam: Elsevier, Vol. 3, Part 1, p. 1463-1555.
- Kler, P. (2006). *The impact of overeducation on job satisfaction among tertiary educated Australians*. St. Lucia: University of Queensland, LERG, Labour economics research group, Discussion paper; No 10.
- Lazear, E.P. (1979). Why is there mandatory retirement? *Journal of political economy*, Vol. 87, No 6, p. 1261-1284.
- Lazear, E.P. (1986). Salaries and piece rates. *Journal of business*, Vol. 59, No 3, p. 405-431.
- Lazear, E.P. (1992). The job as a concept. In: Bruns, W.J. (ed.). *Performance measurement and incentive compensation*. Cambridge: Harvard Business School Press.
- Lazear, E.P. (1998). Hiring risky workers. In: Ohashi, I.; Tachibanaki, T. (eds). *Internal labour market, incentives and employment*. New York: St. Martin's.
- Lazear, E.P. (2000). Performance pay and productivity. *American economic review*, Vol. 90, No 5, p. 1346-1361.
- Lazear, E.P. (2004). The Peter principle: a theory of decline. *Journal of political economy*, Vol. 112, No S1, p. S141-S163.

- Lazear, E.P. (2009). Firm-specific human capital: a skill-weights approach. *Journal of political economy*, Vol. 117, No 5, p. 914-940.
- Lazear, E.P.; Gibbs, M. (2009). *Personnel economics in practice*. Hoboken, NJ: John Wiley and Sons.
- Lazear, E.P.; Oyer, P. (2004). Internal and external labour markets: a personnel economics approach. *Labour economics*, Vol. 11, No 5, p. 527-554.
- Lazear, E.P.; Oyer, P. (2009), Personnel Economics. In: Gibbons, R.; Roberts, D.J. (eds). *Handbook of organisational economics*. Princeton, NJ: Princeton University Press.
- Lazear, E.P.; Rosen, S. (1981). Rank-order tournaments as optimum labour contracts. *Journal of political economy*, Vol. 89, No 5, p. 841-864.
- Lazear, E.P.; Shaw, K.L. (2007). Personnel economics: the economist's view of human resources. *Journal of economic perspectives*, Vol. 21, No 4, p. 91-114.
- Leuven, E.; Oosterbeek, H. (2011). *Overeducation and mismatch in the labour market*. Bonn: Institute for the study of labour, IZA Discussion paper series; No 5523.
- Lindeboom, M. et al. (1994). Matching employers and workers: an empirical analysis on the effectiveness of search. *Oxford economic papers*, Vol. 46, No 1, p. 45-67.
- Lindley, J. (2009). The overeducation of UK immigrants and minority ethnic groups: evidence from the labour force survey. *Economics of education review*, Vol. 28, No 1, p. 80-89.
- Machin, S.; Van Reenen, J. (2007). *Changes in wage inequality*. London: CEPSP, Centre for economic performance, Special paper; No 18.
- MacLeod, W.B.; Malcomson, J.M. (1989). Implicit contracts, incentive compatibility, and involuntary unemployment. *Econometrica*, Vol. 57, No 2, p. 447-480.
- Mahy, B., et al. (2011). Does wage dispersion make all firms productive? *Scottish journal of political economy*, Vol. 58, No 4, p. 455-489.
- Manning, A. (2000). Pretty vacant: recruitment in low-wage labour markets. *Oxford bulletin of economics and statistics*, Vol. 62, No 51, p. 747-770.
- Manning, A. (2003). *Monopsony in motion: imperfect competition in labour markets*. Princeton, NJ: Princeton University Press.
- Marmaros, D.; Sacerdote, B. (2002). Peer and social networks in job search. *European economic review*, Vol. 46, No 4-5, p. 870-879.
- Mavromaras, K. et al. (2009). Assessing the incidence and wage effects of overskilling in the Australian labour market. *Economic record*, Vol. 85, No 268, p. 60-72.
- Mavromaras, K. et al. (2010). *Job mismatches and labour market outcomes: panel evidence on Australian university graduates*. Bonn: Institute for the study of labour, IZA Discussion paper series; No 5083.

- McCall, J.J. (1970). Economics of information and job search. *Quarterly journal of economics*, Vol. 84, No 1, p. 113-126.
- McGoldrick, K.M.; Robst, J. (1996). Gender differences in overeducation: a test of the theory of differential overqualification. *American economic review*, Vol. 86, No 2, p. 280-284.
- McGuinness, S. (2003). Graduate overeducation as a sheepskin effect: evidence from Northern Ireland. *Applied economics*, Vol. 35, No 5, p. 597-608.
- McGuinness, S. (2006). Overeducation in the labour market. *Journal of economic surveys*, Vol. 20, No. 3, p. 387-418.
- Medoff, J.L.; Abraham, K.G. (1980). Experience, performance and earnings. *Quarterly journal of economics*, Vol. 95, No 4, p. 703-736.
- Meliciani, V.; Radicchia, D. (2011). The informal recruitment channel and the quality of job-worker matches: an analysis on Italian survey data. *Industrial and corporate change*, Vol. 20, Issue 2, p. 511-554.
- Mendes de Oliveira, M. et al. (2000). The role of human capital and technological change in overeducation. *Economics of education review*, Vol. 19, No 2, p. 199-206.
- Milgrom, P. (1988). Employment contracts, influence activities and efficient organisation design. *Journal of political economy*, Vol. 96, No 1, p. 42-60.
- Mincer, J. (1974). *Schooling, experience and earnings*. New York: Columbia University Press.
- Montgomery, J.D. (1991). Social networks and labour market outcomes: toward an economic analysis. *American economic review*, Vol. 81, No 5, p. 1408-1418.
- Mortensen, D. (1986). Job search and labour market analysis. In: Ashenfelter, O.C.; Layard, R. (eds). *Handbook of labour economics*. Amsterdam: Elsevier, Vol. 2, p. 849-919.
- Mortensen, D.T.; Pissarides, C.A. (1999). Job reallocation, employment fluctuations and unemployment. In: Taylor, J.B.; Woodford, M. (eds). *Handbook of macroeconomics* (1st edition). Amsterdam: Elsevier, Vol. 1, p. 1171-1228.
- Oyer, P.; Schaefer S. (2011). Personnel economics: hiring and incentives. In: Ashenfelter, O.C; David, C. (eds). *Handbook of labour economics*. Amsterdam: Elsevier, Vol. 4, Part 2, p. 1769-1823.
- Pellizzari, M. (2010). Do friends and relatives really help in getting a good job? *Industrial and labor relations review*, Vol. 63, No 3, p. 494-510.
- Pellizzari, M. (2011). Employers' search and the efficiency of matching. *British journal of industrial relations*, Vol. 49, No 1, p. 25-53.
- Phelps, E.S. et al. (1970). *Microeconomic foundations of employment and inflation theory*. New York: W.W. Norton.
- Pissarides, C. (2000). *Equilibrium unemployment theory* (2nd edition). Cambridge, MA: MIT Press.

- Pistaferri, L. (1999). Informal networks in the Italian labour market. *Giornale degli Economisti e Annali di Economia*, Vol. 58, p. 355-376.
- Piva, M. et al. (2005). The skill bias effect of technological and organisational change: evidence and policy implications. *Research policy*, Vol. 34, No 2, p. 141-157.
- Pouliakas, K. (2010). Pay enough, don't pay too much or don't pay at all? The impact of bonus intensity on job satisfaction. *Kyklos*, Vol. 63, No 4, p. 597-626.
- Pouliakas, K.; Theodossiou, I. (2009). Confronting objections to performance pay: the impact of individual and gain-sharing incentives on job satisfaction. *Scottish journal of political economy*, Vol. 56, No 5, p. 662-684.
- Pouliakas, K.; Theodossiou, I. (2010). Measuring the utility cost of temporary employment contracts before adaptation: a conjoint analysis approach. *Economica*, Vol. 77, No 308, p. 688-709.
- Prendergast, C. (1993). The role of promotion in inducing specific human capital acquisition. *Quarterly journal of economics*, Vol. 108, No 2, p. 523-534.
- Prendergast, C. (1995). A theory of responsibility in organisations. *Journal of labor economics*, Vol. 13, No 3, p. 387-400.
- Prendergast, C. (1999). The provision of incentives in Firms. *Journal of economic literature*, Vol. 37, No 1, p. 7-63.
- Prendergast, C.; Topel, R.H. (1996). Favoritism in organisations. *Journal of political economy*, Vol. 104, No 5, p. 958-978.
- Rajan, R.G.; Wulf, J. (2006). The flattening firm: evidence from panel data on the changing nature of corporate hierarchies. *Review of economics and statistics*, Vol. 88, No 4, p. 759-773.
- Redding, S. (1996). Low-skill, low quality trap: strategic complementarities between human capital and R&D. *Economic journal*, Vol. 106, p. 458-470.
- Rees, A. (1966). Information networks in labour markets. *American economic review*, Vol. 56, p. 559-566.
- Robst, J. (1995). Career mobility, job match and overeducation. *Eastern economic journal*, Vol. 21, No 4, p. 539-550.
- Rosen, S. (1982). Authority, control and the distribution of earnings. *Bell journal of economics*, Vol. 13, No 2, p. 311-323.
- Rosen, S. (1986). The theory of equalising differences. Ashenfelter, O.C.; Layard, R. (eds). *Handbook of labour economics*. Amsterdam: Elsevier, Vol. 1, p. 641-692.
- Rosen, S. (1978). Substitution and division of labour. *Economica*, Vol. 45, No 179, p. 235-50.
- Rosenbaum, J.E. et al. (1999). Pathways into work: short-and long-term effects of personal and institutional ties. *Sociology of education*, Vol. 72, No 3, p. 179-196.

- Rothschild, M.; Stiglitz, J. (1976). Equilibrium in competitive insurance markets: an essay on the economics of imperfect information. *Quarterly journal of economics*, Vol. 90, Issue 4, p. 630-649.
- Rubb, S. (2003). Overeducation in the labour market: a comment and re-analysis of a meta-analysis. *Economics of education review*, Vol. 22, No 6, p. 621-629.
- Ruffini, A.; Torre, D. (2009). *Inside the black box of informal recruitment: buy your network!* (mimeo).
- Rumberger, R. (1987). The impact of surplus education on productivity and earnings. *Journal of human resources*, Vol. 22, No 1, p. 24-50.
- Russo, G. et al. (1997). Employers' recruitment behaviour: an empirical analysis of the role of personnel management attitudes. *Labour*, Vol. 11, No 3, p. 599-623.
- Russo, G. et al. (2001). Searching, hiring and labour market conditions. *Labour economics*, Vol. 8, No 5, p. 553-571.
- Rycx, F. (2011). *The impact of educational mismatch on firm productivity: direct evidence from linked panel data.* (mimeo).
- Salop, J.; Salop, S. (1976). Self-selection and turnover in the labour market. *Quarterly journal of economics*, Vol. 90, No 4, p. 619-627.
- Sattinger, M. (1993). Assignment models of the distribution of earnings. *Journal of economic literature*, Vol. 31, No 2, p. 831-880.
- Shapiro, C.; Stiglitz, J.E. (1984). Equilibrium unemployment as a worker discipline device. *American economic review*, Vol. 74, No 3, p. 433-444.
- Sicherman, N. (1991). Overeducation in the labour market. *Journal of labor economics*, Vol. 9, No 2, p. 101-122.
- Simon, C.J.; Warner, J.T. (1992). Matchmaker, matchmaker: the effect of old boy networks on job match quality, earnings, and tenure. *Journal of labor economics*, Vol. 10, Issue 3, p. 306-330.
- Sloane, P.J. (2003). Much ado about nothing? What does the overeducation literature really tell us? In: Büchel, F. et al. (eds). *Overeducation in Europe: current issues in theory and policy*. Cheltenham: Edward Elgar, p. 11-48.
- Sloane, P.J. et al. (1996). Overeducation and the formal education/experience and training trade-off. *Applied economics letters*, Vol. 3, Issue 8, p. 511-515.
- Sloane, P.J. et al. (1999). Overeducation, undereducation and the British labour market. *Applied economics*, Vol. 31, No 11, p. 1437-1453.
- Spence, M. (1973). Job market signaling. *Quarterly journal of economics*, Vol. 87, No 3, p. 355-374.
- Stevens, M. (1994). A theoretical model of on-the-job training with imperfect competition. *Oxford economic papers*, Vol. 46, No 4, p. 537-562.
- Stevens, M. (2001). Should firms be required to pay for vocational training? *Economic journal*, Vol. 111, No 473, p. 485-505.

- Stigler, G.J. (1961). The economics of information. *Journal of political economy*, Vol. 69, p. 213.
- Stigler, G.J. (1962). Information in the labour market. *Journal of political economy*, Vol. 70, No 5, p. 94-105.
- Sylos Labini, M. (2004). *Social networks and wages: it's all about connections!* Pisa: LEM, Laboratory of economics and management, LEM Papers series; 2004/10.
- Thurow, L.C. (1975). *Generating inequality*. New York: Basic Books.
- Topel, R.H. (1991). Specific capital, mobility and wages: wages rise with job seniority. *Journal of political economy*, Vol. 99, No 1, p. 145-176.
- Tsang, M.C. (1987). The impact of underutilisation of education on productivity: a case study of the US Bell companies. *Economics of education review*, Vol. 6, No 3, p. 239-254.
- Tsang, M.C. et al. (1991). The impact of surplus schooling on worker productivity. *Industrial relations: a journal of economy and society*, Vol. 30, No 2, p. 209-228.
- Tsang, M.C.; Levin, H.M. (1985). The economics of overeducation. *Economics of education review*, Vol. 4, No 2, p. 93-104.
- van Ours, J.C.; Ridder, G. (1991). Job requirements and recruitment of new employees. *Economics letters*, Vol. 36, p. 213-218.
- van Ours, J.C.; Ridder, G. (1992). Vacancies and recruitment of new employees. *Journal of labor economics*, Vol. 10, No 2, p. 138-155.
- van Ours, J.C.; Ridder, G. (1993). Vacancy durations: search or selection? *Oxford bulletin of economics and statistics*, Vol. 55, p. 187-198.
- Verhaest, D.; Omeij, E. (2006). Discriminating between alternative measures of overeducation. *Applied economics*, Vol. 38, p. 2113-2120.
- Verhaest, D.; Omeij, E. (2010) The determinants of overeducation: different measures, different outcomes? *International journal of manpower*, Vol. 31, No 6, p. 608-625.
- Waldman, M. (1984). Job assignments, signalling and efficiency. *RAND Journal of economics*, Vol. 15, No 2, p. 255-267.
- Waldman, M. (1990). Up-or-out contracts: a signalling perspective. *Journal of labor economics*, Vol. 8, No 2, p. 230-250.
- Weststar, J. (2009). Worker control as a facilitator in the match between education and jobs. *British journal of industrial relations*, Vol. 47, No 4, p. 723-740.

ANNEX

European data sources on skill mismatch at the enterprise

The Eurofound European company survey (ECS)

The European company survey (ECS 2009) is a large-scale representative survey among establishments in all EU-27 Member States and three acceding and candidate countries (Croatia, Former Yugoslav Republic of Macedonia, Turkey). The ECS 2009 is the second EU-wide establishment survey launched by the European Foundation in recent years. The preceding survey – the European establishment survey on working-time and work-life balance (ESWT 2004/05) – had been conducted in 2004 in the EU-15 Member States plus – in a second round in 2005 – in six of the 10 countries that had newly joined the European Union on 1st May 2004 (Czech Republic, Cyprus, Latvia, Hungary, Poland and Slovenia).

The main topics of the ECS 2009 are flexibility measures at firm level and the involvement of employee representatives in decisions regarding their application. It is based on the views of both managers and employee representatives. It gives an overview of workplace practices and how they are negotiated in European establishments on a range of issues, such as working time, work-life balance, variable pay, company performance and the development of social dialogue in companies.

The structure of earnings survey

The European structure of earnings survey is undertaken within the European statistical system⁽²⁸⁾, and covers all firms that employ at least 10 employees and, in the 2006 survey, economic activities within sections C to K and M to O of the NACE Rev.1 nomenclature⁽²⁹⁾. The survey is a matched employer-employee data set containing a wealth of information, provided by the management, both

⁽²⁸⁾ The European statistical system is the partnership between the Community statistical authority, which is the Commission (Eurostat), and the national statistical institutes (NSIs) and other national authorities responsible in each Member State for the development, production and dissemination of European statistics. This Partnership also includes the EEA and EFTA countries.

⁽²⁹⁾ The 2010 survey covers sections B to N and P to S of NACE Rev. 2.

on the characteristics of the firm (e.g. sector of activity, number of workers, level of collective wage bargaining) and on the individual employees within the enterprise (e.g. age, education, tenure, gross earnings, paid hours, gender, occupation). The aim of the structure of earnings survey is to provide accurate and harmonised data on earnings in EU Member States, so in this respect the data are not ideal for addressing many questions on skill mismatch. As no longitudinal information is available, it is also not capable of allowing for an understanding of how skill mismatch has evolved in the past and what is its future progression. Nevertheless, it constitutes a sufficient starting point for analysing cross-country differences in the impact of firm characteristics on skill mismatch at European level.

The continuing vocational training survey (CVTS)

The European continuing vocational training survey (CVTS) is undertaken within the European statistical system, and gives a unique insight into the conditions and provision of training in enterprises. It is the only data source that provides internationally comparable, detailed statistics on the volume, subjects and cost of training in enterprises, and on their training policy and management. The third survey (CVTS3, 2005) across EU Member States and Norway covered enterprises with 10 or more employees in sections C to K and O of the statistical classification of economic activities (NACE Rev.1.1)⁽³⁰⁾. A comprehensive description of the findings of the CVTS3 is available in Cedefop (2010d).

The survey had been performed on two previous occasions, covering reference years 1994 and 1999. The fourth round is carried out in 2011 (reference year 2010). As a result of further development of the survey methodology, the fourth survey shifted focus from training 'subjects' to skills and competences considered as important for the development of the enterprise in the near future, and targeted by training courses.

The Cedefop employer survey

The purpose of the forthcoming Cedefop employer survey is to identify future needs of occupations, skills, competences and qualifications in enterprises in Europe, covering the whole economy. Education and training, in particular VET, has an important role to play in the process of adequate skill supply to the labour

⁽³⁰⁾ The fourth survey covers sections B to N, and R to S of NACE Rev. 2.

market. Adequate skill supply can be better achieved if employers identify and describe not only their current demand, but also their expectations for the future.

Using an innovative task-related approach to skill needs measurement, the employer survey aims to obtain insight into generic and occupation-specific skill needs of enterprises in economic sectors and countries. A first pilot survey will be conducted in five EU Member States (Germany, Ireland, Spain, Poland and Finland) and in a limited number of NACE Rev. 2 divisions to test the feasibility of extending the approach to all Member States and the whole economy. Before carrying out the full pilot survey, the survey instrument will be tested in 2011 to validate the questionnaire and the methodological concept.



CEDEFOP

European Centre for the Development
of Vocational Training

Skill mismatch

The role of the enterprise

Luxembourg:
Publications Office of the European Union

2012– VI, 97 p. – 21 x 29.7 cm

ISBN 978-92-896-0918-0

ISSN 1831-5680

doi: 10.2801/7930

Cat. No: TI-BC-12-002-EN-N

Free download at:

http://www.cedefop.europa.eu/EN/Files/5521_en.pdf

Free of charge – 5521 EN –

Skill mismatch

The role of the enterprise

Understanding the dynamics of skill mismatch is a crucial pillar of Cedefop's work on skills in the European labour market. While most research to date has focused on the individual perspective, this report is a first attempt to explore the role of enterprises in mitigating skill mismatch. Specific attention is given to the potential role of human resource practices (e.g. recruitment, training, performance appraisal and pay-setting, job design, employee empowerment) and of high performance workplaces for ensuring that the knowledge, skills and competences of individuals are used to best effect. The report paves the way for a closer look into what has previously been a black box of the skill mismatch agenda: what is the role of the firm in anticipating and matching skill needs with skill supply within a fast-paced and uncertain economic environment?

Europe 123, 570 01 Thessaloniki (Pylea), GREECE
Postal address: PO Box 22427, 551 02 Thessaloniki, GREECE
Tel. +30 2310490111, Fax +30 2310490020
E-mail: info@cedefop.europa.eu

[visit our portal www.cedefop.europa.eu](http://www.cedefop.europa.eu)

5521 EN

http://www.cedefop.europa.eu/EN/Files/5521_en.pdf

