

Innovative changes in European companies

3rd
European
Company
Survey

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List of abbreviations

AMO	Ability, Motivation and Opportunities [model]
CIS	Community Innovation Survey
ECS	European Company Survey
EIS	European Innovation Scorecard
EWCS	European Working Conditions Survey
HCWS	high commitment work systems
HIWS	high involvement work systems
HPWP	high performance work practices
HPWS	high performance work systems
HR	human resources
HRM	human resource management
OLS	ordinary least squares
ROC	receiver operating characteristic
SMEs	small and medium-sized enterprises
VIF	variance inflation factor

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Executive summary

Introduction

Innovation in its various forms is considered an important driver of improved competitiveness, productivity and the growth potential of companies. By innovating both in their products and in workplace practices and processes, European workplaces may have a better chance to compete internationally.

This report critically reflects on common concepts of innovation and explores the links between innovation, practices, performance and workplace well-being across the EU28. In particular, it examines associations between innovative company behaviour and the implementation of bundles of workplace practices. The report also studies the role of social dialogue in translating innovative workplace practices into higher levels of performance and well-being.

The report contributes to research and policy debates by examining innovation from a different perspective. It acknowledges that companies need to invest in research and development (R&D), increase the number of patents granted and improve technology. However, it highlights other important factors that contribute to innovation such as the organisation of work, human resource practices and employee participation.

Policy context

In the European context and the Europe 2020 strategy, innovation is seen as a way to achieve smart, sustainable and inclusive growth. A sustainable recovery from the economic and social crisis calls for structural changes driven by innovation. Innovation is considered essential to preserve and improve Europe's competitiveness and its ability to create jobs and to tackle societal challenges. The Innovation Union, a Europe 2020 flagship initiative, aims to improve Europe's capacity to innovate. Efficient use of skills and tacit knowledge, informal and lifelong learning, and the adaptation of work organisation to meet new challenges are among key EU priorities. In a future-proof European workplace, innovation is a central feature, as are workplace practices that drive innovative behaviour to the benefit of the company, employees and society.

The findings of this research are relevant for the Skills Agenda for Europe, in particular the Digital Skills and Jobs Coalition and the Blueprint for Sectoral Cooperation on Skills, as innovation depends on relevant skills.

Key findings

This research investigates innovation in the form of the introduction of new or significantly changed products

or processes, new or significantly improved marketing methods and organisational change. It examines innovations reported as being new to the company (but not necessarily new to the market).

Across the EU28, more than half of the establishments (55%) reported the introduction of new or significantly changed products and services, marketing strategies or processes over the period 2010–2013. Looking at the EU average, the most frequent type of innovation related to products (40%), followed by processes (35%). Changes in marketing (32%) were the least frequent.

The research also examined how innovation is associated with work practices, including work organisation, human resource management (HRM) and employee involvement. Such practices provide the context within which skills development, participation, collaboration and innovation can thrive. Innovative company behaviour requires joint efforts and an organisational setting that facilitates and supports innovation. Additionally, certain combinations (bundles) of workplace practices were found to have stronger links with performance and workplace well-being.

Various sets of work organisation practices were examined through statistical analysis. The use of monitoring instruments for internal quality and external developments turned out to be among the strongest determinants of overall innovation. Collaboration on – and/or outsourcing of – production, marketing or development also showed positive links with innovation; the degree of workers' autonomy was another important factor. However, the accumulation of positive individual practices will not necessarily positively boost innovation in isolation. The probability of innovation is boosted when strong work organisation structures are combined with direct employee participation (for example, involvement in solving problems or improving the quality of production).

HRM practices play a major role in enhancing employees' knowledge and skills, and can influence behaviour. They can also reward initiative and develop innovative capacity. Analysis of HRM-related variables found that access for employees to training was linked positively to innovation. Training to ensure appropriate skills helps a company ensure a competitive edge (as other research has shown). Motivation, in the form of financial incentives such as variable pay, was also positively linked to innovation. Bundles of HRM practices that encouraged employee participation were very strongly associated with innovation, indicating that such practices have a better chance of creating a pro-innovation environment.

Overall, a strong link was found between innovation and direct employee involvement. In particular, the number of direct participation instruments in place was found to be important, as was the participation of employees in the decision-making process.

Taken together, all three bundles of workplace practices (work organisation, HRM and employee involvement) were significantly associated with innovation. The strongest effects were found for the bundle of employee involvement practices.

It was also found that the more innovative organisations experienced better company performance and greater workplace well-being. These innovative companies tended to have strong employee participation practices in place.

Trusting social dialogue is also important for performance and well-being. Levels of performance and workplace well-being were well below average in establishments where disputes and industrial action had taken place. A trusting relationship between employee representation and management, in combination with direct employee participation, was associated with higher levels of performance and well-being and created a positive environment for innovative action.

Policy pointers

- European initiatives associated with innovation and the future of work should encourage Member States to adopt pro-innovation workplace practices. National policies and regional programmes need to be aware of the importance of specific workplace practices, in particular the work organisation and HRM practices that encourage employee involvement.
- National and regional programmes should also provide opportunities for companies to tap into external ideas and research, and to collaborate with other companies and research institutes to help them improve their products or services. Relevant European networks can facilitate such an exchange.
- National programmes should continue to support training to develop skills.
- Planning for the future workplace should support companies to assess and adopt workplace practices that contain the important elements presented in this research.
- Learning networks can bring together researchers with businesses and workers' organisations. Taking a bottom-up approach and exploring the needs of companies and employees could create benefits for all.
- Governments and the business community could assist small businesses and start-ups to embrace pro-innovation workplace practices.
- Participative change nourishes an environment of trust between management, employees and their representatives. Social dialogue can help inform employees about adaptation needs, promote employee involvement in operations, and engage the workforce in debates about the future of their company.
- European-level social partners could work with national-level social partners to address the issue of different forms of participation and the linking of workplace practices with innovation.

Introduction

Introduction

Change is a constant feature of the lives of companies and their employees. Employers and employees alike are facing unprecedented challenges, including volatility in the global business environment; responding constructively requires constant vigilance, versatility and innovation. There is a shift away from mass production to an emphasis on customised products and services. There is also a shift from centralised to decentralised production, made possible by advances in technology. As a result, traditional production modes and processes are changing. The advent of Industry 4.0 is becoming possible through cyber-physical systems, which enable networks of virtual and physical systems in different locations and times to interact¹. These developments are leading to the emergence of new business models, such as the smart factory; e-business; on-demand models such as Netflix; and market-place models such as eBay and Airbnb. These new models require different approaches to managing resources, people and processes.

In such work environments, workers' jobs and competency profiles will be transformed. Work needs to be organised in a way that fosters participative work design, embraces lifelong learning, gives greater responsibility to employees and provides opportunities for self-development. Additionally, investment is required in research and development (R&D), as is innovation in production, processes and organisation. Firms need to be ready to deal with complex, networked systems and to use their resources intelligently. Some of the challenges managers are faced with require greater flexibility in the use of systems and networks, optimal resource productivity and decision-making based on big data in real time. It is becoming clear that previously valid styles of managing and organising work cannot deliver the adaptability required in this new landscape of fierce competition and rapid, pervasive technological change.

Policy context

In the Europe 2020 strategy, innovation is seen as a way to achieve smart, sustainable and inclusive growth (European Commission, 2010). A sustainable recovery from the economic and social crisis calls for structural changes driven by innovation (European Commission, 2013). However, developing the capacity for companies to innovate, grow and be flexible enough to respond to changing markets is not a one-dimensional task. It requires nurturing, enhancing and making optimal use of human capital, implementing more effective methods

of work organisation and dealing with issues of work-life balance (Oeij et al, 2012).

Innovation is considered essential for improving Europe's competitiveness and its ability to create jobs and tackle societal challenges (European Commission, 2014). For that reason, the Innovation Union strategy, a Europe 2020 flagship initiative, aims to improve Europe's capacity to innovate. Supporting companies in translating ideas to marketable products has been given priority through various investment schemes (including financial support, R&D, training and partnerships). Recent data from the European Innovation Scoreboard show that, since 2008, the EU has significantly narrowed the innovation performance gap with the USA and Japan. However, the position of other competitive regions such as South Korea and China poses a major challenge.

The new Skills Agenda for Europe emphasises the development of workforce skills. EU policies consider the following areas as priorities: using employees' skills and tacit knowledge at work; informal learning; lifelong learning; and adapting work organisation practices to new challenges.

Organising work in teams and with broad employee participation can help develop human capital. Good company outcomes *and* employee well-being are features of 'happy companies', which produce efficiently, compete successfully and avail of their employees' skills and experience.

Research suggests that the survival of companies is dependent upon their ability to innovate in terms of their products, processes and systems. One way companies can achieve this is to develop the talents of the workforce. By being innovative in their *products*, *services* and their *processes*, European workplaces may have a better chance to compete in international markets.

It is therefore important to understand how firms innovate in terms of their products, processes, marketing and organisation; also important are the particular bundles of practices that innovative firms use to produce positive outcomes for the organisation and the workforce. This type of understanding can inform policymaking so as to achieve sustainable, inclusive economic growth and build resilient, inclusive societies.

This report explores innovation-enhancing practices in establishments and companies across EU Member States; it is based on quantitative analysis of Eurofound's third European Company Survey (ECS 2013). The overview

1 The term 'Industry 4.0' originated in Germany. *The Plattform Industrie 4.0* website describes it as people, machines, equipment, logistics systems and products communicating and cooperating with each other directly. This results in production and logistics processes being integrated intelligently across company boundaries to make manufacturing more efficient and flexible. Industry 4.0 was originally one of the projects that the German federal government adopted in 2010 for its action plan for a high-tech strategy for 2020. The concept exists in different countries using alternative terms such as 'smart factories', 'the industrial Internet of things', 'smart industry', and 'advanced manufacturing'.

report on the results of the ECS 2013 examines the incidence of work organisation practices, human resource (HR) policies and social dialogue (Eurofound, 2015).

Research objectives

The impact of management practices and organisational behaviour has been reported in management and human resource management (HRM) literature for many years. Furthermore, a growing body of economics literature has drawn attention to management practices in terms of employee motivation and involvement, and their impact on performance. The link between different forms of innovation and performance has long been identified in economics literature. It has thus been recognised that workplace practices can be a driver of performance and innovation.

Innovation is an extremely complex concept, developing on multiple levels and being influenced by a huge variety of external and internal factors. The ECS 2013 was not originally designed to capture the conditions and determinants of innovation; rather, it provides information on workplace practices which can be linked to innovation. The ECS is the only EU-wide establishment survey that encompasses a wide range of questions about work organisation, HRM practices, direct employee involvement and social dialogue. This report seeks to make use of this rich dataset and to investigate the links between different forms of innovation and establishment practices across the EU28 as a whole. A particular focus of this research is to explore the associations between innovative company behaviour and outcomes on the one hand and the organisational settings and practices on the other. The report also aims to use quantitative data to contribute to the debate about the triggers of, and barriers to, innovation at the establishment level.

On this basis, the main research questions of this report can be formulated as follows.

- What are the main components of innovation and to what extent are these captured by the changes reported in the establishments surveyed in the ECS 2013?
- Can specific structural, organisational and employee-related characteristics of innovative establishments be identified? How do they differ from those of non-innovative establishments?
- What are the main internal factors associated with innovation in establishments in terms of combinations of workplace practices in place?
- To what extent do innovative practices in the workplace affect workplace well-being and performance? What is the role of social dialogue in this regard?

The findings of this work will contribute to information provided to policymakers to inform decisions regarding possible measures at national and/or European level.

Structure of the report

The report is organised in seven chapters.

Chapter 1 discusses the concept of innovation and how it is measured in international surveys. The chapter also critically reflects on the main challenges in the measurement and argues for a broader and extended conceptualisation of innovation in future surveys and research.

Chapter 2 goes through the literature and presents empirical findings about determinants of innovative establishment behaviour. How are different workplace practices, HRM strategies and instruments of employee participation linked to change at the company level? How is overall performance affected?

Chapter 3 analyses the prevalence of innovative activities across the EU in terms of three areas: products and services; processes; and marketing. The chapter looks at the structural characteristics of innovative establishments such as size, type, sector and the composition of the workforce and compares them with those establishments that did not report changes in any of the three areas.

Chapter 4 explains the methodology used to analyse the main determinants of innovation on the basis of data from the ECS 2013. It then outlines the approach taken to explore the impact of workplace practices associated with innovation and of social dialogue on the overall performance of the establishment and well-being at the workplace. For this purpose, multivariate logistic regressions are used to show which practices, company characteristics and structures are most important in analysing the different relationships.

Chapter 5 presents the results of the quantitative analysis. The first part explores which of the identified practices are significantly associated with change in establishments, using a range of variables. The second part of this chapter shows how far the identified practices and bundles of practices impact on overall performance of the establishment and on well-being at the workplace. In addition, the mediating role of social dialogue in translating these workplace practices into higher levels of performance is investigated.

Chapter 6 discusses the findings and embeds them in a broader picture.

Finally Chapter 7 summarises and highlights the findings and presents policy pointers.

1 | Innovation at company level

1 | Innovation at company level

Innovation: Definition and measurement

Innovation and change in this research is considered within the context of the Europe 2020 strategy, which aims to achieve smart, sustainable and inclusive growth. The concept of ‘creative destruction’ – coined by Joseph Schumpeter in the 1940s – refers to those phenomena today called ‘innovations’. In innovation, new combinations and further developments of existing production processes are replacing old products, detached processes and production systems. This section explains how the phenomenon of innovation is captured by organisations such as the OECD, the European Commission and in the present report. It also discusses some issues related to measurement.

OECD Oslo Manual

The OECD sees innovation as a factor underpinning the growth and dynamism of the economy and thus important for all countries. It lists the main features of innovation:

- a wide scope beyond traditional R&D
- encompassing social and organisational innovation
- involvement of various actors
- a strong basis in the digital economy
- a wide geographical scope.

While growth and job creation are closely linked with innovation, a broader set of activities rely on innovation: these include public services, green growth, health, food security and the fight against poverty.

The OECD defines innovation as wider than R&D, going ‘beyond the confines of research labs to users, suppliers and consumers everywhere – in government, business and non-profit organisations, across borders, across sectors, and across institutions’².

While no overall innovation index has been developed the country reviews focus on innovation systems and other issues such as policy developments with regard to university research, linking research and innovation, and dealing with societal challenges and priorities, and governance.

The *Oslo Manual* (OECD and Eurostat, 2005) is the foremost international source of guidelines for the collection and use of data on innovation activities in industry. The third edition of the *Oslo Manual* is still the valid reference work on definitions and methodology. (Another relevant OECD document for the collection of R&D statistics is the *Frascati*

Manual, which provides a broader definition of R&D and is regularly updated.)

With the publication of the *Oslo Manual* for the first time in 1992, recommendations for the statistical monitoring of innovation were launched, offering a framework for OECD Member States. While the first edition of the *Oslo Manual* focused on technological product and process innovations, the second edition specified the concept of innovations in the service sector. With the third edition in 2005, the definition of innovation was expanded to non-technological innovations. Also for the first time, marketing and organisational innovations were conceptualised and moved into the focus of interest. The document distinguishes between product, process and marketing innovation – which are clearly outputs of the innovation process – and organisational change, which can be thought of as an intermediate step in reaching innovation goals. Innovation is defined as ‘new to the firm’ – rather than ‘new to the market’ or completely new. This definition also implies that innovation need not be developed by the establishment itself but that it can be acquired by the process of diffusion from other companies or institutions. In the latest edition of the *Manual*, innovation activities in the service sector and in ‘low technological’ industries have received more attention.

Community Innovation Survey

The Community Innovation Survey (CIS) innovation statistics are integrated in the EU science and technology statistics. EU Member States and other partner countries are responsible for the data collection, which takes place every two years.

The CIS investigates innovation activities in companies. As Eurostat (2016) states:

The harmonised survey is designed to provide information on the innovativeness of sectors by type of enterprises, on the different types of innovation and on various aspects of the development of an innovation, such as the objectives, the sources of information, the public funding, the innovation expenditures etc.

Statistics based on CIS data can be analysed by country, type of innovators, economic activities and size classes.

With reference to the *Oslo Manual*, the CIS captures information on the four types of innovation: products/ services, processes, marketing and organisation. Furthermore, the survey includes data on innovation expenditure, public funding of innovation, information sources for innovation, cooperation in innovation, and public procurement and innovation.

2 OECD Innovation Strategy: <http://www.oecd.org/site/innovationstrategy/defininginnovation.htm>

European Innovation Scoreboard

The European Innovation Scoreboard (EIS), previously known as the Innovation Union Scoreboard, provides a comparative analysis of the research and innovation performance in EU Member States as well as other European countries and neighbouring countries³.

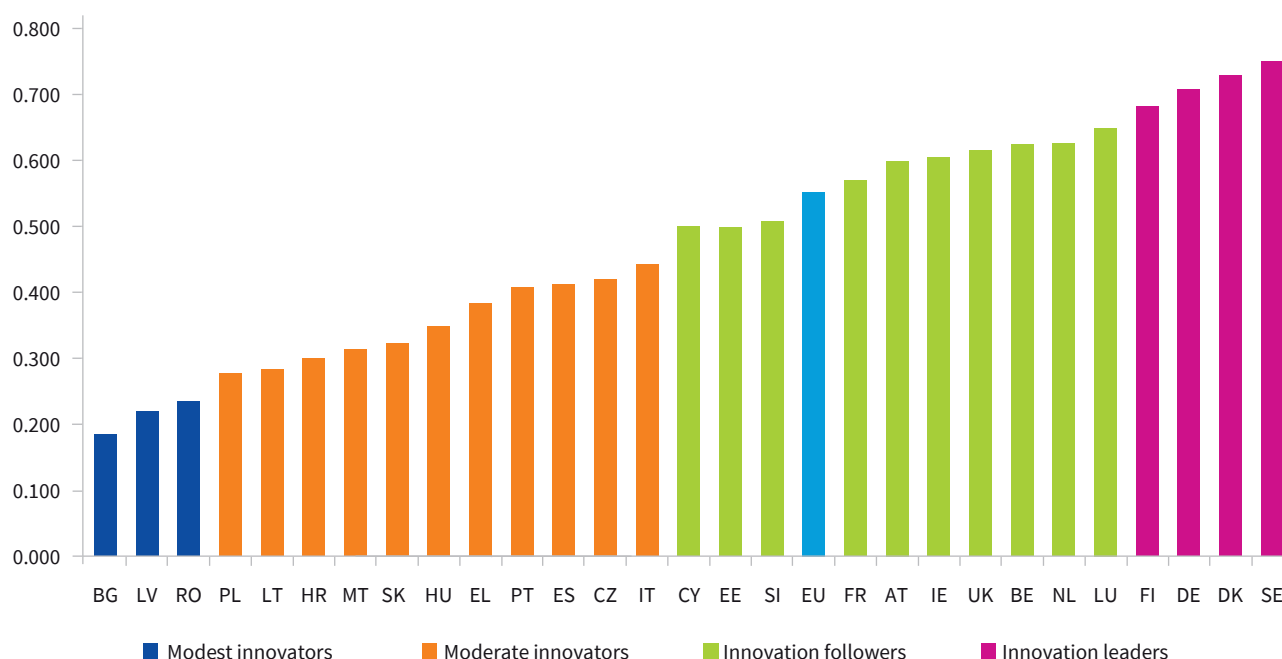
The EIS uses three main types of indicators: enablers, firm activities and outputs. It also includes eight innovation dimensions, capturing in total 25 indicators. The 'enablers' indicator captures the main drivers of innovation performance external to the firm (such as human resources, research systems, finance and support). 'Firm activities' captures the innovation efforts at company level, such as investments by the firm, other innovation activities specific to small and medium-sized enterprises (SMEs), and intellectual assets. Lastly, the 'outputs' indicator captures the effects of firms' innovative activities, including indicators such as product, process, marketing and organisational innovation (for SMEs) and economic effects.

The EIS has been produced on an annual basis (apart from 2012) since 2007 and uses Eurostat data and other

sources from international organisations such as OECD and the United Nations. The methodology has been revised and data sources and definitions have developed over the years. To assess the performance of national innovation systems, a composite indicator known as the Summary Innovation Index has been produced, using an unweighted average of the 25 indicators. The EIS measurement framework does not include measures of management or organisational practices.

Data from the EIS 2015 show the ranking of Member States; Figure 1 shows significant differences between countries with regard to innovation performance. The Nordic countries and Germany are classified as innovation leaders, while most countries fall into one of two categories: innovation followers and moderate innovators. The fourth group, modest innovators, consists of a small number of countries with scores of less than 50% of the EU average. This group includes Bulgaria, Latvia and Romania. Compared with the previous year, 13 Member States saw a decline in their innovation performance while 15 countries experienced improvement in their innovation performance.

Figure 1: Innovation performance by country



Source: EIS 2015

ECS 2013 and definition of innovation

The quantitative analysis of this report is based on data from the third wave of the ECS carried out by Eurofound in 2013 (Eurofound, 2015 – see Chapter 1 for details). The ECS 2013 included a set of questions that capture innovation by asking whether or not establishments had recently introduced the following changes:

- introduction of new or significantly changed products or services
- introduction of new or significantly changed processes;
- introduction of new or significantly improved marketing methods
- introduction of any organisational change.

3 The full report, national rankings and methodology are available from: http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en

More specifically these are defined as follows.

Product innovation – any new or significantly changed product or service with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, software incorporated, user-friendliness or other functional characteristics.

Process innovation – any new or significantly changed process either for producing goods or supplying services. This includes significant changes in techniques, equipment and/or software. These can also be delivery methods, storage, inventory handling, management information software or an innovation to improve internal production or support processes.

Marketing innovation – any new or significantly improved marketing method. This can be in product packaging, product placement, product promotion or pricing.

Organisational innovation – any organisational change. This could be any of the following: new business practices for organising procedure; new methods of organising work responsibilities and decision-making; and new methods of organising external relations with other companies or public institutions. These particular innovations may come from a larger organisation that the establishment is part of, but they must be introduced at the local establishment.

It should be emphasised that, unlike the CIS, the definition used in the ECS 2013 did not distinguish between ‘new to the firm’ and ‘new to the market, EU or the world’; it captured only ‘new to the firm’ innovations.

Challenges in measuring innovation processes

Conceptual issues

The concept of innovation, and how it is commonly measured in surveys as a result, is challenged by recent trends and by insights on how innovation processes actually occur in organisations. Several of these challenges are not new and are reflected in revisions of the innovation concept and its measurement by leading institutes. It has proved difficult to measure the organisational complexity of innovation processes in quantitative studies and, in particular, to achieve a quantitative understanding of how innovation is embedded in organisational structures and work practices and how it affects jobs and workers.

Questionnaires addressing the topic of innovation, including the CIS and the ECS, typically identify at least four major types of innovation as mentioned above: product/service innovation, process innovation, organisational innovation and marketing innovation. These relate to the OECD definitions and the Oslo Manual. The OECD itself has adopted a broad concept of innovation and says that it is a key economic strategy in enabling economic growth and

job creation, and in supporting sustainability and social inclusion⁴.

However, it appears that the different types of innovations (process, product, organisation and marketing) are in fact approached in an analytical way, even if surveys include questions on the combinations of the four types. Today, innovations may imply profoundly new business models where the distinction between product, process, organisation and marketing strategy is very difficult to make. Examples include innovations in the form of credit derivatives (for example, mortgage-backed securities and credit default swaps) in financial services. The current Industry 4.0 innovations, which are represented as fundamentally new paradigms in manufacturing goods, present another example. While this is not a core issue of this chapter, the question is whether the distinction between the four types and their isolated measurement will eventually have to be revised.

Other researchers have acknowledged the distinction between radical and incremental innovation and gone on to identify five types of innovation: incremental product, incremental process, radical product, radical process and administrative innovation (Vermeulen, 2005; Herrmann et al, 2007; Di Benedetto et al, 2008; Kim et al, 2012). The term ‘radical innovation’ refers to the adoption of new technology that would create new demand (‘not recognisable by markets’, according to Kim et al, 2012), while incremental innovation entails smaller changes to current technologies.

The inclusion of organisational innovation as part of the paradigm of innovation is of key importance. It reflects the fact that organisational innovation contributes to economic growth. As explained below, the inclusion of organisational innovation does not entirely solve the problem of measuring innovation as undertaken by Eurofound and the ECS. For one thing, definitions of organisational innovation (in particular, work organisation innovation) seem much less straightforward than definitions of product innovation. It is often not easy to clearly distinguish whether (work) organisational innovation is a condition for innovation, an objective of its own, or a consequence of the other types of innovation. Also, harmonised or standardised measurements are not available due to the multidimensional character of innovation in (work) organisation. While significant improvements have been made in measuring product and process innovation in surveys, challenges remain with regard to measuring organisational innovation. Issues that need to be addressed include the actual definition of organisational innovation and a shared understanding regarding its contribution to innovation processes, as explained above. For these reasons, the concept of innovation in this report includes only changes in products/services, processes or marketing strategies, while organisational change will be analysed as an impact factor and not as part of the concept itself.

4 <http://www.oecd.org/site/innovationstrategy/defininginnovation.htm>

Despite a generally broadened conceptualisation and measurements, the approach to innovation (and the distinction of the four types) remains primarily business-oriented, rooted in a science–technological perspective and, more importantly, the principal interest is economic when it comes to assessing benefits and outcomes. In innovation surveys, some questions remain underrepresented and underdeveloped: precisely how innovation is embedded in organisational structures and work practices; what the extent and contribution is of direct and indirect employee participation in innovation; and what the effects are on workers' jobs and well-being. The ECS aims not to investigate the technological, commercial or purely economic aspects of innovation, but rather to link innovation with work organisation, HRM practices, performance, and well-being. In order to achieve this, it is important to address innovation from the perspective of how innovation processes are actually set up and embedded in organisations, rather than to focus only on the types of innovation initiated, as will be further explained. More than in the innovation literature, this perspective is covered in the broad literature and empirical studies on work organisation innovation. The conceptualisation and measurement of work organisation innovation (including its distinction from social innovation) is for instance clarified in the Eurofound study *Work organisation and innovation* (Eurofound, 2013a). It was also the core theme in the ECS 2013, which included a qualitative follow-up study. Aspects of work organisation are also a key theme in the European Working Conditions Survey (EWCS) reports insofar as work organisation is linked with job quality and well-being at work.

In short, while both the human factor and work organisation innovation are now commonly accepted in the conceptualisation and measurement of innovation, they are still part of separate theoretical and empirical approaches. On the one hand, innovation studies have a key interest in the technological and economic drivers and outcomes. On the other hand, work organisation literature and studies have a key interest in work organisation practices, HRM and well-being at work.

Lastly, innovation is often presented as a linear process, from research effort to invention to commercial application, development and marketing (Cooper and Merrill, 1997) or variations on these phases (for example, idea generation, development and implementation). In reality, innovation in companies occurs as a complex, continuous and non-linear interaction between idea, development, implementation, experiences and iterative adaptations. In order to understand this complexity and to take account of the interactive and circular character of innovation processes, it is essential to address innovation from an organisational *and* a process perspective. More knowledge is therefore needed about the way innovation projects are set up, who is involved, and how innovation and change are embedded in the organisation and in the daily work practices of workers.

Role of employees in innovation

The difference in perspectives and emphasis – technological, business and economic versus organisational and employee-oriented – is reflected in the definitions of innovation. In the innovation literature, research generally focuses on the aim of creating or sustaining economic added value. While such economic added value and company performance in general is not absent from the work organisation and innovation literature, the latter places emphasis on work practices and the role of employees in innovation processes. It also investigates the knowledge-sharing dimension of innovation, producing mutual benefits and win-win outcomes (Dobbins and Gunnigle, 2009; Geary and Trif, 2011; Eurofound, 2015). Other scholars approach innovation as a result of the exchange of knowledge between different actors within an organisation and in different organisations (Powell, 1998; Hargadon, 2003; Caloghirou et al, 2004).

This focus on the utilisation, sharing and generation of knowledge implies the inclusion of innovations that are achieved in daily work by individual workers, or by the joint effort of more employees or regular teams, and that may be implemented without the prior approval of higher management. This type of innovation is the 'doing–understanding–interacting' mode of innovation (Jensen et al, 2007); it involves the use of workers' tacit knowledge. Taking a broad view of the role of tacit knowledge, one might argue that even informal work practices might be considered as 'innovations' to the extent that they contribute to improvements in the labour process that potentially add economic value to the company.

The academic debate on tacit knowledge has certainly had implications for the economics of science and technology and innovation. As a consequence, it is accepted that innovation cannot solely rely on R&D infrastructures or patents, and that the diffusion of innovations is in reality quite complex due to the impossibility of codifying this type of knowledge. This insight has led to the development of Gibbons' 'mode 2' form of innovation, in which knowledge is produced in interdisciplinary teams, brought together to solve specific real-world problems in a particular context (Gibbons et al, 1994).

The importance of uncodified knowledge as a key asset for innovation at the company level, and hence for the competitive position of companies, is also emphasised by resource-based views of the company (Johnson et al, 2002; Gertler, 2003) and in a broad strand of academic theories on organisational learning. It is also prominent in the literature on participative job design and high-involvement workplaces (HIWs).

This focus on tacit knowledge, and on employee behaviour and involvement, is important: it acknowledges that workers are not simple 'executives' but have an expertise and role that should be included in the analysis of innovations.

Research framework of innovation

Data

This report uses data from the ECS 2013. The ECS is a telephone survey of establishments in Europe. Interviews are carried out with a management representative (the most senior person in charge of personnel) and, where available, an employee representative responsible for the establishment⁵.

The respondent for the employee representative interview is identified through a series of questions in the management questionnaire. These questions were adapted to match the institutional structure of each country. The questionnaire was translated into 31 languages and tested to verify that the terminology used in the source questionnaire was suitable for a cross-national survey. The unit of enquiry for the survey, as in previous waves, is the establishment. The target population is all establishments with 10 or more employees in all economic sectors except those in the Statistical Classification of Economic Activities in the European Community (NACE) Rev. 2 categories A (agriculture, forestry and fishing), T (activities of the household) and U (activities of extraterritorial organisations and bodies). The survey covers all 28 EU Member States, as well as Iceland, the former Yugoslav Republic of Macedonia, Montenegro and Turkey.

This analysis considers only the 28 EU Member States and covers establishments engaged in what are termed here ‘market activities’ (NACE Rev. 2 categories B, C, D, E, F, G, H, I, J, K, L, M, N, R and S). The report is based on 24,471 management interviews (ranging from 280 in Malta to 1,514 in Italy) and 6,919 employee representative interviews (ranging from 41 in Malta to 563 in Finland).

Main framework

This research uses the definitions of innovation in the *Oslo Manual* and CIS, as adapted in the ECS 2013. ‘Innovation’ is thus captured as new or significant changes in products, processes and marketing. For the reasons mentioned above, organisational change is not part of the innovation concept used in this report but it is treated as a factor contributing to change.

The particular emphasis of this research is to explore the links between innovation and work organisation, HRM practices, and performance and workplace well-being. It recognises that the role of the ‘human factor’ is crucial in the innovation process and assumes that HRM, work organisation and employee-involvement practices have a central role in, and are associated with, a company’s disposition to innovate.

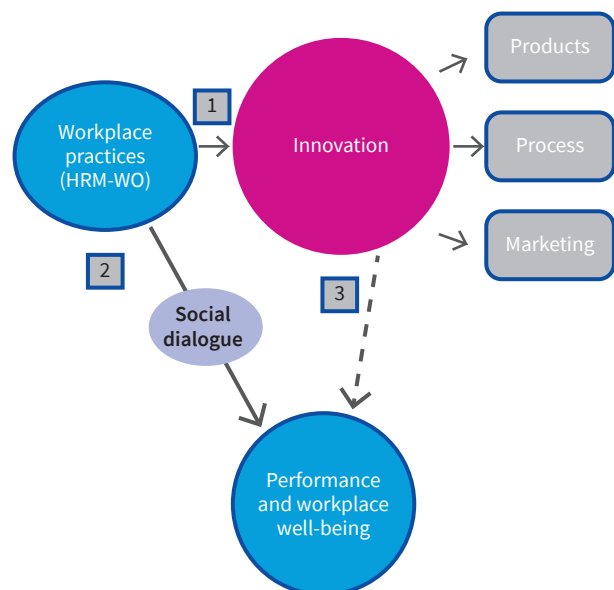
Research suggests that particular bundles of practices, as well as their various configurations, may have a different impact on innovation than individual measures – an issue investigated in this report. It is also assumed that the implementation of certain bundles or configurations

of workplace practices may have an impact on the company’s performance and on workplace well-being.

The innovation pursued within an organisation is affected by a number of internal factors (for example, company strategy or competitive advantage of company resources) and external factors (such as the national innovation system, institutions and legislation) which are not accounted for in this research. The analysis in this report focuses on organisational structures and practices as drivers of innovation. Innovation requires the creativity, commitment and full involvement of employees to solve problems and provide new insights or ideas. To enable individual employees and the entire organisation to participate in the innovation process, organisational practices should be in place to encourage such behaviours, provide resources, incentivise, foster collaboration, share information and develop skills.

Figure 2 illustrates the framework of this research: innovation is reflected in changes to processes, products, services or marketing strategies taking place within the organisation. It is affected by a combination of individual practices, bundles of practices and their interactions (as well as other unobserved factors not covered by the ECS), as illustrated by arrow 1. The combinations of these practices and their interaction also have an impact on performance and workplace well-being (shown by arrows 2 and 3). Social dialogue can be a mediator, influencing workplace practices and translating them into higher levels of well-being and overall performance.

Figure 2: Research framework



Note: WO = work organisation.

Source: Authors’ illustration.

5 See Annex 1 for a full description of the methodology used for the ECS 2013.

SUMMARY

Concepts of innovation

This chapter discusses current issues regarding concepts of innovation and measuring the phenomenon. Innovations are considered an important driver of improved competitiveness, productivity and the general growth potential of companies. More broadly, innovation is seen as a factor underpinning the growth and dynamism of the economy. The main features of innovation as defined by the OECD go beyond R&D, encompassing social and organisational innovation, involving various actors, and with a strong basis in the digital economy and a wide geographical scope.

The *Oslo Manual* is the foremost international source of guidelines for the collection and use of data on innovation activities in industry. These guidelines are implemented in the CIS and in the ECS 2013, which delivers the quantitative basis for the following analysis.

However, the concept of innovation and how it is commonly measured in surveys needs to be critically reflected upon. While the different types of innovations already capture a broad picture of innovation, the concept is still more complex. Innovations may imply new business models where the distinction between product, process, organisation and marketing strategy is very difficult to make and probably is becoming less relevant. Often it is more complex and not a linear process.

In innovation surveys, some key questions are underrepresented and underdeveloped: how precisely innovation is embedded in organisational structures and work practices, what the extent and contribution is of direct and indirect employee participation in innovation, and what the effects of innovation are on workplace well-being. It is thus important to address innovation from the perspective of how innovation processes are actually set up and embedded in organisations, rather than to focus solely on the types of innovation initiated. In order to understand this complex issue, it is essential to address innovation from an organisational perspective.

Moreover, the employee component in innovation processes needs to be taken into account. The analysis of innovation needs to include the way employees generate, use and share (tacit) knowledge, the way they initiate changes in tasks, products, processes and procedures and the way they are involved in and deal with innovations initiated by management in their daily work.

The concept of innovation used in this report puts work organisation, HRM and employee involvement centre stage and explores their links with innovation. Furthermore, it explores links with performance and workplace well-being. This report thus highlights the role of the ‘human factor’ in the innovation process.

2 | Innovation, workplace practices and performance – insights from the literature

2 Innovation, workplace practices and performance – insights from the literature

The link between innovation and company practices, performance and, to a lesser extent, well-being is the subject of a growing body of literature. Innovation has been explored by different disciplines, with contributions from HRM, economic, organisational and psychological literature. Impacts on performance have been particularly explored in the HRM literature. Associations between innovation and workers' well-being are often interlinked with organisation performance measures, with a focus on job satisfaction and organisational commitment.

This chapter reviews selected literature and empirical findings on the main determinants of innovation (in terms of workplace practices) and their impact on economic performance and workplace well-being. This review, together with insights from the ECS overview report (Eurofound, 2015), provides the basis for the quantitative analyses that follow. Literature and empirical findings on HRM and work organisation practices are of particular interest insofar as such practices have been identified as 'push factors' of innovation processes. (More often than not, HRM and work organisation practices are intertwined in both theory and practice.) Additionally, relevant research regarding the role of direct employee involvement and social dialogue in triggering change is explored. Lastly, empirical evidence on the overall impact of innovation on economic performance and well-being is presented.

HRM practices as factors contributing to innovation

The association of innovation with HRM strategies – both as bundles of combined practices and also single HR measures – has been the subject of a large body of literature addressing the question: why is HR policy relevant to innovation? (Lawler, 1986; Wood, 1999; Wood et al, 2015).

On a general level, human resources are crucial to a firm's competitive advantage, for becoming more creative and for contributing to growth. The focus of research in this area is diverse in terms of the countries, sectors and specialisms covered. However, recent academic research generally agrees that well-designed HRM strategies directly or indirectly enhance the likelihood of innovation in a company (Laursen and Foss, 2003; Shipton et al, 2006; Jiménez-Jiménez and Sanz-Valle, 2005; Jiang et al, 2012; Eriksson et al, 2014; Lin et al, 2015; Donate et al, 2016). The literature about high-performance work systems (HPWS) and its two variations – high-involvement work systems

(HIWS) and high-commitment work systems – HCWS (Boxall and Macky, 2009), as discussed below, influences the body of research on HRM and innovation practices.

A large body of literature on HPWS examines the impacts of HRM and work organisation practices on companies and employees (Huselid, 1995). High-performance work practices (HPWP) have been explored in depth in management science since the 1970s (Becker and Gerhart, 1996; Ashton and Sung, 2002; Appelbaum, 2015). Researchers in the field recognise that there is no one best way to organise production and work organisation practices, and they emphasise the importance of combining practices. They argue that the existence of a practice should not be taken as a proof of good performance; the researcher should seek for proof of the contribution the work practice makes to performance (Becker and Gerhart, 1996). Another term and approach would be *high-involvement* workplace practices or *high-commitment* workplace practices (Pil and MacDuffie, 1996). High-involvement practices are of particular relevance as they emphasise employee involvement and highlight some of the practices that can be included in this analysis.

Although it makes no specific reference to innovation, this literature is useful for this discussion as it deals with HRM impacts on performance and the combination of practices into bundles rather than being implemented as individual practices.

In an extensive review of empirical literature on the impact of HRM on innovation published between 1990 and 2015, Seeck and Diehl (2016) found the role of high-commitment practice bundles to be particularly important. They concluded that 'studies on the various individual practices indicate that practices that foster employee commitment, loyalty, learning and intrinsic motivation are conducive to innovation'. The authors provided some evidence of the role factors such as creativity and knowledge-management play as explanatory mechanisms for the HRM–innovation link (while also acknowledging that the industry companies are operating in and company strategy may also have an influence).

Approaching innovation as a socio-psychological process, Searle and Ball (2003) found that an integrated HRM policy creates understanding, support and trust at all levels and fosters the emergence of creative ideas, which in turn lead to incremental and radical changes. Laursen and Foss (2000) found positive links between innovation and HRM bundles – including interdisciplinary groups, quality circles,

systems for collecting employees' views, job rotation, performance-related pay and training.

Many publications explore specific HR practices and their associations with innovative activities. Jiménez-Jiménez et al (2008), for instance, identified positive links with flexibility in job definition, autonomy, employee participation, communication, teamwork, training, employment security, broad career paths, systematic performance appraisals and variable pay rewards. In line with this, Beugelsdijk (2008) found evidence that certain combinations of practices such as task autonomy, training and performance-based pay are more associated with incremental innovations, while radical innovations are more linked to task autonomy and flexible working hours. Chowhan (2016) identified that skill, motivation and opportunity practices (HRM) had a causal role in enhancing organisational, operational (innovation) and financial performance outcomes. Similarly, Lundvall (2002) concluded – using the example of Danish firms – that certain characteristics associated with learning organisations (such as autonomy in work, training, cross-unit teams or job rotation) had a positive link to innovation. Another interesting conclusion of Lundvall's paper is that the interaction between technical innovations and HRM organisational cooperation between firms ('networking') is crucial for transforming innovation into economic performance.

Other research mainly focuses on the positive impact of HRM bundles on innovation. In a study of UK manufacturing companies, Shipton et al (2006) emphasised the role of skills development and training combined with exploratory learning (generating new ideas through actively searching for alternative viewpoints and perspectives) in supporting innovation performance. Jiménez-Jiménez and Sanz-Valle (2005) concluded, on the basis of a sample of 180 Spanish companies, that the use of internal labour markets and practices promoting participation and commitment are more likely to boost every kind of innovation. Similar results are demonstrated by Verburg et al (2007) who concluded that HRM practices that promote commitment are more likely to be associated with higher levels of innovative activities. Wang (2005) concluded that the effect of strategic HRM, as compared to functional practices, on innovation remains particularly strong.

The literature on the links between HRM and innovation is growing and only a few selected results are presented here⁶.

Innovation and aspects of work organisation

Work organisation is more directly concerned with the ways in which work processes are organised; HRM practices, in contrast, are concerned with job design and the motivation and/or control of workers. Work organisation builds the

context for a fertile innovative environment, though it is not necessarily the result of conscious and systematic effort. Typical models of work organisation described in the literature include:

- discretionary learning models
- lean production models
- Taylorist models
- traditional models.

Discretionary learning organisations are characterised by an emphasis on problem-solving and innovation processes. High levels of autonomy, autonomous teams or the prevalence of project teams are some of the key characteristics of this type.

Lean production models, while using autonomous teams, also promote highly formal structures with limited employee discretion, often constrained by various hierarchical levels.

The **Taylorist** approach is characterised by limited autonomy, few possibilities for learning and teamwork that does not include task autonomy.

Lastly, the simple or **traditional** forms of work organisation are known for their informal modes of work and are often non-codified (Mintzberg, 1979; Greenan and Lorenz, 2009).

Often work processes develop over time rather than being explicitly designed. It was pointed out by Lundvall (2013) that, in the past, researchers into innovation paid little attention to the link with work organisation. Also Lorenz (2013) concluded in the same volume that the analysis of work organisation and organisation design 'has been relatively marginal to development of the field of innovation studies'.

HIWS is a useful concept for explaining management approaches towards work organisation, as mentioned earlier. It covers practices such as employee involvement in task definition, high levels of autonomy in task implementation and enhanced learning opportunities. Higher involvement implies a greater level of skills.

However, some authors have focused on specific aspects of work organisation. A relatively large number of researchers have studied particular work organisation practices – for instance, practices of quality management – and the links with innovation. Many researchers, including Prajogo and Sohal (2001) have argued that firms that implement quality management practices will create a beneficial environment for innovation and will enable knowledge-sharing. Kim et al (2012) stated that a set of quality management practices that relate to process management has a positive relationship with all types of innovation. They found that process management directly and positively relates to incremental, radical and administrative innovation. Based on the analysis of data from 283 plants in eight countries,

6 For an extensive literature review on this topic, see Seeck and Diehl (2016), who differentiate between HRM bundles and practices and the main mediators (contextual promoters linking HRM practices to innovation) and moderators (contextual barriers) identified as influencing the impact on innovation. For an integrated model of HRM and innovation, see also De Leede and Looise (2005).

Zhang et al (2014) indicated that 'hard' quality management affects innovation performance directly and indirectly through its effect on quality performance⁷. They advised managers to emphasise quality control techniques and use teamwork, training, employee empowerment and problem-solving approaches. Based on data from 383 firms in nine Chinese provinces, Zhang et al (2016) found evidence that both quality management infrastructure practices and core quality management practices have a positive effect on innovation performance. Others (for example, Slater and Narver, 1994) noted that quality management practices hinder creativity by enforcing standards or formalisation.

In terms of the more general division of labour, some country studies have explored the link between innovation and collaboration/outsourcing. Beke (2009), for example, found a positive relationship between outsourcing/offshoring and product innovation performance in the Dutch production industry. Mazzanti et al (2007) studied the link between outsourcing practices and innovation in the Italian province of Emilia-Romagna and concluded that 'in the district-like context investigated, where networking intertwines with market mediated mechanisms, the firm's innovativeness correlates positively with the complexity of the outsourcing strategies'. Görg and Hanley (2011) found that international outsourcing of services had a positive effect on innovative activity at the plant level.

Other, more employee-related aspects of work organisation such as degree of autonomy, work design in terms of teamwork and the links to innovation are often dealt with in HRM-related literature, as discussed partly above, or in the debate on employee-driven innovation, as considered in the next section.

Employee involvement and social dialogue

Managers make strategic choices as to the approaches and practices they use to achieve desirable outcomes. A better unit of analysis is the bundle of practices employed to meet these objectives. The main thrust of HIWS is the different approaches that management uses to engage employees in achieving desirable outcomes. Lawler (1986) argued that in HIWS, all elements of employee involvement should be present – that is, participation of employees in decision-making, information-sharing, training and rewards. Lawler maintains that decision-making power without information and rewards is likely to lead to poor decisions; information without the ability to influence decisions may lead to frustration; information and decision-making power without rewards for performance do not guarantee that people will exercise their power towards desirable organisational effectiveness. HIWS is a sensible notion, which is used in this research when selecting variables

for analysis such as the incidence of teamwork, employee involvement in decision-making, and instruments and opportunities for direct employee participation.

Some authors have suggested that participation enhances innovation by enabling the integration of different ideas, suggestions and solutions (Sawyer, 2006). Wang et al (2015, p. 1162) stated that 'employees' intimate knowledge and experience about their firms' businesses and operations enable them to generate innovative ideas to improve and/or develop new products and processes'. In their study, they provided evidence for their hypothesis that the percentage of participatory employees has a strongly positive effect on innovation. Other studies explore the link between employee participation and innovation in specific types of establishments, sectors or countries. Andries and Czarnitzki (2014), for example, provided evidence that for process innovation performance, small firms benefit greatly from involving non-managerial employees. They also identified that employee participation has a positive effect on product innovation performance. Kesting et al (2016) found that employee participation had a positive impact during the generation phase of the innovation process in Chinese high-tech companies. Overall, it can be concluded from these findings that employee participation is particularly relevant for innovations in skilled labour contexts.

Research on the precise role and effects of representative participation in innovation is still relatively scarce. Issues focusing on the direct participation of workers in innovation are addressed in the literature on employee-driven innovation and employees' innovative behaviour. Employee innovative behaviour is defined as employee behaviour that implies the generation, introduction and/or application of new ideas, processes, products and procedures that are potentially beneficial for the unit the workers belong to. Using this definition, the type of innovation initiated by workers is more comprehensive and far-reaching than is suggested by the term 'incremental innovation'.

Studies on indirect or representative participation in innovation are covered by other strands of the literature, first and foremost the industrial relations literature, including the recent Eurofound project about win-win arrangements (Eurofound, 2016a). In another recent piece of research, Brandl (2016) stated that trust between employers and employees improves the efficacy of social dialogue.

The main findings about the factors that affect innovation are summarised in Table 1. Workplace practices that were also covered in the ECS 2013 are shown in red. Together with insights from the ECS overview report, this literature review builds the basis for the quantitative analyses carried out in the following chapters.

⁷ 'Hard' quality management is the use of technical tools and techniques in quality management.

Table 1: Overview of main predictors of innovation

Reference	HRM practices	Work design/ work organisation	Direct employee participation	Research focus
Ganter and Hecker (2014)		Access to external knowledge, ideas		Configurational paths to organisational innovation: qualitative comparative analyses
Beke (2009)		Outsourcing/off-shoring		Product innovation
Beugelsdijk (2008)	Training Performance-based pay Flexible working hours	Task autonomy Teamwork		Product innovation
Bogliacino and Pianta, (2016)		Investment in R&D, knowledge accumulation		Innovation
Chowhan (2016)	Skills Motivation HR strategies			Innovation
Lundvall (2002)	Training Skills orientation	Work autonomy Cross-unit teams Job rotation Cooperation		
Görg and Hanley (2011)		International outsourcing		Innovative activity at the plant level
Jiménez-Jiménez and Sanz-Valle (2005), Jiménez-Jiménez et al (2008)	Training Performance appraisal Variable pay rewards	Autonomy Teamwork Flexibility in job definition Use of internal labour markets and practices promoting participation and commitment	Employee participation Employment security	Could HRM support organisational innovation? Innovation
Laursen and Foss (2000)	Training Performance pay	Autonomy Interdisciplinary groups Job rotation Quality circles Teamwork Delegation	Collection of employee views	Innovation performance
Mazzanti et al (2007)		Outsourcing practices		General innovativeness in the district-like context
Mazzola and Perrone (2013)		Knowledge/learning/develop new products/process Inter-company cooperation		Innovation
Prajogo and Sohal (2001), Kim et al (2012), Zhang et al, 2014, 2016		Quality management practices Quality management through process management Hard quality management		Innovation/technological innovation/product innovation

Reference	HRM practices	Work design/ work organisation	Direct employee participation	Research focus
Searle and Ball (2003)	Training Integrated HRM policies			Innovation
Shipton et al (2006)		Skills development and training combined with exploratory training		Innovation performance
Slater and Narver (1994)		Negative impact of Quality management by standardisation and formalisation		Market orientation performance
Verburg et al (2007)		HRM practices promoting commitment		Levels of innovative activities
Wang et al (2015), Andries and Czarnitzki (2014), Kesting et al. (2016)			% of participative employees Employee participation Involvement of non-managerial employees	

Note: Items shown in blue are also covered in the ECS 2013.

Innovation, workplace practices and impact on performance and well-being

Why do companies innovate? The main reason is probably to maintain competitive advantage and performance (Becker and Gerhart, 1996).

The link between innovation and performance is being explored in a growing body of literature. Researchers have examined the relationship between performance and specific types of innovation such as strategic knowledge management (López-Nicolás and Meroño-Cerdán, 2011), organisational innovation (Yamin and Mavondo, 2015), strategic innovation (Talke et al, 2011) or the influence of organisational culture on innovation and performance (Hogan and Coote, 2014).

Research has provided evidence that certain organisational practices, which are linked to innovation, influence a company's performance (Damanpour et al, 1989; Caroli and Van Reenen, 2001; Piva and Vivarelli, 2002; Greenan, 2003). The topic of organisational innovation has been included in innovation surveys

(including the CIS, as described earlier) and some research based on national data provides evidence of the links between organisational characteristics (such as size and ownership), work practices and performance.

Other empirical work has examined more specifically the effects of innovation on productivity (Crepon et al, 1998; Löf and Heshmati, 2003; Griffith et al, 2006). The well-known Crepon–Duguet–Mairesse (CDM) model (Crepon et al, 1998) investigated the interplay between innovation performance and productivity. R&D has been used as an input and output factor in many of these studies, which measure the rate of return on R&D. Additionally, the effect of different types of innovation (for example, product or process innovation) on productivity has been investigated (Mairesse and Mohnen, 2005). Innovation and profitability has been the subject of several studies (Teece, 1986; Cefis and Ciccarelli, 2005). Using survey data, Bartoloni (2012) and Antonelli et al (2012) found some effects of innovation on profitability. A great number of studies have found a link between innovation and productivity/ labour productivity (Bigliardi, 2013; Cusí et al, 2013; Klingenberg et al, 2013; Preenen et al, 2015; Friesenbichler and Peneder, 2016; Inigo et al, 2016).

The HPWS literature focuses on a system of work practices that lead to superior organisational performance. Work by Appelbaum et al (2000) maintained that technological advances are not enough and that a reform of work systems is also needed. Several studies conducted at the establishment level with a group of production workers, using specific performance metrics, proved the associations of certain groups of HRM practices with performance (MacDuffie, 1995; Ichniowski et al, 1997; Ichniowski and Shaw, 1999; Appelbaum et al, 2000). Two variations of the HPWS model – HCWS and HIWS – have attempted to explain performance with regard to management attitude towards work organisation and employee-involvement practices. Wood and de Menezes (2008) found that management’s orientation towards the involvement and development of employees can be more significant than any specific practice. Variable pay and high-involvement management in conjunction with total quality management (TQM) were found to contribute to productivity.

Motivation-enhancing bundles were found to be significantly linked with performance in a study involving 150 manufacturing companies (Bello-Pintado, 2015).

Through a meta-analysis of 92 recent studies, Combs et al (2006) found associations between HRM practices and performance in terms of an increase in return on assets and decrease in turnover. Recent publications have focused on the role of organisational learning and leadership style in achieving high performance and innovation (Vargas, 2015), the relationship of performance and innovation in non-profit firms (Chen et al, 2016) and the impact of innovation and performance on the capital structure (Nosheen et al, 2016)⁸.

The literature above used a variety of variables to analyse the relationship between innovation and HRM practices, work organisation practices and performance.

With regard to HRM and work organisation, a great emphasis has been placed on practices that lead to superior organisation performance. The literature revealed that combinations of work organisation and HRM practices can contribute to better organisational performance. Research also indicates that certain HRM or work organisation practices are better able to boost innovation.

Very little research has been undertaken to establish a link between innovation and well-being. One example is the National Endowment for Science Technology and the Arts (NESTA) project to create an innovation index for the UK (see Dolan et al, 2008, for a review). Miller et al (2008) state that ‘the idea of well-being as both an input to and outcome from innovation is both naturally appealing and supported by a great deal of indirect evidence’.

A study (Vandenberg et al, 1999) of North American insurance companies found a connection between high-involvement practices and good well-being outcomes. The authors found that organisational practices linked with high involvement of employees and organisational effectiveness can follow two paths:

- the motivational path, which increases employee satisfaction through involvement
- the cognitive path, through which employee high-involvement practices make use of their skills and abilities.

High-involvement practices act positively through motivational and cognitive paths. Furthermore, Mackie et al (2001) found benefits of high-involvement practices in US healthcare sites for employee mental health. Similarly, Macky and Boxall’s research (2008) found that workers in companies using-high involvement practices were more satisfied with autonomy and communication.

8 ‘Capital structure’ is how a company finances its assets.

3 | **Setting the scene: Innovation in EU establishments**

3 Setting the scene: Innovation in EU establishments

This chapter provides an overview of reported innovations across EU Member States and investigates (bivariate) links between innovation, establishment characteristics, sectors, characteristics of the workforce and selected workplace practices. Chapter 4 analyses whether these links remain significant after controlling for other impact factors.

Innovation across the EU

Across the EU28, more than half of the establishments (55%) reported changes in marketing, products/services or processes during the period 2010–2013. According to Eurostat (2016), the proportion of innovative enterprises over this time frame decreased compared with the period 2008–2010.

Table 2 provides an illustration of innovation across EU Member States between 2010 and 2013. The highest prevalence of change overall was reported in Denmark (75% of establishments reported change), followed by Malta and Greece (both 67%). The lowest percentages were in the Czech Republic (41%) and Hungary (43%).

On average in the EU, product innovation was the most frequent type of innovation (reported by 40% of establishments), followed by process innovation (35%). The least frequently reported was innovation in

marketing (32%) (Figure 3). Establishments in Lithuania (43%) and Finland (45%) most often reported innovations in processes (Table 2).

The analysis of innovation intensity at the workplace level in the EU Member States indicates that change in products and processes is reported mostly in Portugal (51% of establishments report product innovation and 47% report process innovation), Greece (54% and 50% respectively) and Denmark (55% and 52%). The highest proportion of establishments reporting innovations in marketing is found in Luxembourg (47%), Malta and Romania (both 48%).

Certain countries, including Austria, Denmark, Luxembourg and Sweden, feature both among the ‘innovation leaders’ of the EIS 2015 and at the top of the ECS innovation rankings. However, some countries that rank as ‘moderate’ innovators in the EIS 2015 innovators also rank quite high in the ECS 2013 dataset. This is largely due to the fact that the ECS 2013 captured the introduction of new or significantly changed products and processes, as well as marketing and any organisational changes that were *new to the firm* and not necessarily *new to the market or the world*. The effect of this inclusion appears to be quite significant and thus results in a different ranking of countries.

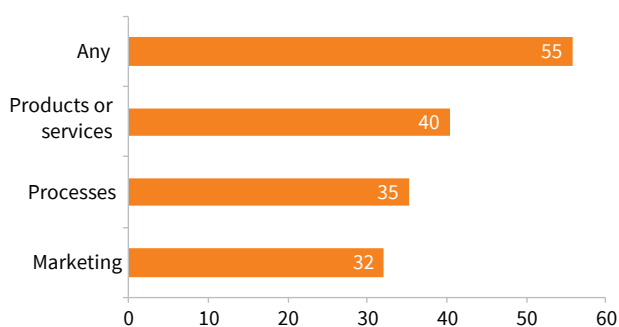
Table 2: Changes within the three years preceding the survey, by country (%)

	Marketing	Products	Processes	Any change
Czech Republic	21	31	21	41
Hungary	16	33	27	43
Slovakia	24	31	29	46
Latvia	26	34	28	47
Estonia	21	37	32	50
Croatia	36	32	23	51
Germany	28	33	31	51
Lithuania	21	42	43	54
France	33	41	32	54
Poland	30	42	35	54
Belgium	31	39	31	55
UK	35	38	31	55
EU28	32	40	35	55
Ireland	35	39	30	57
Slovenia	33	45	33	58

	Marketing	Products	Processes	Any change
Spain	36	45	43	59
Netherlands	35	43	35	60
Italy	32	45	41	60
Bulgaria	35	45	37	60
Finland	31	36	45	61
Sweden	33	42	35	62
Romania	48	48	37	63
Austria	33	46	42	64
Cyprus	37	44	43	65
Luxembourg	47	45	38	65
Portugal	40	51	47	66
Greece	36	54	50	67
Malta	48	46	41	67
Denmark	47	54	52	75

Source: ECS 2013 – Management questionnaire

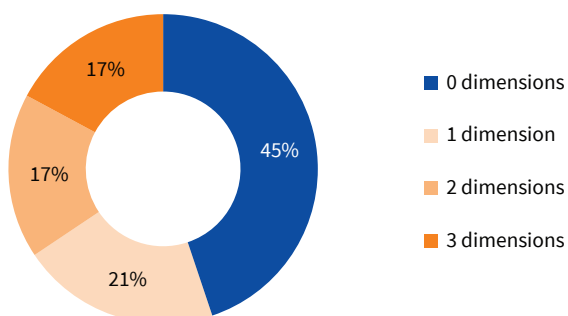
Figure 3: Innovations in EU establishments (%)



Source: ECS 2013 – Management questionnaire

Nearly 2 in 10 EU establishments (17%) reported innovations in all three dimensions, while 21% implemented innovation in only one of the dimensions. However, 45% of the establishments did not introduce any significant renewals or innovation at all (Figure 4).

Figure 4: Innovations in multiple dimensions (%)

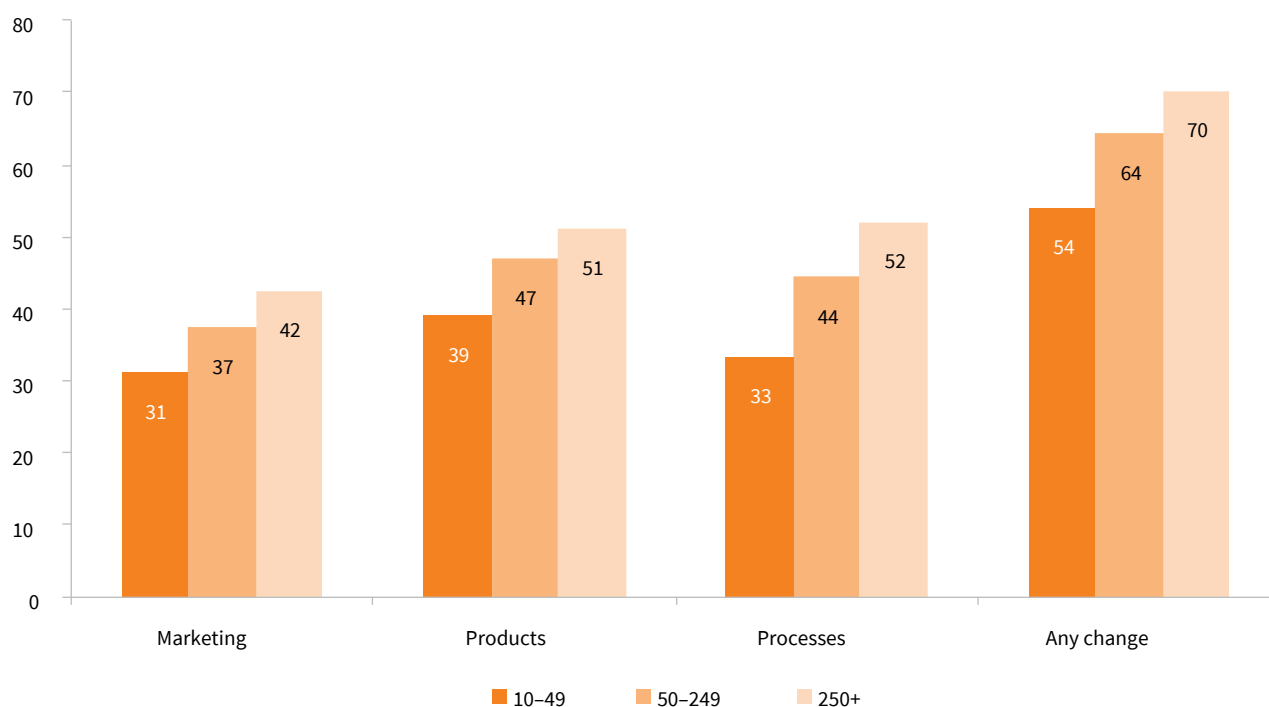


Source: ECS 2013 – Management questionnaire

Further analysis focuses on companies in which innovation was reported. The following chapters examine the key characteristics of these companies and assess whether they differ from those that did not report innovation at all. What are the main drivers of innovation and how do they relate to particular work practices? What are the associations of performance and well-being with innovation?

Establishment characteristics

In most sectors, small establishments are less likely to implement innovations than larger firms due to limited resources and information (Murphy, 2002). Small establishments are, however, likely to be more informal and flexible, and may constantly change practices according to context. Still, it can also be observed in the ECS data that innovation generally is more probable the larger the establishment is. Around 7 in 10 companies with 250 or more employees implemented some kind of innovation in the three years preceding the survey. The same holds for only 54% of small establishments with 10–49 employees. The most prevalent innovation type in small, and in medium-sized, establishments was product innovation (39% and 47% respectively), while the most common type of innovation in large establishments was process-oriented innovation. Marketing innovations were the least prevalent in all three sizes of establishment (Figure 5).

Figure 5: Innovations by establishment size (number of employees)


Source: ECS 2013 – Management questionnaire

Sectors

In line with the ECS overview report (Eurofound, 2015), sectors of economic activity have been summarised into six broad categories. These categories are: construction, industry, commerce and hospitality, transport, financial services and other (business- and administration-related) services. The biggest sectors EU-wide are commerce and hospitality (30% of establishments belong to these sectors), followed by industry (27%) and other services (23%), while the remaining sectors count for less than 10% each. There is a considerable difference in the prevalence of different sectors across the EU Member States (Eurofound 2015, p. 20).

Table 3 shows the proportion of establishments in each sector that had implemented innovations in the three dimensions as well as overall. Innovations in general took place in around 40% of establishments in the construction and the transport sector (with changes across the single dimensions of less than 30% of establishments in the sector). A majority of establishments in all other sectors reported innovations in at least one dimension. The most common innovations reported in the financial services sectors were in processes. In contrast, product or services innovations were the most frequent type in the commerce and hospitality sector (reported in 45% of establishments), the industry sector (43%) and the other services sector (42%).

Table 3: Innovations in the three years preceding the survey, by sector (%)

Sector	Marketing	Products	Processes	Any
Construction	22	25	25	40
Transport	22	27	29	42
Financial services	30	35	38	53
Other services	34	42	36	57
Industry	29	43	41	59
Commerce and hospitality	40	45	33	60
Average	32	40	35	56

Source: ECS 2013 – Management questionnaire

Characteristics of the workforce

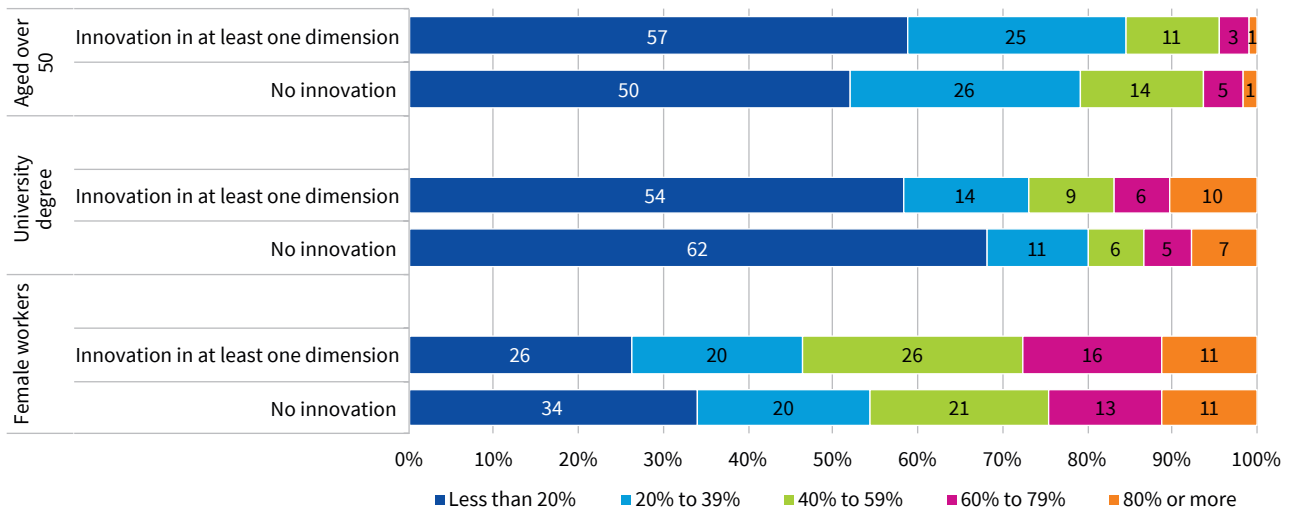
The ECS 2013 captured three key structural characteristics of the workforce in each of the establishments: gender, age and education. More specifically, it asked about the proportion of workers in the following groups: women; those aged over 50 years of age; and those holding a university degree. The results show huge variations between Member States, the composition of the workforce appearing to be influenced by the availability of incentives to recruit specific groups.

Figure 6 compares the structure of the workforce in establishments where innovation was reported with the structure of the workforce in establishments that did not report any innovation. Differences are most obvious in terms of level of education: in more than two-thirds

of establishments with no innovation, the proportion of employees with a university degree was below 20%. In only one-half of establishments that had implemented innovations was this the case. At least three in five employees held a university degree in 16% of innovative establishments; in establishments without innovations, the equivalent figure was just 12%.

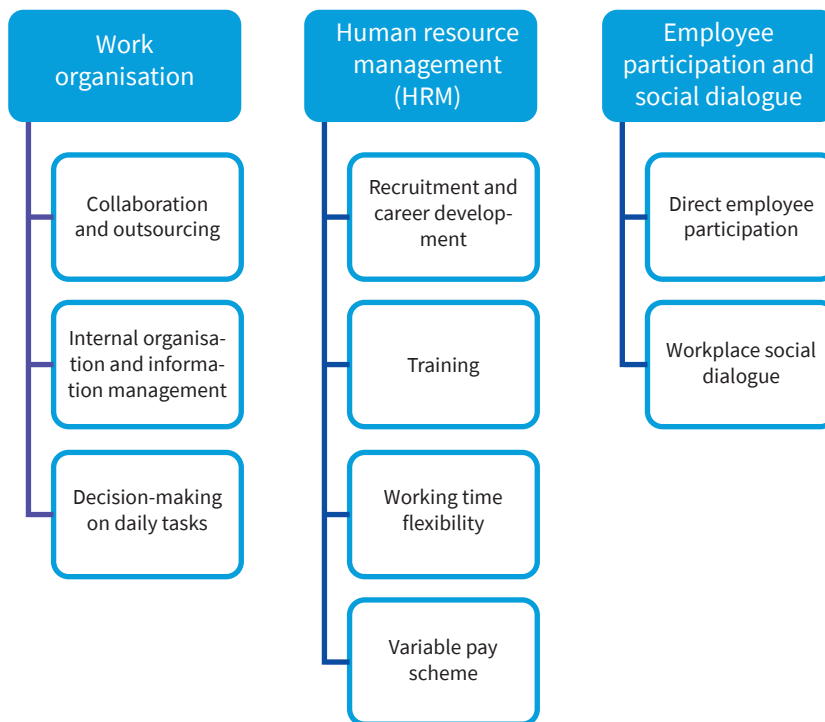
The differences between innovative and non-innovative establishments are also quite pronounced regarding gender and age. The workforce in innovative companies tends to be younger and have a higher proportion of women than establishments that are not innovative. In more than one-third of establishments without innovation, the proportion of female workers was below 20%; this was true for only 26% of establishments in which innovation was reported.

Figure 6: Percentage of women, older workers and workers with university degree by use of innovation (%)



Source: ECS 2013 – Management questionnaire

Figure 7: Main thematic fields and subdimensions of ECS data



Source: Eurofound (2015)

Workplace practices in changing environments

In the ECS overview report (Eurofound, 2015), latent cluster analysis identified patterns behind the main thematic fields of the survey and their subdimensions (Figure 7).

This process made it possible to place establishments in five distinct groups on the basis of their practices in terms of work organisation, HRM and employee participation.

Innovative establishments differ in many ways from those that did not report any innovations – not only in terms of structural characteristics but also regarding the workplace practices in place.

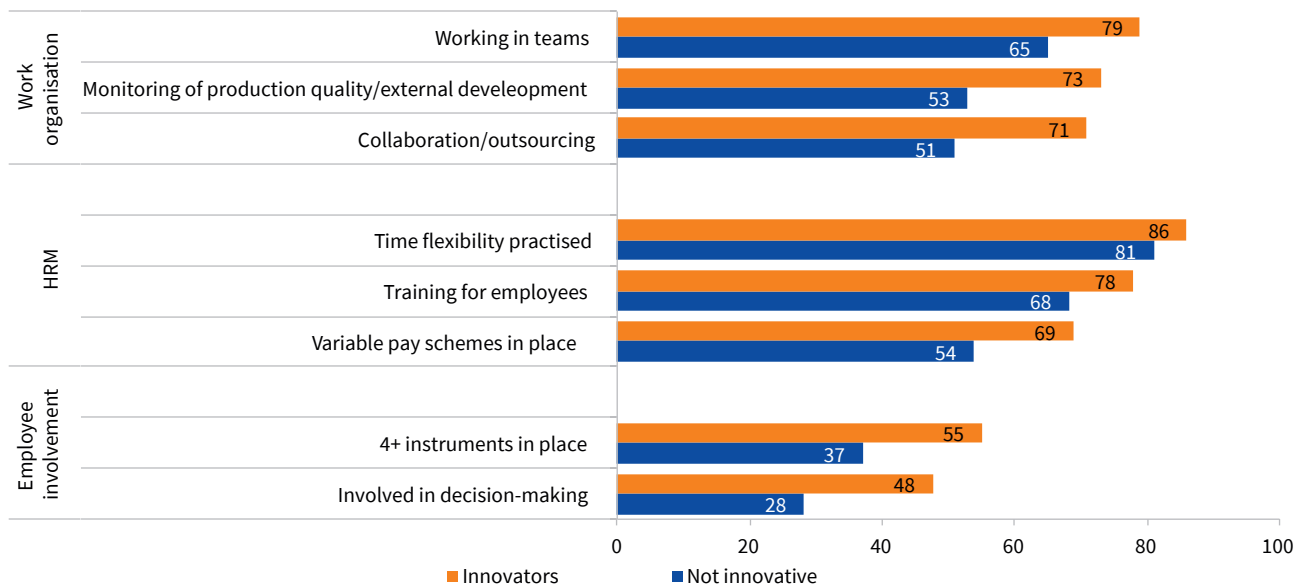
Figure 8 shows differences between the innovative and non-innovative establishments in selected practices across the three areas: work organisation, HRM and employee involvement. The data show that 79% of innovative establishments organised work in teams compared with 65% of non-innovative establishments. The quality of production and/or external developments are monitored in 73% of establishments that reported innovations and just 53% where no innovations were reported. Collaboration and/or outsourcing are also much more likely in establishments reporting innovation

than in establishments which have not introduced innovation.

In terms of HRM practices, there is only a little difference between both types regarding working time flexibility measures. Distinctions are more pronounced when it comes to training for employees and variable pay schemes.

Lastly, direct employee participation is much more frequent in innovative establishments: 48% involve their employees in decision-making processes by consultation or joint decision-taking. This is the case in only 28% of establishments in the non-innovative group. Four or more instruments of employee involvement – such as employee surveys, staff meetings and suggestion boxes – are in place in 55% of establishments where innovations were reported compared with 37% of those where no innovations took place.

Figure 8: Selected practices in establishments



Source: ECS 2013 – Management questionnaire

For the purpose of this report, since the main focus is on the relationship of these work practices and innovation, combined measures were constructed for each of the three thematic fields: work organisation, HRM and direct employee participation⁹.

- The index of work organisation comprises practices of collaboration and outsourcing, monitoring of production quality and external developments department structures and the degree of work autonomy and teamwork
- The HRM index combines provision of training to employees, variable pay structures and working time flexibility
- The employee involvement index synthesises information on direct employee participation in the decision-making process and the instruments applied to support it.

Furthermore, combined practices of the three thematic fields were computed in order to analyse their joint implementation. All indices were transformed into a range between 0 (which indicates that none of the practices in place) and 10 (all practices are implemented).

Table 4 provides a breakdown of all three types of bundles implemented in the establishments by structural characteristics (such as age, size and type) and compares establishments that reported innovation with those that did not. The scores for all three bundles are higher in establishments where change was reported than in the reference group.

With regard to the innovative establishments, mean values of workplace practice bundles are overall higher in large organisations than in small or medium-sized establishments. It is also no surprise that subsidiary sites and headquarters are more likely to implement strong workplace practice bundles than single establishments.

⁹ See Annex 1 for a more detailed explanation.

Table 4: Bundles of workplace practices (average score out of 10)

	Work organisation bundle		HRM bundle		Employee involvement bundle	
	Innovations implemented					
	no	yes	no	yes	no	yes
Type						
Single establishment	3.9	4.7	3.0	3.7	3.8	5.1
Headquarters	4.5	5.3	3.5	4.3	4.4	5.6
Subsidiary site	4.3	4.9	3.4	4.4	4.7	5.8
Size (number of employees)						
10–49	4.0	4.8	3.0	3.7	3.8	5.1
50–249	4.3	5.0	3.6	4.4	4.6	5.7
250+	4.3	5.2	4.0	4.8	5.2	6.1
Sector						
Industry	4.0	4.7	3.0	3.7	3.7	5.0
Construction	3.5	4.3	3.1	3.7	3.7	5.0
Commerce and hospitality	4.2	4.7	3.0	3.9	3.8	5.0
Transport	3.7	4.7	2.8	3.7	3.8	5.4
Financial services	4.3	5.5	3.5	4.6	4.3	5.7
Other services	4.3	5.3	3.3	4.1	4.3	5.7
Operating since						
Less than 2 years	3.8	4.8	3.1	3.9	4.1	4.9
2–9 years	4.0	4.8	3.2	3.9	4.1	5.3
10–49 years	4.0	4.8	3.1	3.8	3.9	5.2
50 years or more	4.3	5.1	3.1	3.9	4.0	5.3
Structural changes						
Organisational change	4.4	5.1	3.5	4.2	4.8	5.8
Change in technology	4.4	5.0	3.5	4.1	5.4	6.0
Overall	4.0	4.9	3.1	3.9	3.9	5.2

Source: ECS 2013 – Management questionnaire

With regard to industry sectors, the financial services sector and the other services sector score higher in all bundles than the other sectors. Interestingly, length of operation of establishment is not significant when it comes to the implementation of workplace practices. There are no significant differences between establishments that have been operating for less than two years and those operating for longer.

Country differences

Large differences between countries are noted in the occurrence of workplace practices and, as a consequence, in the mean values of the bundles presented in Figure 9, which compares innovative with non-innovative establishments across countries. Taking into account innovative organisations only, mean scores in the work organisation bundle vary from 4.0 in Slovakia, followed by Czech Republic and Romania (both 4.4), France and Croatia (both 4.5) to a high of 7.0 in Finland, followed by

Sweden (6.6), Austria and Denmark (both 6.3). A similar range of variation is observed for the other bundles: the mean value for HRM ranges from 2.7 in Greece to 5.3 in Finland, followed by the Czech Republic and Slovakia (both 5.1). Finally, direct employee involvement is weakest among innovative establishments in Croatia, Italy (both 4.5) and Portugal (4.7) and strongest in Sweden (6.8), Finland (6.4), Austria and Denmark (both 6.2).

It can be concluded from these figures that the three bundles are not necessarily interrelated. Some countries – for example, the Czech Republic and Slovakia – have weak work organisation but apply strong measures of HRM. The strongest correlations overall were found between the HRM and the direct employee involvement bundles, as is discussed later in this report.

A summary of the extent of innovation reported by establishments involving employees in decision-making is provided diagrammatically in Figure 10.

Figure 9: Workplace practices by countries (average score out of 10)

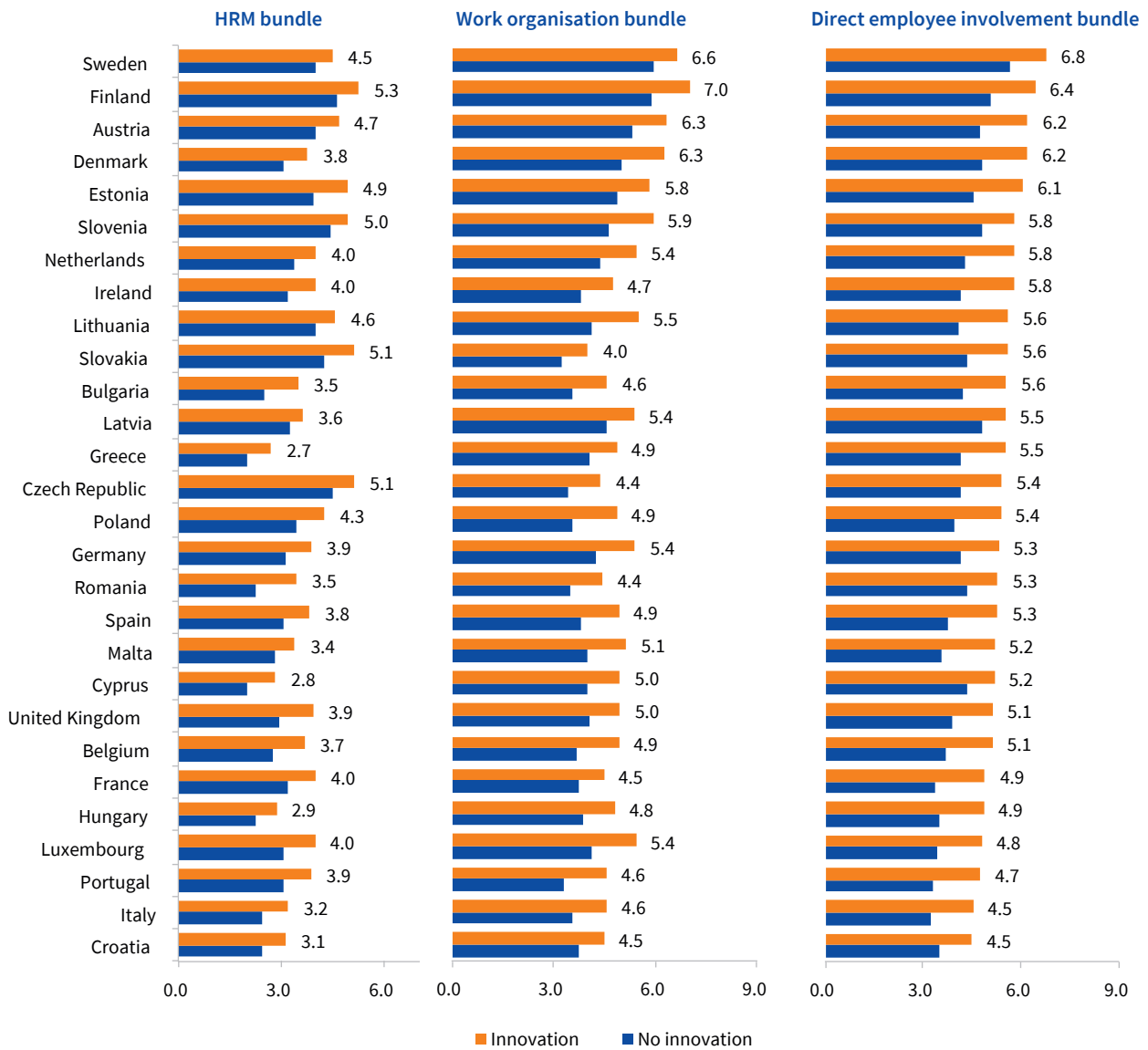
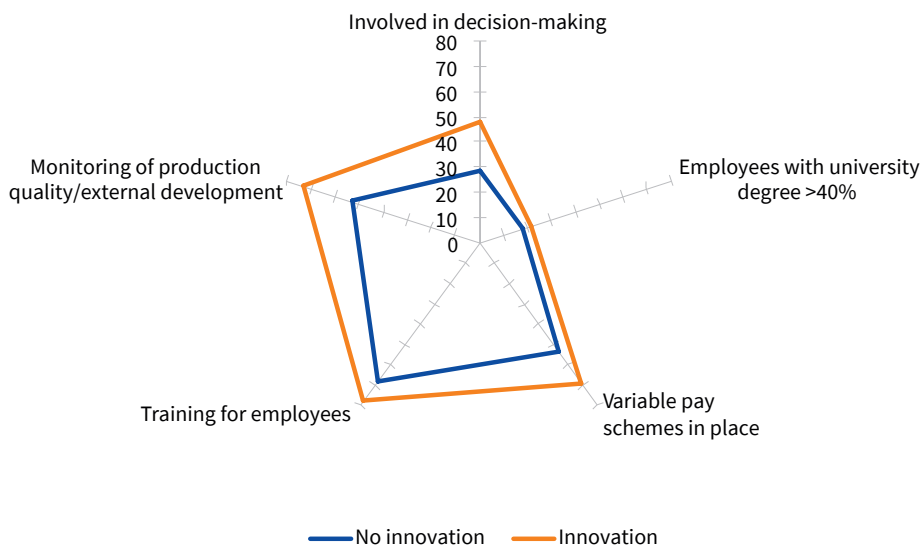


Figure 10: Summary of innovating establishments in EU28, 2013 (%)



SUMMARY

Innovation in EU establishments

In the European context and the Europe 2020 strategy, innovation is seen as a way to achieve smart, sustainable and inclusive growth. Innovation is considered essential to preserve and improve Europe's competitiveness and its ability to create jobs and to tackle societal challenges (European Commission, 2014). For that reason, the Innovation Union initiative – as part of the Europe 2020 strategy – aims to improve Europe's capacity to innovate.

Across the EU28, more than half (56%) of the establishments reported innovations in products and services, marketing strategies or processes during the period 2010–2013. On average in the EU, product innovation was the most frequent type of innovation (in 40% of establishments), followed by innovative processes (35%) and marketing (32%). There is a huge range between countries, varying from reported innovation in 41% of establishments in the Czech Republic to 75% in Denmark.

Innovation was reported in around 40% of establishments in the construction and the transport sectors (with changes across the single dimensions of less than 30%). In contrast, around 60% of establishments in the commerce and hospitality and industry sectors reported innovation.

Around 7 in 10 large companies (250+ employees) implemented some kind of innovation in the three years preceding the survey. This compares with only 54% of small establishments (10–49 employees).

Differences were also seen in the characteristics of the workforce. In 16% of innovative establishments, at least three out of five employees held a university degree; this was the case in just 12% of establishments without innovations.

Some 79% of innovative establishments organised work in teams, compared with 65% of non-innovative establishments. External ideas and/or the internal quality of production quality are monitored by 73% of innovative and 53% of non-innovative establishments. Training and variable pay schemes are more likely to be provided by establishments that report innovation than by those that do not. Furthermore, companies reporting innovation are more likely to involve their employees in decision-making and to encourage direct employee participation.

4 | Methodology

4 | Methodology

This chapter outlines the methodology of the quantitative analysis carried out to trace the links between workplace practices and innovation, performance and workplace well-being. The literature review presented in Chapter 2 and insights from the ECS overview report (Eurofound, 2015) provided input for the selection and modification of the models used. The ECS 2013 dataset is used for this analysis which, as a first step, develops four multivariate models in order to estimate the effects of workplace practices (and combinations of practices) on the overall probability of innovation in the establishment.

- Model 1 considers structural characteristics of the establishment only.
- Model 2 includes workplace practices, controlling for structural establishment characteristics.
- Model 3 replaces single items by bundles of workplace practices to estimate their effects as a whole.
- Model 4 looks at the configurations of these bundles keeping other factors equal.

Next, the impact of workplace practices and their combinations on other outcome measures is tested with several ordinary least square (OLS) regressions. Two models are run.

- Model 5 looks at the impact of bundles of workplace practices on performance (model 5.1) and well-being (model 5.2), controlling for structural establishment characteristics.
- Model 6 focuses on the role of social dialogue, controlling for structural characteristics and bundles of workplace practices.

Bundles of practices

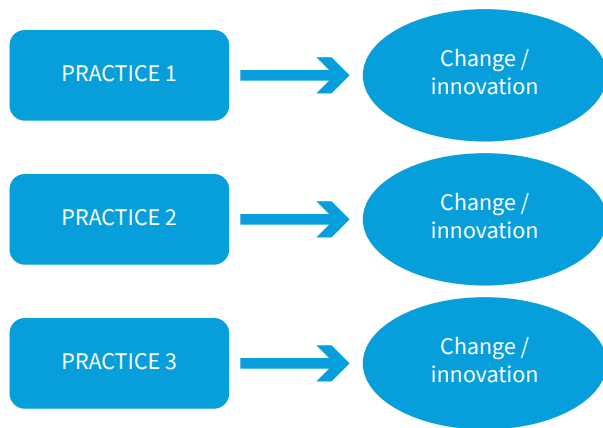
In this study, the primary interest was in the relationship of innovation to certain characteristics of work organisation, HRM practices and social dialogue. Of secondary interest was the analysis of the impact of workplace practices on performance and workplace well-being and an examination of the mediating role of social dialogue. To that end, multivariate logistic and linear regressions were applied.

Bivariate analyses show which characteristics of establishments – for example, in terms of work organisation or demographic information – are associated with innovation. However, these analyses do not help us to understand whether these associations are significantly linked to innovation after controlling for other influential factors. This can be done by applying regression methods, which show how well each factor predicts innovation, while controlling for other factors. The main results of the

regressions are estimates of the difference a certain factor makes, after controlling for all other factors. Once the model is developed, the same set of variables is used in all regressions¹⁰.

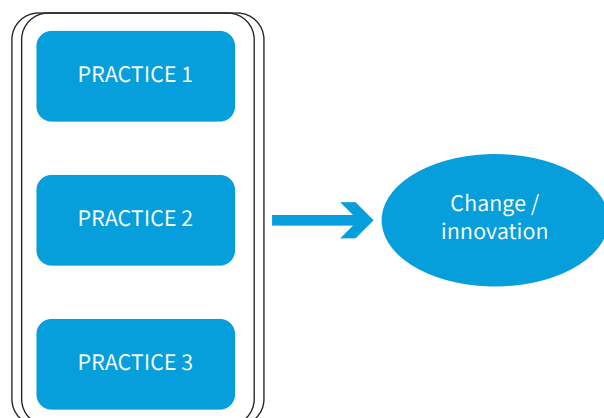
For the analysis it is important to examine single practices, the interrelationships and bundling of practices and, most importantly, the interaction between practices. Seen in isolation, individual practices may appear to have a stronger or weaker link with change and innovation (Figure 11).

Figure 11: Schematic illustration of individual practices linked with innovation (Model 2)



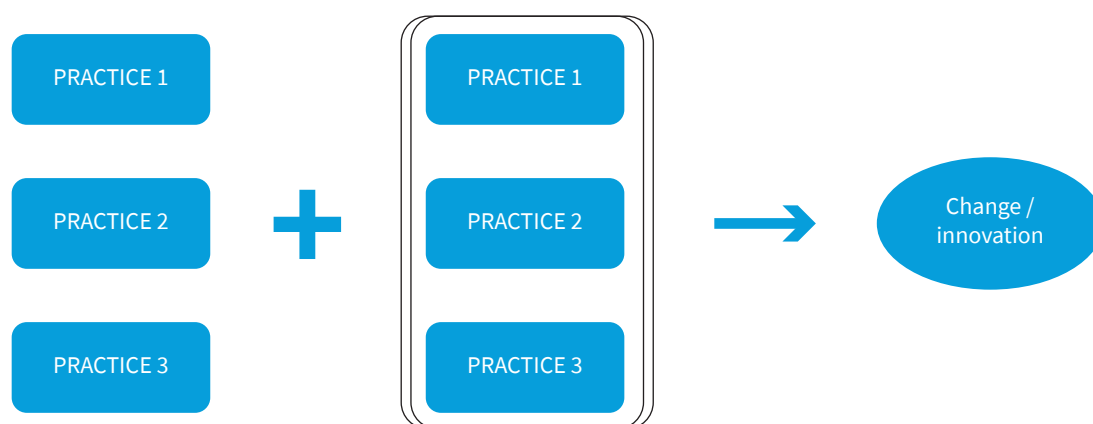
Much of the literature shows that there are positive links between individual practices and innovation; however, there is a variety of practices examined in different studies. Sometimes, selecting ad hoc practices in a random way may also be found to be linked with performance and innovation. This makes it difficult to draw conclusions about the impacts. However, looking at a group of practices together in a bundle (or set) may provide a better appreciation of their links with innovation (Figure 12).

Figure 12: Schematic illustration of bundles of practices linked with innovation (Model 3)



10 For further information, see Annex 1.

Figure 13: Schematic illustration of individual practices and their bundles used in the analysis (model 4)



Even this approach has its own limitations. A reasonable question would then be: which set or bundle is better suited to, or more closely linked with, innovation? By taking into account their configurations the effect becomes more meaningful. These configurations comprise the individual practices and the interaction of the bundles. This is the approach this research takes (Figure 13).

Model specification – measures

Innovation

The dependent variable of Models 1–4 (see below) is measured as the proportion of establishments that – in the three years preceding the interview – reported significant changes in any or all of the following:

- products/services
- processes
- marketing strategies.

Organisational change was not included in this variable as this type of change can be thought of as an intermediate step in reaching innovation goals and is different in nature from the types of change included. The key concept of innovation in this report refers to products, processes and marketing strategies that are new to the firm rather than new to the market.

Performance and workplace well-being

Models 5 and 6 (see below) use two further outcome measures as dependant variables:

- economic performance (level of performance/direction of development)
- workplace well-being.

Economic performance – the performance index – is composed of measures (a) of the establishment’s current financial situation and (b) of changes in its financial situation, labour productivity and production volume in the three years preceding the survey (Eurofound, 2015).

Two aspects interpreted as proxies of workplace well-being were contained in the ECS dataset, forming the workplace well-being index:

- work climate
- (absence of) human resource problems.

In particular, a high degree of sickness absence was considered to indicate physical or mental health issues among employees in the establishment. Similarly, reported difficulties in retaining employees were read as an indicator of challenging working conditions. Finally, the overview report (Eurofound, 2015) took managers’ perceptions of poor employee motivation and a poor or deteriorating work climate to represent negative aspects of the well-being of employees at work.

This information was condensed into two indices, which were subsequently transformed to range between 0 and 100. The measure of workplace well-being was constructed by ‘taking the average scores on the items on work climate, change in work climate, problems with employee retention, problems with poor employee motivation and problems with high sick leave’ (Eurofound 2015, p.30). The establishment performance index was constructed by taking the average of the standardised scores of the four items described above (work climate, employee retention, employee motivation and sick leave).

Table 5 lists the main descriptive statistics of all items used for measuring establishment performance, workplace well-being and social dialogue. (See above for the measures comprising the performance and well-being indices).

Workplace practices, bundles and interactions

In the ECS 2013 overview report (Eurofound, 2015), latent class analyses identified patterns behind the main thematic fields of the survey (work organisation, HRM, direct employee participation and social dialogue) and their subdimensions. This process made it possible to classify a large variety of combinations of practices across individual establishments into a few types of establishments with certain distinct characteristics.

The selection of the set of workplace practice variables built on this framework. The choices made were simultaneously based on existing empirical literature and the derived hypothesis (see above). For the purpose of this report, where the particular interest is in the relationship between these work practices and reported innovation, combined measures for each of the three thematic fields were also constructed: work organisation, HRM and direct employee involvement (described in Chapter 3). All indices were subsequently transformed such that they range between 0 and 10.

Social dialogue

Social dialogue variables are based on interviews with both management and employee representatives, and can thus be analysed on the basis of a limited number of cases only. Variables roughly measuring this dimension include synthetic measures and single items¹¹. Three of the indices used for social dialogue – available resources, available information and employee representative influence in the decision-making process – were developed in the overview report (Eurofound, 2015). Occurrence of industrial action is taken as a proxy for conflictual industrial relations, whereas harmonious social dialogue is reflected in the level of mutual trust.

Control variables

The approach controls for company-specific characteristics and external factors that might either influence the establishment's level of innovation directly or may result in an over- or underestimation of links between workplace practices and innovation. Variables prone to introduce bias – such as the sex or role of the respondent – were also controlled for. A total of 12 control variables are included.

First, the establishment size is included, taking into consideration that larger organisations may be more innovative than small firms (Watson et al, 2009). Firms that are part of a larger entity may have access to more resources and might have a greater ability to innovate. Hence, a dummy variable is included if the firm is a

single establishment (rather than a subsidiary site or headquarters) (see Tsai, 2001; Hansen, 2002).

Another aspect of an establishment's organisational structure is the number of its hierarchical levels. Hierarchy can be seen as antithetical to employee involvement and may thus provide a barrier to innovative behaviour (Spitzer, 2015). Furthermore a measure that captures increases or decreases in the number of employees between 2010 and 2013 is included. The hypothesis could go in both directions: establishments that had to reduce their workforces are under pressure to innovate in order to remain competitive. On the other hand, an increasing number of staff may be an indication of enhanced innovation and business growth (Pianta, 2004).

Gender and age structures of employees are further aspects to be considered (Batt, 2002). Gender diversity is measured by the proportion of female employees, while age structure is measured as the percentage of employees aged 50 or older.

A full set of country dummies is used in all models, controlling for any eventual country variations such as differences in the economic situation or different innovation policies. One of the benefits of the ECS is that it provides harmonised information on all EU Member States.

Differences are also expected between different sectors. Establishments in particular sectors may face different technological possibilities. In line with the overview report (Eurofound, 2015), sectors of economic activity have been summarised into six broad categories.

Models 1–4

The inclusion of predictor variables was driven by the analyses of the overview report (Eurofound, 2015) and the literature on determinants of innovation (Chapter 3). The overview report structured the findings from the ECS 2013 along three main thematic fields: work organisation; HRM management; and employee participation.

Several logistic regression models are run and marginal effects are shown with the aim of identifying predictors of innovation and explaining the observed patterns. As discussed above, innovation is analysed to show the probability of change in any of the three areas (marketing, products and processes). At the same time, all models for all three kinds of change are run and can hence identify particular patterns in each of these.

Table 5 gives an overview of the variables that were used in the models in each of the dimensions.

11 See Annex 1.

Table 5: Overview of variables per dimension – Models 1–4

Thematic fields	Model 1	Model 2	Model 3	Model 4
	Establishment demographics	Single dimensional items	Substitution of single items by bundles	Single dimensional items + configurations
Establishment information	Size of establishment	Size of establishment	Size of establishment	Size of establishment
	Establishment type	Establishment type	Establishment type	Establishment type
	Sector of industry	Sector of industry	Sector of industry	Sector of industry
	Increase/decrease in employment (2010–2013)	Increase/decrease in employment (2010–2013)	Increase/decrease in employment (2010–2013)	Increase/decrease in employment (2010–2013)
	Number of hierarchical levels	Number of hierarchical levels	Number of hierarchical levels	Number of hierarchical levels
	% of female employees	% of female employees	% of female employees	% of female employees
	% of workers age 50 or over	% of workers age 50 or over	% of workers age 50 or over	% of workers age 50 or over
	Organisational change	Organisational change	Organisational change	Organisational change
Work organisation		Collaboration and/or outsourcing	Work organisation bundle (scale 0–10)	Collaboration
		Monitoring of internal quality/external ideas		Number of monitoring instruments (3)
		Department structure		Department structure
		Job rotation		Job rotation
		Autonomous teams/task autonomy		Autonomous teams/task autonomy
Interaction				HRM–work organisation configuration
HRM		Human capital	Human capital	Human capital
		Perceived need to reduce staff	HRM bundle (scale 0–10)	Perceived need to reduce staff
		On-the-job / paid time off		On-the-job / paid-time off
		Flexi-time / accumulation of overtime		Flexi-time / accumulation
		No. of variable pay instruments		No. of variable pay instruments
Interaction				HRM–employee involvement configuration
Direct employee participation		Employee involvement in decision-making	Employee involvement bundle (scale 0–10)	Employee involvement in decision-making
		Number of employee involvement instruments used		Number of employee involvement instruments used
Interaction				Work organisation–employee involvement configuration

Thematic fields	Model 1	Model 2	Model 3	Model 4
	Establishment demographics	Single dimensional items	Substitution of single items by bundles	Single dimensional items + configurations
Social dialogue	Employee representation structure	Employee representation structure	Employee representation structure	Employee representation structure
Controls	Sex of respondent	Sex of respondent	Sex of respondent	Sex of respondent
	Role of respondent (owner, HR manager, other)	Role of respondent (owner, HR manager, other)	Role of respondent (owner, HR manager, other)	Role of respondent (owner, HR manager, other)
	Country dummies	Country dummies	Country dummies	Country dummies

Model 1 considers only core establishment information such as size and sector, place of operation and workforce characteristics. Model 2 keeps the demographic variables and includes further variables that were identified as highly important for the three dimensions, as outlined above. Model 3 replaces the individual items of Model 2 with bundles for each of the dimensions in order to explore the explanatory power of condensed workplace practices. Single items of Model 2 were kept if they were not part of the bundles. Also following Model 2, Model 4 includes measures of combined practices (HRM/work organisation, HRM/direct employee participation, work organisation/direct employee participation) to examine whether the overall explanatory power can be increased by taking into account specific strategic decisions on combinations of work practices.

Models 5 and 6

Models 5 and 6 test the impact of workplace practices on performance and workplace well-being. Workplace practices/bundles as tested in Models 2–4 are included in Models 5 and 6. Finally, the component of social dialogue is introduced and its association with outcomes. A number of questions are addressed.

- To what extent does the employee representative influence decision-making linked with company outcomes (in terms of performance and workplace well-being)?
- What is the role of mutual trust between managers and employee representatives in this process?
- What are the impacts of conflictual relationships?

OLS regressions on performance and workplace well-being were developed and tested to investigate whether the effects of implementing specific workplace practices and their combinations are statistically significant. Two models were run as explained above

Limitations

Data on change in establishments were collected in order to assess the extent to which they used different combinations of workplace practices and whether change was a feature that characterised certain types of workplaces. The overall theme of the ECS 2013 was workplace innovation. Therefore, as mentioned earlier, the *Oslo Manual* definition of innovation was adopted (excluding organisational change). For this reason, and as space was limited, the questionnaire could not fully cover the complex nature of innovation. Innovation studies usually include detailed measures of outputs, such as increase in sales as a proportion of the total turnover, exports, revenues and productivity. Furthermore, the data capturing increase in volume of products or services do not differentiate between new (as a result of the innovation) and old products or services.

The results are constrained by the types of questions used in the ECS 2013 and by missing responses to some questions. As explained in the introductory part of this report, the ECS was not originally designed to analyse innovation. The survey questions ask whether change had been implemented in the three years preceding the survey (2010–2013). Other types of change, such as changes in technology or HRM practices, could have happened before or after the introduction of new products, marketing strategies or processes. For this reason, these variables are not included in the models as it is supposed that change in one area cannot be explained with change in another but rather might happen concomitantly. The same holds for workplace practices in general which might have been in place since the foundation of the establishment or been introduced a month before the survey. Hence, it is not possible to draw conclusions of any causal nature and only significant associations and relationships can be indicated.

Naturally, as with all ex-post constructs, the measures of well-being and performance used in the analysis have their limits. First of all, an index of well-being (as used in Eurofound (2015) and in this report) is based on information given by the management side alone. However, the notion of workplace well-being is often associated with individual experiences (Barrios-Choplin et al, 1997; Thompson and Bates, 2009; Roche and Rolley, 2011; Anitha, 2014). The term used in the Sixth European Working Conditions Survey, was ‘job quality’, taking into account the workers’ perspective (Eurofound, 2016b). Notwithstanding these limitations and for reasons of

consistency, this report uses the same terminology as Eurofound (2015). As the analysis shows, all the performance measures turned out to be useful in the analysis of establishment structures and in identifying practices that are associated with performance. For instance, it was shown that establishments that were classified as ‘systematic and involving’ and as ‘interactive and involving’ scored significantly higher in the performance index than other types of establishments. The latter also scored highest in the well-being index (Eurofound, 2015, p. 128).

5 | Results of the analysis

5 | Results of the analysis

Patterns of innovation in terms of structural characteristics were discussed in Chapter 3. This chapter aims to explain which practices are significantly associated with change in establishments. This provides some answers to the question about which organisational structure in establishments promotes a tendency to implement innovations in their various forms. It also helps in identifying best practices and priority areas for business and innovation policies.

The second part of this chapter is dedicated to the analysis of how workplace practices/bundles affect performance and workplace well-being, with a particular focus on the role of social dialogue.

Determinants of innovation in establishments

Results: Models 1–4

The main results of Models 1–4 are presented generically below. A thorough discussion of these results is undertaken in Chapter 6. Overall, estimates are robust over the different specifications. Both significant levels and size effects are stable. Hence, the results obtained from the quantitative analysis can be seen as highly robust (Table 6).

Work organisation

Monitoring internal production quality and/or external ideas turned out to be the strongest determinant of overall innovation in the area of work organisation. This variable increases the probability of innovation by 9%, controlling for other influence factors (Model 2). This is the single strongest driver of innovation.

The collaboration and/or outsourcing of production, marketing or development also shows highly significant positive effects for innovation. In terms of the organisation of daily work, both task/job rotation and the degree of autonomy of teams or within tasks is positively linked with innovation at the 0.01 level. Finally, the structure of work organisation also matters. The likelihood of reporting innovation increases by 8% where work and production flow are structured by department (assigned to geographic, functional or product-based tasks).

Departments as organisational units dealing with different types of products/services or with specific geographical areas turned out to have a strong positive influence on change, with marginal effects of 0.09 across the models. Across the various types of innovation, marginal effects were strongest for changes in products/services.

HRM-related measures

Several items were included that relate to HRM-related issues:

- the percentage of employees with access to training
- the number of variable pay instruments in place (maximum of five)¹²
- the option of flexibility in terms of starting and ending time and accumulating overtime
- a focus on skills and human capital (measured as the proportion of employees with a university degree).

Access to training (whether on the job or paid time off for training) was positively linked to innovation in the establishment, with highly significant marginal effects for change overall. The number of variable pay instruments in place was also positively linked with innovation. The more instruments implemented, the higher the probability that change was reported. Exploring each pay instrument individually showed, however, that the association of change overall and variable pay was highly significant only for bonuses. The association of payments by results and overall change was significant only at the 0.05 level and not significant for the other measures.

Finally, an establishment's human capital in terms of skilled employees is an important determinant of change, as expected. Across all models, marginal effects were highly significant, controlling for other factors. There were, however, differences between different types of innovation. The level of skills was significant only for innovation in products/services, and there were no significant associations between human capital and innovation in processes or marketing.

No significant effects were found for working time flexibility and overall innovation. Some weak impact (at the 0.05 level) was, however, identified for working time flexibility on product innovation.

Employee involvement

Evidence is provided for the hypothesis relating direct employee involvement to innovative company behaviour. The number of instruments used for employee involvement (such as regular staff meetings, staff surveys or suggestion boxes) is positively associated with the reporting of overall innovation. The results show that the higher the number of instruments in place, the greater the probability of change being reported.

Furthermore, direct involvement of employees in terms of consultation or joint decision-making was found to be positively associated with innovation in the establishment.

12 Payment by results; bonuses paid; group performance-based pay; profit-sharing; and share ownership.

Where employees are consulted or take part in joint decisions, the likelihood of innovation rises by 7%, controlling for other influence factors. The presence of a formal employee representation structure, however, is not itself associated with innovation, but is mediated through other variables. Interestingly, Model 3 found no significant association between innovation in products and employee involvement in decision-making.

Change in the organisation

As was explained in Chapter 1, organisational change was not included in the innovation concept used in this report. The main reason is that the ECS focuses on organisational issues. Hence, organisational change must be interpreted in the ECS context as one organisational characteristic. It was thus included as an independent variable. However, the results clearly show tight links between organisational change and reported innovation in products/services, processes and marketing. The likelihood of an establishment reporting innovation in the three areas was, across all models, more than 20% higher in cases where organisational change was implemented. This finding emphasises the nature of change as a process embracing the whole establishment. Where change in one area takes place, the probability of change in other areas increases.

Bundles and interactions

Model 3 replaces single items of practices in the three areas (work organisation, HRM, direct employee involvement) with synthetic bundles (with scales ranging from 0 to

10), thus condensing applied workplace practices to a single measure. This method does not improve the overall explanatory power (pseudo-R² is 18%) but indicates that the likelihood of innovation might be driven by strategic decisions on how to combine common workplace practices. All three bundles are significantly associated with reported innovation, with the strongest marginal effects for the direct employee involvement bundle. A rise in this index of one point increases the probability of change by 3%. The weakest association, at the 0.01 level, was between HRM and innovation. Still, the more measures that were in place or combined, the more likely it was that innovations were implemented in the establishment.

More interesting, however, are the results of Model 4. Measures of configuration/interaction between the various areas were built (ranging from 0 to 10) and their impact was tested together with the single items of Model 2. The inclusion of the configuration slightly increases the explanatory power of Model 2. With a few exceptions, marginal effects of the single practices (including collaboration/outsourcing and training) stay unchanged or even get stronger. Furthermore, strong positive effects from the interaction of work organisation and employee involvement as well as from the HRM and employee involvement can be seen. This suggests that establishments that consider a well-balanced mix of practices in these areas are more likely to innovate. On the other hand, negative effects are produced for the interaction of work organisation and HRM.

Table 6: Marginal effects across models

Variables	Model 1	Model 2	Model 3	Model 4
Organisational change implemented (2010–2013)	0.290***	0.226***	0.234***	0.225***
	(0.00535)	(0.00558)	(0.00559)	(0.00557)
Size: number of employees (Reference: 10–49)				
50–249	0.0290***	-0.00232	0.00574	-0.00242
	(0.00745)	(0.00718)	(0.00720)	(0.00718)
250+	0.0655***	0.0156	0.0264***	0.0150
	(0.0102)	(0.00995)	(0.00991)	(0.00995)
Sector (Reference: Industry)				
Construction	-0.129***	-0.115***	-0.119***	-0.114***
	(0.0115)	(0.0112)	(0.0112)	(0.0112)
Commerce and hospitality	-0.000409	0.00853	-0.00387	0.00945
	(0.00782)	(0.00760)	(0.00758)	(0.00758)
Transport	-0.134***	-0.0943***	-0.113***	-0.0935***
	(0.0119)	(0.0117)	(0.0116)	(0.0117)
Financial services	-0.0687***	-0.0660***	-0.0893***	-0.0668***
	(0.0153)	(0.0148)	(0.0148)	(0.0149)
Business, administration and other services	-0.0483***	-0.0430***	-0.0679***	-0.0433***
	(0.00820)	(0.00820)	(0.00815)	(0.00820)

Variables	Model 1	Model 2	Model 3	Model 4
Establishment type (Reference: Headquarters/subsidiary sites)				
Single establishment	-0.0506*** (0.00668)	-0.0250*** (0.00651)	-0.0269*** (0.00653)	-0.0249*** (0.00651)
Number of hierarchical levels	0.00566** (0.00255)	-0.000768 (0.00144)	0.00107 (0.00167)	-0.000648 (0.00143)
Workforce characteristics				
Proportion of female workers is greater than 20%	0.0483*** (0.00788)	0.0358*** (0.00771)	0.0343*** (0.00772)	0.0355*** (0.00770)
Proportion of workers aged 50+ is greater than 20%	-0.0322*** (0.00698)	-0.0242*** (0.00677)	-0.0233*** (0.00681)	-0.0238*** (0.00677)
Number of employees increased (2010–2013)	0.120*** (0.00686)	0.104*** (0.00669)	0.105*** (0.00675)	0.103*** (0.00670)
Number of employees decreased (2010–2013)	0.00950 (0.00731)	0.00874 (0.00722)	0.0115 (0.00707)	0.0102 (0.00703)
Work organisation practices				
Collaboration and/or outsourcing		0.0535*** (0.00363)		0.0535*** (0.00456)
Monitoring of production quality/external ideas		0.0887*** (0.00627)		0.0894*** (0.00671)
Structured in departments		0.0842*** (0.00794)		0.0848*** (0.00821)
Task/job rotation		0.0320*** (0.00599)		0.0320*** (0.00599)
Autonomous teams/task autonomy		0.0164*** (0.00544)		0.0175** (0.00838)
HRM-related items				
Training in place		0.000437*** (9.75e-05)		0.000459*** (0.000139)
Flexibility measures in place		0.00125 (0.00528)		0.00348 (0.00644)
Variable pay schemes in place		0.0197*** (0.00218)		0.0207*** (0.00469)
Skills (% of workers with university degree greater than 20%)		0.0168** (0.00724)	0.0158** (0.00726)	0.0168** (0.00724)
Employee involvement				
Number of instruments deployed for employee involvement		0.0184*** (0.00198)		0.000859 (0.00359)
Direct employee participation in decision-making		0.0658*** (0.00596)		0.0232** (0.00935)
Employment representation structure present in establishment (or company)		0.00129 (0.00676)		0.00239 (0.00677)
Bundles of workplace practices				
Bundle 1: Work organisation			0.0240*** (0.00145)	
Bundle 2: HRM			0.0177***	

Variables	Model 1	Model 2	Model 3	Model 4
			(0.00166)	
Bundle 3: Employee involvement			0.0279***	
			(0.00139)	
HRM–employee involvement configuration				0.0228***
				(0.00622)
HRM–work organisation configuration				-0.0270***
				(0.00634)
WO–employee involvement configuration				0.0197***
				(0.00514)
Pseudo-R ²	14.2%	19.1%	18.1%	19.2%
Observations	24,471	24,455	24,455	24,455

Notes: Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; unweighted data, marginal effects and robust standard errors in brackets, Pseudo-R² = 19.2% for Model 4 (best fit)

Source: ECS 2013 – Management questionnaire

Links between workplace practices, performance and well-being

In the previous section, the effects of various workplace practices on innovation in establishments were estimated. This estimate was based on the assumption that innovation and the associated workplace practices would overall have a positive impact on establishment outcomes. Understanding the relationship between outcomes and innovative activities provides crucial insights for both policymakers and company management, as well as for social dialogue at the establishment level. As outlined in the introduction, innovation is described in the Europe 2020 strategy as a way to achieve smart, sustainable and inclusive growth. Hence, it is necessary to explore the micro links between individual company innovation and company performance in order to draw conclusions on a broader basis. For managers, these insights can help to optimise decision-making processes and achieve effective allocation of resources. In terms of social dialogue, it is essential to understand the links between performance, innovation and win-win arrangements such as favourable working conditions or employee-centred HR strategies. Well-functioning social dialogue is a key component for the successful design and implementation of reforms needed to increase the competitiveness of Europe's economies and create more jobs, as demonstrated in previous Eurofound research (Eurofound, 2016a).

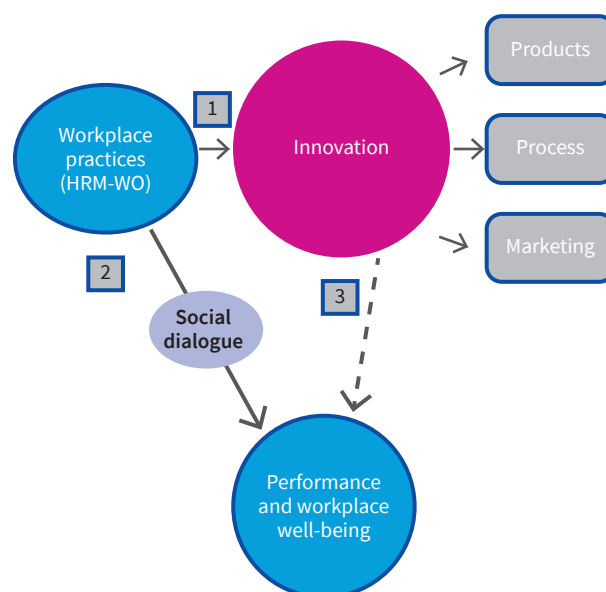
Against this background, the objective of this section is to study the effects of innovative workplace practices and social dialogue on the overall outcome of the establishment, in terms of performance and workplace

well-being, on the basis of empirical evidence from the ECS.

Results: Models 5 and 6

This section explores the impact of associated work practices (including different configurations) on performance (external) and workplace well-being (internal). Figure 14 illustrates the conceptual framework of the analysis (displayed previously in Figure 2).

Figure 14: Schematic of the conceptual framework



As described above, workplace practices and their combinations and interactions have a crucial role not only for the strategic alignment of an establishment towards competitive markets but also in terms of the company's overall performance. In Chapter 3, evidence

was provided that these practices have an impact on, or are at least significantly associated with, a firm's decision to introduce innovation. This section explores whether this disposition to innovate and the associated bundles of practices are also interrelated with the performance and well-being levels of the establishment. Analysis also shows that correlations between performance and many of the variables included are comparable to the correlations of well-being and these same variables – with, however, some differences (Annex 3). Table 7 compares the levels of performance and well-being in establishments that introduced innovation with levels in those establishments that did not innovate. It breaks the results down by bundles of workplace practices (with structures categorised as rudimentary, moderate or strong, depending on the number of practices implemented in each area) and by variables of social dialogue.

First, it is clear that measures of performance and well-being are higher in establishments reporting innovation. The differences are more pronounced in terms of performance than of well-being. Second,

across all bundles of practices, strongly structured establishments (implementing a wide range of practices in the area) show significantly higher levels of performance and well-being than establishments with rudimentary or moderate structures in place. Notably, even within the categorical structures (strong/moderate/rudimentary), establishments that reported innovations show significantly higher values in both measures than the reference group. The highest average levels of performance (71.3) and of workplace well-being (78.7) overall are achieved in establishments with strong HRM structures in place (offering access to training, time flexibility and variable pay measures to employees) and that introduced innovation in the three years preceding the survey.

Finally, interesting results are displayed in terms of social dialogue. Variables cover both the harmonious and conflict-oriented type of social dialogue. It is observed that levels of performance/well-being drop below average in cases where industrial action took place. Moreover, a trustworthy relationship between employee representation and management is associated with

Table 7: Performance and workplace well-being by workplace bundles and change (mean)

	No innovation reported		Innovation reported	
	Performance	Well-being	Performance	Well-being
HRM structure				
Rudimentary	53.1	71.5	57.7	73.5
Moderate	58.7	73.2	64.6	75.0
Strong	61.9	77.0	71.3	78.7
Work organisation structure				
Rudimentary	54.5	71.7	59.5	73.1
Moderate	58.4	73.4	64.5	75.5
Strong	62.4	76.1	69.7	77.6
Employee involvement structure				
Rudimentary	53.7	71.2	58.3	72.6
Moderate	57.2	73.3	63.3	74.5
Strong	61.0	74.5	66.2	76.4
Social dialogue				
Industrial action	49.3	66.1	55.8	69.3
High trust in management	59.7	76.3	64.0	75.4
Low trust in management	52.6	66.5	59.2	67.1
High trust in employee representation	61.4	75.7	69.6	77.3
Low trust in employee representation	47.7	62.2	50.9	62.1
Total	56.5	72.6	63.5	75.0

Note: Scores range from 0–100.

Source: ECS 2013, weighted data

higher levels of performance and well-being. However, the trust that managers have in employee representatives has a bigger impact (at least looking at bivariate links). Whether these factors remain significant after controlling for other factors is explored below.

Once the correlations and interrelations between workplace well-being/performance and key workplace practices and social dialogue are identified, the degree of consistency between them in a multivariate regression model is assessed so that the additional impact of each variable after controlling for the others is examined. For this purpose, all categorised bundles of workplace practices (rudimentary/moderate/strong) (with performance (Model 5.1) and well-being (Model 5.2) as dependent variables) were included first, controlling for structural establishment characteristics. Model 6 focuses on the impact of social dialogue on both measures,

keeping other factors constant. This model includes a limited number of cases (6,919) as it includes only those establishments where interviews with employee representatives were carried out.

Table 8 analyses selected results of Model 5. Unsurprisingly, an increase in employment is significantly and strongly associated with a better performance. On average, in establishments that reported such an increase, performance levels were 11 points higher than in the reference category. Organisational change is actually the only item with opposite signs: while such change turns out to be generally favourable for performance levels, the impact on workplace well-being is less beneficial. This result is in line with previous research on uncertainty during organisational restructuring (Bordia et al, 2004). It should be taken as evident that organisational change needs to be accompanied by measures to cushion its

Table 8: Regression coefficients, by dimension and change (Model 5)

	Performance	Well-being
Establishment characteristics		
Increases in employment	11.07*** (0.336)	3.398*** (0.267)
Organisational change	2.095*** (0.306)	-0.775*** (0.243)
% of female workers >20%	1.352*** (0.381)	0.643** (0.303)
% of workers aged 50+ >20%	-1.686*** (0.337)	-1.462*** (0.267)
% of skilled workers >20%	2.065*** (0.360)	1.544*** (0.286)
Work organisation bundle (Reference: Rudimentary)		
Moderate	1.472*** (0.323)	0.616** (0.257)
Strong	2.270*** (0.554)	1.679*** (0.440)
HRM bundle (Reference: Rudimentary)		
Moderate	2.661*** (0.347)	0.707** (0.276)
Strong	5.021*** (0.561)	3.338*** (0.445)
Employee involvement bundle (Reference: Rudimentary)		
Moderate	1.401*** (0.387)	0.793*** (0.307)
Strong	3.649*** (0.390)	2.940*** (0.310)

Notes: Models are controlled for establishment size, establishment type, sector, workforce characteristics, hierarchy levels and further controls (country, sex of respondent, role of respondent). Significance level: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: ECS 2013, unweighted data

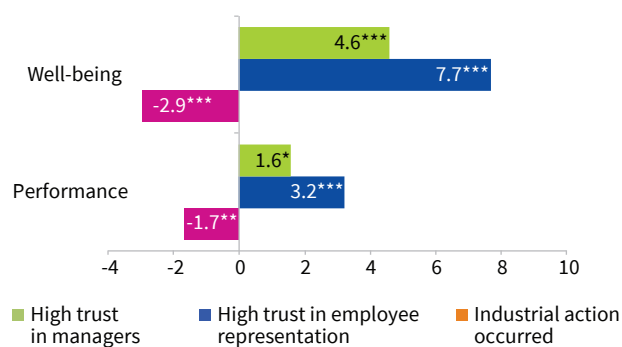
negative effects, a topic also extensively studied in the literature (Rafferty and Griffin, 2006; Prilleltensky and Prilleltensky, 2007).

Notably, in terms of workplace practices, the strongest associations are between the HRM bundle and performance levels. On average, establishments with strongly structured HRM practices score five points higher than those with weak structures. The level of well-being level in these establishments is on average three points above that in the reference establishments.

Figure 15 shows the regression coefficients of social dialogue variables from Model 6 for both measures. The regression analysis confirms that industrial action is negatively associated with both outcome measures also after controlling for other determinants. If industrial action took place, performance levels decreased on average by 1.7 points and well-being levels dropped by 2.9 points. This result is, of course, not surprising given the situations in which industrial action is usually taken: for example, in cases of restructuring, downsizing and budget cuts. Hence, it is important to highlight that this result is not to be interpreted as a causal relationship but may reflect associated events.

The crucial role of mutual trust is also confirmed. High levels of trust on the part of management in the employee representatives raise levels of workplace well-being by 7.7 points on average (compared with establishments with low trust levels). Likewise, trust in management as expressed by the employee representatives positively affected both outcome measures, though the trust in management was only weakly significant for levels of performance (1.6).

Figure 15: Regression coefficients – Model 6



Notes: Models are controlled for establishment type, sector, workforce characteristics, hierarchy levels, bundles of workplace practices and further controls (country, sex of respondent, role of respondent). Significance level: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: ECS 2013, unweighted data

Further to the predictors shown in Figure 15, the model tested the synthetic indicators of the available resources for employee representatives (including sufficiency of allocated time, availability of training, availability of funding for external advice), the availability of information to them and the level of representatives' influence on decision-making. The estimates of available information for employee representatives are significant at the 0.1 level for well-being only, indicating a favourable interplay between positive outcomes and cooperative social dialogue. Also, the influence of employee representatives is significant for well-being only. The available resources, on the other hand, are not significant for any of the dependent variables.

It is also of interest to look at the effects of workplace practice bundles in the employee involvement models. For establishments that implemented innovation, very strong effects were found for strong direct employee involvement structures. Establishments that have these structures in place score on average five points higher in both performance and workplace well-being, compared with establishments with rudimentary employee involvement structures. Strong HRM structures – on the other hand – turned out to be more important for the establishment's performance than for well-being.

The main conclusion to be drawn from this section is that there are clear links between the main dimensions analysed: performance, workplace well-being, workplace practices and social dialogue. In the bivariate analysis, it was found that levels of performance and well-being are above average across all breakdowns in establishments where innovation took place compared with those where it did not. In addition, levels of performance and well-being are higher where strong structures of work organisation, HRM measures and direct employee involvement are implemented. Finally, the crucial role of harmonious social dialogue at the workplace cannot be overestimated. High levels of mutual trust, in combination with strong instruments of direct employee participation, result in the highest levels of performance and create a beneficial atmosphere for innovative action.

SUMMARY

Links between the main dimensions

Using data from the ECS 2013, and multivariate logistic regression models, this chapter explored the relationship between reported change in establishments, establishment characteristics, work organisation, HRM practices and direct employee involvement. Furthermore, it was examined whether bundles of workplace practices and their configurations could further contribute to innovation. The chapter identifies clear links between the main dimensions analysed: performance, workplace well-being, change and associated workplace practices. The crucial role of harmonious social dialogue in the workplace was also highlighted.

Establishment size matters for innovation overall: The bigger the establishment in terms of the number of employees, the higher the likelihood that innovation was reported. However, the effect disappeared when including further measures, indicating that establishment size is mediated through other items and is not in itself a determinant of change.

Type of establishment is important for innovation: Apart from size, the type of establishment (headquarters/subsidiary site versus single establishment) was tested and turned out to be significantly associated with innovation across all models.

Sectors differ in likelihood of introducing innovation: There are significant differences regarding the introduction of innovation between some sectors. The industrial sector, for example, had a much higher probability of introducing innovation.

Characteristics of the workforce are relevant: Workforce related measures, such as gender and age structure and the increase of employment since 2010, all were significantly linked to change across all models.

Monitoring internal production quality and/or external ideas are key determinants of overall change in the area of work organisation.

Collaboration in – and/or outsourcing of – production, marketing or development showed highly significant positive effects for change.

Role of rotation and team autonomy: In terms of organisation of daily work, both task/job rotation and the degree of autonomy of teams or within tasks is positively linked with reported innovation.

The structure of work organisation matters: departments as organisational units dealing with different types of products/services or with specific geographical areas were found to have a positive relationship with change.

HRM-related variables showed the following picture.

- Access for employees to training was positively linked to innovation.
- The association of innovation and the number of variable pay instruments was highly significant.
- An establishment's human capital in terms of skilled employees proved to be an important predictor of innovation, as expected.

No significant effects were found for working time flexibility.

Importance of direct employee involvement: A strong link was found between innovation and direct employee involvement. In particular, the number of instruments in place supporting such involvement is important (including regular staff meetings, staff surveys, suggestion boxes) and others. Furthermore, the participation of employees in the decision-making process turned out to have a positive impact on overall innovation.

Importance of bundles of practices: The research moved from looking at single items of practices in the three areas (work organisation, HRM and direct employee involvement) to looking at bundles of practices. All three bundles are significantly associated with innovation, the most strongly associated being the employee involvement bundle, the weakest association being between HRM and innovation.

Importance of interactions between bundles: within the workplace, the bundles of practices are implemented together: their interaction matters. The work organisation bundle, interacting with the employee involvement bundle produced strong, positive effects on innovation. The same was found for the interaction between HRM practices and employee involvement.

Role of social dialogue on establishment economic performance and workplace well-being: Harmonious social dialogue matters. Measures of performance and well-being were well below average in cases where industrial action took place. Moreover, a trusting relationship between the employee representatives and

management was associated with higher levels of performance and well-being. These results remained significant after controlling for other influencing factors. In addition, levels of performance and well-being levels were higher on average in establishments that reported innovation .

Role of strong structuring in workplace practices: In addition, across all bundles of practices, establishments that were strongly structured in terms of work organisation, HRM or direct employee involvement showed higher levels of performance and well-being than those with rudimentary or moderate structures. Notably, even with the same degree of structuring, establishments with innovations had significantly higher values for both performance and well-being than establishments without innovations. The highest average levels of performance and of workplace well-being were observed in establishments with strong HRM structures in place and that had also implemented innovations in the three years preceding the survey.

6 | Workplace practices in fostering innovation

6 Workplace practices in fostering innovation

As said in Chapter 1, innovation in companies implies a complex, continuous and non-linear interaction between ideas, development, implementation, experiences and iterative adaptations. In order to understand this complexity, it is essential to address innovation from an organisational *and* a process perspective. The organisational form and work systems adopted by companies may facilitate, foster or hinder innovation. Any company's HRM system essentially includes the management of work and the management of people. So, in the broadest sense there are two types of practices; work practices and HRM practices (Boxall and Macky, 2009). The former refers to the design of the production process (transforming inputs into outputs) and the organisation of work processes (how employees can effectively deploy their skills, use their creativity, innovate, work in teams, solve problems, and be involved in decision-making). The design of such systems can affect the quality of products or services and become a determinant of company innovative action and performance (and eventually success).

At the same time, HRM practices, such as recruitment, selection, redundancies, dismissals, training and development skills for innovation, appraisal and remuneration and, more generally, motivating and rewarding employees for creative ideas and innovation can assist companies in improving performance.

Both practices, work and HRM, can affect the organisation (at both the individual/ employee and collective level) and can potentially make a significant contribution to innovation and performance. The implementation of work practices and their association with performance is analysed and not taken as evidence of 'superior' performance.

In this chapter, the results of the statistical analysis, informed by the insights of the relevant literature, are discussed in detail. Again, it needs to be stressed that the quantitative analysis has its limits due to the design and purpose of the original survey questionnaire. It is therefore important to put the quantitative findings in a broader context of interpretation in order to make them meaningful.

Role of work organisation in innovation

The various forms of work organisation adopted reflect a company's choice to combine different practices, different internal control and coordination systems,

and different strategies in order to establish adequate operational modes and systems of resource allocation (Sparrow et al, 2015). Innovation and change is very much linked to the flexibility to adapt these structures to economic challenges.

The literature review has shown that the design of work organisation matters for innovation – especially the organisation of work in teams (Van de Ven et al, 2000; Lam and Lundvall, 2006). Different work organisation models can produce different outcomes. Collective working methods are useful for generating and implementing ideas. Autonomy and cooperation are important dimensions linked to innovation (Stoker et al, 2001). In addition, it is known from the literature on HPWP that different configurations of organisational practices can enhance both the company's efficiency in its work processes and the quality of products and processes. Practices that increase employee participation in decision-making, problem-solving and quality control can contribute to better organisational performance.

Work organisation practices

The ECS 2013 contained three sets of work organisation practices to be analysed for their contribution to, and association with, change at the workplace level. These only tentatively cover the entire range of work organisational settings. They are as follows:

- collaboration and outsourcing
- decision-making on daily tasks
- internal organisation, information management and technology – including monitoring of quality of the production process or service delivery, monitoring of external ideas and department structure.

The statistical analysis of the previous chapter examined individual work organisation practices but also different configurations, as explained above. The following single practices were significantly and positively associated with the implementation of change:

- collaboration and outsourcing
- quality management and knowledge transfer
- task rotation
- employee autonomy in decision-making.

These practices are also among the nine key factors that Smith et al (2008) identified as affecting innovation management – including knowledge management, corporate strategy, organisational structure and culture.

With regard to **collaboration**, it is known from previous research that companies usually cooperate with each other as a response to:

- the need to strengthen competitiveness
- strategic resource development
- social and institutional needs
- the use of a partner's assets and resources.

Companies prioritise strategic cooperation with a view to increase knowledge and learning in certain areas; to improve efficiency and play a bigger role in the global market. (Mazzola and Perrone, 2013).

Similarly, **outsourcing** is considered a way to increase efficiency, foster innovation by accessing other firms' expertise and specialised resources, and to transfer knowledge and skills (Mowery et al, 1996; McCarthy and Anagnostou, 2004; Holcomb and Hitt, 2007; Mazzola and Perrone, 2013). It is also a well-established practice: in innovation projects and processes, most firms rely on external sources and collaboration with other organisations. Such outsourcing or collaboration schemes involve both public and private institutions and are often not confined to domestic partnerships. From a strategic point of view, the collaboration of a firm with technology providers or intermediaries such as research and consultancy firms promotes the vital exchange of knowledge and facilitates mutual learning, which in turn boosts innovation (Storper and Venables, 2004). The analysis contained in this report confirms the importance of collaboration (in design, marketing and/or development) for innovation (see Chapter 3).

The analytical results demonstrate that **quality management and knowledge transfer** practices play a role in an establishment's tendency to innovate. Practices more often used by innovative companies include the adoption of quality management through developing a quality mentality, formal quality management policies and procedures, and quality circles. Innovative companies encourage their employees to collect external stimuli with a view to improving access to new products or services or new technologies, and to dealing with emerging societal challenges. Transferring knowledge from the outside world into the company can boost the internal innovative capacity.

In this statistical analysis, practices associated with quality management include monitoring of quality of production or delivery of service, monitoring external ideas or keeping records of best practices. They were all found to be positively associated with innovation in the establishments that use them, confirming previous insights.

Task rotation allows employees to move from one task to another. Under certain circumstances this provides opportunities for learning and can potentially stimulate creativity, much needed for innovative organisations. Organisations can become more flexible by enhancing the capacity of their staff to perform and alternate different tasks.

The quantitative exercise also showed that a certain degree of autonomy for employees regarding the planning and execution of daily tasks or the organisation of teamwork seems to be beneficial for the overall tendency to introduce innovation in the establishment. Extensive research on **employee autonomy** in decision-making has documented its manifold benefits on both the workforce and the organisation (Nicholson et al, 2005). In highly skilled business environments, in particular, work autonomy has a beneficial impact on employee behaviour, leading in turn to greater motivation, better skills utilisation and more job satisfaction. Autonomy also provides workers with resources to make use of their creative potential (Černe et al, 2016). Solving business-related problems and finding creative approaches requires employees to have expert knowledge and exercise autonomy.. Conversely, lack of employee autonomy is related to higher staff turnover, absenteeism and enhanced health problems (Head et al, 2007; Eller et al, 2009; Schaufeli et al, 2009).

Conventional wisdom associates innovation with breakthrough changes, such as inventions, possibly envisioned by a single individual. However, reality shows that, first, even the visionary individual needs a team to implement ideas and, second, that innovations often take place in an incremental way and require group work and organisation. This does not undermine the role of the individual innovator; instead, it highlights the importance of joint efforts towards an organisational objective and as a source of creative ideas and, consequently, innovation. A joint effort could include solving production or service delivery problems, testing new solutions and ideas, and revising until the final product or service is ready for the market. In conclusion, the presence of teams as such may not automatically lead to creative or innovative solutions but teams can be understood as a means to organise and channel implicit and tacit knowledge towards overarching objectives. In this report, teams were found to be significantly associated with change in the workplace. Moreover, teams need to have specific structural characteristics to make these approaches work. These characteristics include the freedom and independence to make decisions about procedures, task autonomy and a spirit of community. Top-down approaches might endanger the unfolding of a team's full potential and can even have negative impacts in terms of performance, identity or motivation. However, the role of the supervisor is essential in encouraging the successful functioning of autonomous teamwork,

especially when it comes to the implementation of innovative ideas (Rosing et al, 2011).

In other words, although a worker can develop new and highly creative ideas on their own, the implementation of these ideas is enhanced ‘when employees are both able (competence) and enabled (relatedness) to participate in decision-making, which both stem from supportive supervision’ (Černe et al, 2016, p. 172). This final remark also illustrates the interplay of work organisation, HRM, employee participation and workplace well-being.

Synergistic effect of work organisation with other workplace practices

The individual practices discussed above appear to affect innovation, as described earlier. However, it was essential to assess the synergistic effect of bundles of practices and their interaction with the individual measures. Single practices per se may have an effect on innovation that is distinct from the impact of a strategic bundle of practices or from the interaction between them. Previous research indicated the limitations of individual HRM and work organisation practices (implemented in isolation) in fostering innovation (Jiménez-Jiménez and Sanz-Valle, 2005). In line with this, the statistical analysis proved that interactions between bundles increase the explanatory power of the model to estimate the likelihood of innovation. Two types of interactions were sought with a view to identifying their impact on innovation:

- work organisation and HRM practices (bundles and individual practices)
- work organisation and employee involvement (bundles and individual practices).

The first configuration – work organisation and HRM – produced negative results as regards the likelihood of change or innovation. This means that, despite the positive effect of individual work organisation or HRM practices on innovation, their combined effect in the absence of employee participation fails to produce the desired overall positive effect on innovation. In other words, there is no indication that accumulation of positive individual practices will in itself positively affect innovation. This suggests once more that it is the strategic approach that matters.

However, the second configuration – work organisation and direct employee involvement – produced a strong effect on the likelihood of reported innovation. This means that a (strategic) combination of strong structures of work organisation, together with distinct measures of direct employee participation, boosts the probability of innovation at the establishment level even more than if each of these measures were implemented loosely and individually. To give a practical example, the probability of innovation (product/process/marketing) is 9% higher in establishments that monitor the quality of the production process and/or external ideas than in

establishments that do not. The probability increases by another 2% if the same establishment also involves its employees in the decision-making process (consulting them or taking decisions jointly with them). However, if the establishment decided to combine these measures strategically (indicating a specific organisational culture), the likelihood that innovation would be introduced rises by another 4%, compared with establishments that did not take such a decision. This example shows that an establishment’s capacity to innovate also depends on strategic decisions in terms of the way work is organised and how organisational settings encourage employees to be directly involved in relevant and crucial choices.

HRM practices

In a highly competitive environment, well-designed HRM policies play a key part in enhancing a company’s performance and the overall functioning of the organisation. The HRM literature (as mentioned earlier) has investigated the role that HRM policies and practices play in increasing company performance, particularly as regards:

- enhancing employees’ knowledge, skills and behaviours, which can positively affect company performance
- innovative capacity (and thus performance), which can be strengthened by investing in employees’ skills, learning and motivation.

Literature on the links between HRM and innovation supports the idea that the above practices enhance the likelihood of company innovation. For example, the application of knowledge obtained through training promotes skills needed for innovation. Furthermore, recruiting a person with the right skills to fit the organisational structure enables companies to tap into the expertise needed for introducing innovation in their products, processes or marketing strategies. Designing attractive forms of motivation (variable pay schemes, time autonomy and appraisal systems) as employee incentives will increase the organisation’s capacity to develop creativity. The Ability, Motivation and Opportunities (AMO) model (Bailey, 1993) proposes that practices that allow individuals the space to carry out duties in their own manner enhance overall commitment and offer opportunities to exert personal and collective capabilities. **Ability** refers to the employees’ skills level and includes practices such as training and development and recruitment for the right skills. The **opportunity** dimension includes participation in decision-making, team autonomy, collaboration and improving quality which can further contribute to innovation. Finally, **motivation** in the form of financial and non-monetary incentives for exercising discretionary effort increases the likelihood of innovative action.

The analysis of the ECS empirically supports the central arguments of the AMO model. Individual HRM practices confirmed as being positively linked to innovation are:

- training
- recruitment of skilled workers
- variable pay.

More importantly, the analysis also assessed the way these practices and their bundles interact with each other.

The role of **training** in the different phases of work processes has been explored by researchers. In particular, focused training was found to be crucial for a favourable outcome. For example, in the early phases of developing a product, service or process, the appropriate training could encourage employees to engage in more free, lateral thinking to arrive at a range of original solutions (Shipton et al, 2006). A later stage of development might necessitate group work and interaction with clients and suppliers, which can be stimulated by training.

A **highly skilled** workforce with a large proportion of employees (more than 20%) holding a university degree appears to contribute to an increased likelihood of innovation, as expected (Taggar, 2002).

Variable pay (such as bonuses, group-performance-based pay and profit-sharing) is a further central HRM practice that has long been part of the discussion on performance. While studies that took place before the 1990s painted a mixed picture, more recent studies emphasise positive associations between rewards and performance. However, variable pay can also inhibit change as it encourages the repetition of practices that have been successful in the past, rather than new approaches (see McCullers, 1978; Kohn, 1993; Amabile, 1996; McGraw, 2015). Still, innovative activities and variable pay schemes have often been found to be interlinked (Lazear, 2000; Shearer, 2004; Ederer and Manso, 2013), as is also supported by the results presented in this report. Detailed analysis of variable pay practices included in the ECS revealed the strongest positive effects for payment-by-results (significantly associated with all three kinds of change). Bonuses were found to be linked to process and product innovation. However, the final model indicated that the number of variable pay instruments in place is important.

Synergistic effect of HRM with other practices

A basic premise of HRM strategy is that organisations are not an aggregation of individuals working together; organisations are systems of interacting elements including organisational structures, practices and behaviours. This research shows that individual HRM

practices and also bundles of HRM practices produce strong effects on innovation, particularly when combined with employee-involvement practices. In other words, combining employee-oriented HRM practices that also encourage employee participation can be very potent and can reinforce the link between single HRM measures and innovation.

These findings imply that a coherent set of HRM policies with an emphasis on employee involvement creates a facilitating environment for innovative action in the establishment. The combination of practices that can contribute to better chances of introducing innovation include variable pay, training (facilitating employees' gaining a high level of skills), together with measures of time flexibility¹³. Additionally, direct employee involvement instruments include different tools (for example encouraging employees to contribute suggestions for improvement) as well as a role for employees in the decision-making process.

In conclusion, HRM practices do matter for the likelihood of a company introducing innovation. However, the HRM-employee participation configuration of practices functions as an even stronger promoter of innovative activities. Ultimately, innovation depends on the generation and, more importantly, the implementation of ideas.

Employee participation and social dialogue

The interplay of direct employee participation with bundles of work organisation and HRM has already been discussed. This section will focus on the overall role that involving employees in decisions and participation schemes plays in creating an innovative environment. Employee involvement is at the heart of the concept of HIWs (Lawler, 1986), suggesting favourable overall outcomes where such practices are in place.

HIWs are a managerial approach to work organisation through the involvement of employees, countering the Taylorist model of work organisation. A movement towards a high-involvement work environment entails better use of employees' capacities for problem-solving and personal development. Such a work environment encourages information-sharing and provides opportunities for employee participation in decision-making. This research examined the opportunities that employees are given for direct participation. Our analysis shows that direct participation of employees in the organisation is strongly associated with innovation in the establishment. All direct participation practices that were examined, such as the number of direct participation instruments provided by management

13 Working time flexibility on its own is not linked to innovation.

and employee participation in decision-making, have a strong link with the likelihood of innovation.

Social dialogue as an indirect form of participation has been less researched in terms of its contribution to innovation. A recent study identified three pathways through which representative employee participation has a positive influence on innovation (Hermans and Ramioul, 2015). It may occur firstly through the effects of the increased expression of (individual) employee voice, which contributes to employee retention, secondly through (the requests for) provision of training and thirdly through the (creation of) support for effective and sustained adoption of innovation-increasing HRM practices such as HIWs.

Two of these pathways (namely, training and employee voice) can at least indirectly be confirmed by the analysis of the ECS data. First, it was found that consultation with employees and joint decision-taking have a positive effect on innovation. Hence, a trusting attitude of management towards employees' capacity to play a role in the strategic objectives of the company seems important for the implementation of change. Second, the more general impact of employee voice as a pull-factor for innovation can partly be confirmed. While no specific instrument of employee voice guarantees innovative impact, the use of a well-balanced mix of tools such as regular meetings between employees and immediate managers, regular staff meetings open to all employees, suggestion schemes, employee surveys and online discussion boards were found to be positively associated with innovation. Later in this chapter, the mediating role of social dialogue is examined as part of its contribution to performance.

It is important to emphasise that both practitioners and researchers of innovation need to focus on the way employees generate, use and share (tacit) knowledge, the way they initiate changes in tasks, products, processes and procedures, and the way they are involved in and deal with innovations initiated by management in their daily work.

Performance and workplace well-being

This research has looked at the impact of work organisation, HRM and employee involvement on performance and well-being.

Among the establishments that introduced any change in product, process or marketing, both establishment performance and workplace well-being were found to be higher (above average) than in establishments that had not introduced changes. Managers who reported that their company had introduced any of the above changes in the three years preceding the survey (2010–2013) saw increased performance and also higher levels of workplace well-being. Additionally, most of these managers reported that they had strong

employee participation practices in place, showing the significant links between direct participation and the establishment's disposition to innovate.

The HRM and work organisation bundles that included a wide range of practices were found to be strongly linked with both performance and workplace well-being. The effect of the employee involvement bundle of practices was greater in companies that had introduced innovation in the last three years than in companies that had not.

The above findings confirm other research findings about the positive effect of certain bundles of workplace practices on an organisation's performance. Previous research evidence has demonstrated that a management philosophy that includes employee involvement has strong, positive effects on company performance (Lawler, 1992; Huselid, 1995; Vandenberg et al, 1999). Employee involvement enables organisations to produce high-quality products or services, increase the speed of work operations and innovation. Workplaces that practise different employee involvement schemes (a central feature of the HIWS model) are outside the Taylorist model of production, whereby decision-making and problem-solving stays in the hands of management. They also go further to capitalise on employee knowledge of production or service delivery. As this study shows, these practices have the potential for win-win outcomes in certain contexts and in an environment of trust and harmonious social dialogue, as discussed in the next section.

Mediating role of social dialogue

In exploring the role of participation at the workplace level, several researchers have distinguished between direct and representative participation. Sometimes the two forms are seen as mutually exclusive or competitive. However, a large body of research points to the complementarities and the mutually reinforcing nature of the two forms (Lucio and Stuart, 2002; Teague, 2005; Kim et al, 2012; Lehr et al, 2015). Representative participation or social dialogue plays an important role in influencing how people engage with work and how they use and develop their skills and creativity. A Eurofound report using the ECS 2009 data indicates that social dialogue can be expressed formally through structures and procedures clearly identified at a strategic level as well as informally in daily tasks and when putting strategic decisions into operation (Eurofound, 2012).

Directive 2002/14/EC, which establishes a general framework for informing and consulting employees, provides for the rights and opportunities of employees to access work-related information. Social dialogue structures and practices enable both the individual and the collective voice at the workplace level.

The importance of the employee voice is that it is linked with greater employee involvement and commitment to the organisation, as argued above. This is demonstrated in reduced absence, staff turnover and conflict, and higher performance (Appelbaum and Batt, 1994; Huselid, 1995). Mutual gains can be achieved through information-sharing and higher levels of trust. Batt and Appelbaum (1995) also identified positive impacts of employee involvement on performance. The ECS overview report (Eurofound, 2015) states that, in terms of social dialogue, the extensive and trusting and the moderate and trusting types of establishments were more likely to be associated with higher levels of performance and workplace well-being¹⁴. In a follow-up study, Eurofound (2016a) found that the trusting types of establishments were more likely to report mutual benefits, even in times of economic hardship.

With research evidence showing the beneficial effects of employee voice and social dialogue, the statistical analysis presented here explored the links between social dialogue and performance. The results, as presented above, clearly show the positive influence of trusting social dialogue practices on both performance and workplace well-being. A central conclusion of this analysis is that high levels of mutual trust, in combination with strong instruments of direct employee participation, trigger the highest levels of performance and create a beneficial atmosphere for innovative action. Low levels of trust and a conflictual approach to social dialogue significantly reduce the possibilities of flourishing performance and workplace well-being.

Interaction of practices

In line with the analysis above, individual social dialogue practices play a role in the constellation of organisation practices but their synergistic impact needs to be identified. As in previous sections, three configurations of practices were examined: HRM practices, work organisation and employee involvement practices. In establishments that have social dialogue structures in place, the strongest drivers of performance were innovative action, combined with extensive measures of direct employee involvement and HRM. This shows the complementarity of direct employee involvement with representative forms of participation, and indicates an encouraging workforce commitment achieved by HRM means. It can also be argued that social dialogue structures in a trusting environment that encourages the employee voice can strengthen or enhance employee participation. Effective partnership between management and employees can deal with change and find solutions to upskill employees and meet business challenges. As Totterdill et al (2013) have argued, social dialogue can act as a bridge for knowledge-sharing between different levels of the organisation.

14 In the ECS 2013, four distinct types of establishments were identified, based on their social dialogue practices and the prevalence of industrial action. The 'extensive and trusting type' of establishment was the most prevalent. Employee representatives are well resourced, well-informed, are involved in making decisions about work organisation and have influence on those decisions. Management and employee representation enjoy mutual trust, which is reflected in little industrial action. In the 'moderate and trusting' type, employee representatives are not as well-resourced and receive less information. Their perceived level of influence on key decisions is much lower and they feel less involved in organisational changes. A relatively high level of mutual trust is coupled with a low incidence of industrial action (Eurofound, 2015).

SUMMARY

HRM practices and innovation

This chapter provided an analysis of the statistics and a discussion of the findings. It began with an analysis of individual practices in the area of HRM and work organisation to identify their association with innovation in products, processes or marketing.

A number of HRM practices (including training, a highly skilled workforce, and variable pay) were found to be positively associated with change. Similarly, in the area of work organisation, it was found that collaboration and outsourcing, quality management and knowledge transfer, task rotation and employee autonomy in decision-making had a positive association with change.

Different authors have argued strongly that a coherent set of workplace practices with a horizontal fit (applied across the organisation) are expected to have better performance results than others (Wood and de Menezes, 2008; Appelbaum et al, 2000). Coherent practices in this context essentially refers to complementarity, synergies and the forming of an integrated system. The results of this analysis support this argument, particularly as complementarities and synergies have been found in workplace practices with a strong emphasis on employee involvement. HRM, work organisation and employee involvement bundles were analysed and their interplay with individual practices was examined.

The results of this analysis show that two configurations of practices were more likely to have a positive effect on innovation:

- work organisation and employee involvement;
- HRM and employee involvement.

Analysis also sought to explore performance and well-being outcomes. In the ECS sample examined here, establishments that opted for changes in their products, processes and/or marketing in the three years prior to the survey had also chosen to put in place HRM and work organisation practices that suited their business model. A common element in both these sets of practices was the inclusion of employee participation schemes to a great extent.

The analysis revealed strong relationships between HRM, work organisation and employee involvement bundles of practices on one side and performance and workplace well-being on the other. The effect of employee involvement is much stronger in terms of performance and well-being in companies that had introduced innovation than in those that had not. Additionally, a trusting relationship between management and employee representatives and a harmonious social dialogue climate in combination with direct employee involvement are linked with higher levels of performance and workforce well-being.

7 | **Conclusions: The changing workplace**

7 Conclusions: The changing workplace

Innovation can contribute to a company's competitiveness and can improve overall living standards. Often, innovation is associated with breakthrough projects but other forms are equally beneficial to the organisation. This is the case in evolutionary change, whereby organisations build on a series of incremental changes. Innovation can be of different types: innovation in products, processes or marketing and organisational innovation. Evidence from the ECS 2013 shows that three out of five establishments in the EU introduced new or significantly changed products, processes or marketing methods between 2010 and 2013. However, the situation varies widely between Member States – at a time when the speed of innovation and technological development is changing the global industrial landscape. Large differences between countries regarding the incidence of different workplace practices remain and, as analysis shows, other national characteristics, legislation, innovation policies and incentives (beyond the scope of this research) may account for those differences.

While large companies (those with more than 250 employees) were more likely to introduce any type of innovation, small companies (10–49 employees) and medium-sized companies (50–249 employees) tended to innovate more often than not in products and processes. A sectoral analysis reveals that organisations in the financial services sector reported organisational innovation more often than in any other sector. Among the different forms of innovation, firms in the commerce and hospitality sector, in industry and in the other services sector predominantly reported product innovation. It is often noted in empirical studies that some companies tend to combine product and process innovation. In this analysis, it was found that a large number of organisations in the industry sector did indeed introduce product (43%) as well as process innovation (41%).

Participatory change

In the light of this analysis, it can be concluded that the implementation of work organisation practices, HRM practices and employee participation workplace practices do matter for a company's likelihood of introducing innovations in products, processes and marketing.

This research set out to explore whether bundles of HRM, work organisation and employee participation practices are significantly associated with innovation introduced in establishments (in products, processes, marketing) and whether there are links with performance and workforce well-being. Having examined the practices individually

and in bundles, it is concluded that companies were more likely to have introduced changes in the three areas above if they had in place either of the two configurations of practices with strong employee involvement schemes:

- combining work organisation measures with employee involvement schemes (work organisation–employee involvement)
- combining HRM with employee involvement schemes (HRM–employee involvement).

In other words, company managers who sought new or significantly improved products, services, processes, or marketing methods are more likely to have done so by making interventions with HRM or work organisation measures in tandem with employee participation practices. Those combinations of practices are significantly associated with the innovation that took place in the three years prior to the ECS Survey (2010–2013).

The configurations of practices that were found to be closely associated with innovation primarily included practices that enhanced employees' abilities and motivation. Clearly, the HRM–employee involvement configuration favours practices that promote the ability and motivation of employees, with a particular emphasis on:

- training for skills development
- ensuring that people with the right skills are attracted to the company through a recruitment and development policy that addresses changes in skill needs, technological advances and demographic composition
- financial motivation to achieve desired results and steer employee behaviour towards the organisation's objectives.

As organisations change (for instance, new lines of products are added or new business models are introduced), jobs must be redesigned to adapt to the new needs; this in turn changes the organisation's skills needs. The ECS 2013 establishments that undertook innovation have used training to update employees' skills; this can potentially result in (more) innovation.

Furthermore, motivation in the form of variable pay was more likely to be provided by those firms that had introduced innovation in the last three years. Variable pay is very strongly associated with innovation and plays an important role in the HRM–employee involvement configuration. As other research has suggested, the

success of an individual HRM practice often depends on the way it is implemented. A characteristic feature of this configuration of practices is that the employee involvement practices sit well with the motivational practices introduced by the management.

Company practices within the work organisation–employee involvement configuration gave opportunities to the employees to use their discretionary effort through participatory work practices. Organisations pursuing such a configuration of workplace practices more often than not encourage knowledge transfer and the sharing of good work practices among employees. Research and practice show that employees who engage in monitoring the quality of products and services on a continuous basis can consequently improve their knowledge of the process of production, delivery and customer satisfaction.

Moreover, organisations using the work organisation–employee involvement configuration were likely to pursue collaboration efforts with other organisations or establishments for the development, production, delivery or marketing of goods and services. Collaboration with other organisations opens up possibilities for employees and management to access new information and knowledge as well as to appreciate new methods and to benefit from mutual learning, which can stimulate innovative activity. Similarly, outsourcing as part of a firm’s activities requires mutual commitment and resource specialisation. It is often associated with quality improvements as well as efficiency and effectiveness. Researchers have argued that, when managed properly, the outsourcing of activities can foster innovation as it allows access to cutting-edge technologies, specialised resources and learning opportunities for employees.

Providing employees with the opportunity to rotate tasks with other employees under certain conditions can improve productivity as employees can undertake a variety of tasks and thus meet production needs. At the same time, employees can benefit from learning new tasks and enhance their skills. Previous research (Greenan and Lorenz, 2009) has found that job rotation is related to innovation. This research also confirms that exercising autonomy in taking decisions and resolving problems with production and service can have a beneficial effect on employees and enhance their motivation.

Overall, companies that use the work organisation–employee involvement configuration use practices that:

- encourage collaboration with other companies or other institutions to expand their knowledge and increase efficiencies
- improve the quality of their product or service and monitor new developments in their sector or other industries so that they can possibly adopt new ideas early
- encourage their employees to rotate tasks so that they can learn through a variety of situations and share good work practices

- provide employee autonomy in decision-making.

The message of this analysis is that more inclusive or participatory organisational practices have stronger links with innovation in products, processes and marketing and innovation at the workplace level.

Performance and well-being: mutual gains

This research sought to investigate outcomes for the organisation as well as for workforce well-being. Companies that had introduced innovation (of any type – products, processes or marketing) had better outcomes in terms of performance and workplace well-being than companies that not introduced innovations. It is also important to stress that establishments were found to have better outcomes when they implemented a wide range (or strong structures) of work organisation, HRM and employee involvement practices compared to those that had only weak practices in place. However, strong HRM-structured establishments had the highest average performance and workplace well-being. This means that enhancing the skills and cultivating talent, motivating the workforce and providing opportunities for participation within the organisation could be linked with better outcomes for the organisation as well as workplace well-being.

In companies with employee representation structures that are characterised by a trusting relationship between management and employee representatives there are high levels of both performance and well-being. This suggests that the mediating role played by employee representatives, for example through influencing decisions on HRM issues, can generate win–win outcomes. As the main elements of this configuration include training, skills and incentive pay practices, it can be inferred that the employee representative role may have had some influence on these HRM practices. More importantly, it should be stressed that these practices appear to have beneficially impacted on performance and workplace well-being.

While it is widely recognised that attitudes, work organisation methods and organisation structures need to adapt and embrace change in order for the organisation to survive, there is no single best response. Caution is recommended regarding the implementation of organisational change. HR policies need to take into consideration the potential negative effects of actions to implement organisational change on workplace well-being.

Policy pointers

Against the backdrop of the EU policy objectives for smart and inclusive growth, and the need for increased competitiveness in a challenging global economic environment, this research identifies non-technological factors and identifies workplace practices associated with innovation – specifically, the introduction or significant renewal of products/services, processes or marketing strategies. It also looks at the factors linked with performance and well-being, at the establishment level.

Encourage Member States to adopt pro-innovation workplace practices: European initiatives and national programmes associated with innovation and the future of work (at national or regional level) should acknowledge the role of organisational practices and encourage Member States to:

- promote new work organisation and HRM practices combined with employee participation
- encourage capacity-building and mutual learning about innovation-enhancing measures.

In particular, they should take into account work organisation and HRM practices that encourage employee involvement. Significant differences exist between countries in the level of innovation and the adoption of workplace practices linked to innovation, performance and workforce well-being. Hence, policymakers may wish to look closely at different country experiences.

Enable companies to tap into external ideas and research and collaborate with bodies to help them improve their products or services: Improving the quality of products or services is rightly emphasised in several national programmes. Equally, national or regional programmes should provide ample opportunities to companies, particularly small companies, to tap into external ideas, new research, collaboration with other firms and research institutes in order for them to improve their products or services. Relevant European networks can facilitate such an exchange.

Facilitate the contribution of local actors: As experience in some Nordic countries has shown, national programmes that promote workplace renewal and innovation, such as those in Finland and Norway, can bring the research community together with business, workers' organisations and firms (Alasoini, 2009; Alasoini, 2015). Taking a bottom-up approach (rather than best examples) and exploiting the needs of local or regional business actors and employees is a way to create value that benefits all these bodies in a targeted fashion.

Support beneficial synergies of innovation, business outcomes and well-being: National and regional programmes to support innovation should encourage the linking of work practices with innovation initiatives – given the positive impact of these practices on innovation, business outcomes and workforce well-being. Emphasis should be placed on bundles rather than individual practices, with employee participation as an essential

element. Planning for the workplace of the future should also include workplace development programmes that support companies to assess and adopt new work practices that contain the essential elements presented in this research. As the association of certain bundles of workplace practices with innovation is quite strong, policymakers and practitioners should develop national or regional programmes with an emphasis on bundles rather than individual practices, with employee participation as an essential element.

Encourage pro-innovation HRM practices: Considering the strong effect of skills levels and training on innovation, national programmes should continue efforts to support employee development. In addition, the use of different forms of variable pay for employees, adjusted to their workplace, could also be discussed with social partners at sectoral level. Sectoral collective agreements could provide the framework for an equitable and fair way of implementation while company agreements could adjust to the local actors' needs.

Facilitate a culture of innovation-readiness in start-ups and SMEs: In an effort to revive the economy, many governments have introduced measures to support start-ups or small companies. Work practices that facilitate innovation can be instrumental for the future success of these companies. Governments and the business community could further assist small businesses to embrace pro-innovation workplace practices so as to further enhance their innovative potential. Small companies, often unaware of the benefits or impacts of these practices, may associate them with a higher cost – in the case of training, for example. Managers of small companies may be reluctant to adopt different work organisation or HRM practices as they may think that they are hard to introduce or time-consuming.

Raise awareness of benefits of pro-innovation workplace practices: Raising awareness of the economic and societal benefits of these workplace practices through public debates can support the economic and social impact of national and regional programmes, as experience in certain EU Member States has shown. The benefits of such practices go beyond the workplace: they enhance the development, capability and learning capacity of both the workforce and organisation and also the communities that establishments are part of.

Review participation structures and practices at workplace level: 'Participative change' can produce mutual gains: it nurtures an environment of trust between management, employees and their representatives. Institutions such as social dialogue make employees aware of the need for adaptation, promote employee involvement in operations and engage the workforce in a debate about the future of the company. Mindful of social dialogue traditions in each country, governments and social partners may wish to review participation structures and practices at workplace level. Similarly, European-level social partners, at both cross-sector and sectoral level, may wish to address this issue as their role

requires a close relationship with national-level social partners.

Future research on innovation

Innovation as a process

A review of the relevant empirical research on innovation shows some gaps about the exact modes of implementation: how exactly innovation *as a process* is embedded in organisational structures and work practices, including the role and impact of employees in this process. The conditions for employee involvement in innovation mostly concern elements associated with high-involvement work practices – HIWPs – (such as teamwork, autonomy, information provision and participation in decision-making) as well as the need for skilled and trained employees and corporate adaptability.

In order to explore how innovation processes are organised, it is important not only to focus on the ‘technical’ aspect of the transformation process (how input is transformed into output) and the division of labour in this process, but also to include more explicitly the regulatory aspect or the control structure as all activities related to the transformation process have to be coordinated and regulated. Regulation or coordination happens at the operational, tactical and strategic level of the organisation and is therefore assigned to different hierarchical levels, including that of workers. If regulatory capacity is assigned at the lowest operational level as much as possible, it is easier for workers to solve problems and to deploy innovative behaviour as defined. In other words, ‘innovation’ can be regarded as a control activity (Lekkerkerk, 2016) and can take place at the strategic, tactical and operational level.

Operationalising an extended concept of innovation

The outlined approach considers innovation as intertwined with all activities and all levels in the organisation and also with the way these activities are regulated and controlled.

The current conceptual framework as outlined in the Oslo Manual is still relevant in surveying organisational change and innovation. However, it is necessary to not only investigate the conditions and impacts of innovation but also to include questions related to the control structure in future surveys.

In order to operationalise such an extended concept of innovation and to identify how innovation processes are embedded at all levels of the organisation, several issues need to be taken into account, as outlined below.

First, it is necessary to make a clear distinction between formal, top-down initiated innovations, innovations at the intermediate level and employee-led innovative behaviour.

Second, top-down innovations stem from strategic innovation decisions and are usually organised on a

project-by-project basis which at some point implies formal steps, initiatives and/or approval by higher hierarchical layers. Top-down innovations usually imply a combination of different types of innovation (product/process, process/organisation, product/marketing or other combinations) and are often taken-up by a dedicated project team that includes employees from other departments, other companies or institutions (such as universities, technology providers or consultancy firms). Questions could be designed to elicit more information on innovation structures at this strategic level.

Third, innovation at the intermediate level implies that individual workers or their teams are formally participating in (possibly temporary) project teams working on an issue such as a product development, changes in procedures, or the installation of equipment at the level of their department. Such forms of participation may be initiated by either workers/teams themselves and supported by management or might be initiated by different hierarchical levels.

Fourth, at the operational level, employee innovative behaviour refers to workers themselves effectively changing operational tasks, equipment, products, processes or procedures. This is possible if operational control is decentralised to the lowest level (such as is the case in high-performance work practices (HPWP)).

Next, in order to map innovation processes and effective employee participation at these different levels, it is important to investigate at what stage, with what aim, at what intensity and with what organisational support employees are involved in innovation at these different levels (strategic, intermediate, operational).

Another question to be explored is how the innovation process at each of these levels is supported by management as well as the leadership role. For each of these forms of innovation, tools for employee participation can be identified, several of which are included in the ECS 2013 questionnaire. Examples include interdisciplinary groups, quality circles, suggestion boxes and similar procedures for collecting, managing and rewarding the ideas of employees and teams, and systems and tools for information sharing.

Further questions for reflection are: Who initiated the innovation? What was the problem that had to be solved (for example, market position, technical problem or lack of efficiency)? How are ideas transformed into concrete actions and how are these implemented? How are they diffused in the wider organisation? What was the effect of input from employees on the choices made by the management and on the actual innovation outcome and implementation?

Finally, indirect or representative participation in innovations refers to social dialogue channels at the establishment level. Questions about the functioning of these social dialogue channels in a survey could be complemented with questions about their involvement in innovation processes and projects.

References

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- Alasoini, T. (2009). Strategies to promote workplace innovation: a comparative analysis of nine national and regional approaches. *Economic and Industrial Democracy*, 30(4), 614–642.
- Alasoini, T. (2015). Two decades of programme-based promotion of workplace innovation in Finland: Past experiences and future challenges. *European Journal of Workplace Innovation*, 1(1), 37–54.
- Allison, M.T. (1999). Organizational barriers to diversity in the workplace. *Journal of Leisure Research*, 31(1), p.78.
- Amabile, T. M. (1996). *Creativity in context*. Boulder, CO: Westview Press.
- Andries, P. and Czarnitzki, D. (2014). Small firm innovation performance and employee involvement. *Small Business Economics*, 43(1), 21–38.
- Anitha, J. (2014). Determinants of employee engagement and their impact on employee performance. *International Journal of Productivity and Performance Management*, 63(3), 308–323.
- Antonelli, C., Crespi, F. and Scellato, G., (2012). Inside innovation persistence: New evidence from Italian micro-data. *Structural Change and Economic Dynamics*, 23(4), 341–353.
- Appelbaum, E. (2015). *High-performance work practices and sustainable economic growth*. EPRN.
- Appelbaum, E. and Batt, R. (1994). *The new American workplace*. New York, NY: Palgrave MacMillan.
- Appelbaum, S. H., Gandell, J., Yortis, H., Proper, S. and Jobin, F. (2000). Anatomy of a merger: Behavior of organizational factors and processes throughout the pre-during-post-stages (part 1). *Management Decision*, 38(9), 649–662.
- Arnkil, R. (2008). In search of missing links in disseminating good practice – Experiences of a work reform programme in Finland. *International Journal of Action Research*, 4, 39–61.
- Arnkil, R., Rissanen, P., Pitkänen, S., Piirainen, T., Koski, P., Berg, P. et al (2003). *The Finnish workplace development programme: A small giant?* Helsinki, Finland: Ministry of Labour.
- Ashton, D.N. and Sung, J. (2002). *Supporting workplace learning for high performance working*. Geneva: International Labour Organization.
- Auspurg, K. and Hinz, T. (2011). Gruppenvergleiche bei Regressionen mit binären abhängigen Variablen: Probleme und Fehleinschätzungen am Beispiel von Bildungschancen im Kohortenverlauf. *Zeitschrift für Soziologie*, 40(1), 62–73.
- Bailey, T. (1993). *Discretionary effort and the organization of work: Employee participation and work reform since Hawthorne*. Teachers College and Conservation of Human Resources, Columbia University.
- Barrios-Choplin, B. O. B., McCraty, R. and Cryer, B. (1997). An inner quality approach to reducing stress and improving physical and emotional wellbeing at work. *Stress Medicine*, 13(3), 193–201.
- Bartoloni, E. (2012). The persistence of innovation: a panel data investigation on manufacturing firms. *International Review of Applied Economics*, 26(6), 787–810.
- Batt, R. (2002). Managing customer services: Human resource practices, quit rates, and sales growth. *Academy of Management Journal*, 45(3), 587–597.
- Batt, R. and Appelbaum, E. (1995). Worker participation in diverse settings: Does the form affect the outcome, and if so, who benefits? *British Journal of Industrial Relations*, 33(3), 353–378.
- Becker, B. and Gerhart, B. (1996). The impact of human resource management on organizational performance: Progress and prospects. *Academy of Management Journal*, 39(4), 779–801.
- Beke, K. (2009). *Outsourcing and Innovation* (doctoral dissertation). Rotterdam, The Netherlands: Erasmus University.
- Bello-Pintado, A. (2015). Bundles of HRM practices and performance: empirical evidence from a Latin American context. *Human Resource Management Journal*, 25(3), 311–330.
- Beugelsdijk, S. (2008). Strategic human resource practices and product innovation. *Organization Studies*, 29(6), 821–847.
- Bigliardi, B. (2013). The effect of innovation on financial performance: A research study involving SMEs. *Innovation*, 15(2), 245–255.
- Bogliacino, F. and Pianta, M. (2016). The Pavitt Taxonomy, revisited: Patterns of innovation in manufacturing and services. *Economia Politica*, 33(2), 153–180.
- Bordia, P., Hobman, E., Jones, E., Gallois, C. and Callan, V. J. (2004). Uncertainty during organizational change: Types, consequences, and management strategies. *Journal of Business and Psychology*, 18(4), 507–532.
- Boxall, P. and Macky K. (2009). Research and theory on high-performance work systems: Progressing the high-involvement stream. *Human Resource Management Journal*, 19(1), 3–23.

- Brandl, B. (2016). *The efficacy of hybrid collective bargaining systems: An analysis of the impact of collective bargaining on company performance in Europe*. MPRA Paer No. 70025.
- Caloghirou, Y., Kastelli, I. and Tsakanikas, A. (2004). Internal capabilities and external knowledge sources: complements or substitutes for innovative performance? *Technovation*, 24(1), 29–39.
- Caroli, E. and van Reenen, J. (2001). Skill-biased organizational change? Evidence from a panel of British and French establishments. *Quarterly Journal of Economics*, 116(4), 1449–1492.
- Cefis, E. and Ciccarelli, M. (2005). Profit differentials and innovation. *Economics of Innovation and New Technology*, 14(1-2), 43–61.
- Černe, M., Kase, R. and Škerlavaj, M. (2016). This idea rocks! Idea championing in teams. In Škerlavaj, M., Černe, M., Dysvik, A. and Carlsen, A. (eds.), *Capitalizing on creativity at work fostering the implementation of creative ideas in organizations*, 53-63. Cheltenham, UK: Edward Elgar Publishing.
- Chen, H. H., Lee, A. H. and Chen, J. (2016). The relationship between innovation and performance in special nonprofit firms: Social and cooperative agrifood firms. *Journal of Management & Organization*, 1–16.
- Chowhan, J. (2016). Unpacking the black box: Understanding the relationship between strategy, HRM practices, innovation and organizational performance. *Human Resource Management Journal*, 26(2), 112–133.
- Combs, J., Liu, Y., Hall, A. and Ketchen, D. (2006). How much do high-performance work practices matter? A meta-analysis of their effects on organizational performance. *Personnel Psychology*, 59(3), 501–528.
- Cooper, R. S. and Merrill, S. A. (eds.) (1997). *Industrial research and innovation indicators. Report of a Workshop 13-14*. Washington DC: National Academies Press.
- Crepon, B., Duguet, E. and Mairesse J. (1998). Research, innovation and productivity: An econometric analysis at the firm level. *Economics of Innovation and New Technology*, 7(2), 115–58.
- Cusí, P. F., Chao, Á. D. and Sellens, J. T. (2013). ICT, Innovation, wages and labour productivity: New evidence from small local firms. *Revista de Estudios Empresariales*, 2(2), 29–45.
- Damanpour, F., Szabat, K. A., and Evan, W. M. (1989). The relationship between types of innovation and organisational performance. *Journal of Management Studies*, 26(6), 587–601.
- De Leede, J. and Looise, J. K. (2005). Innovation and HRM: Towards an integrated framework. *Creativity and Innovation Management*, 14(2), 108–117.
- Di Benedetto, C. A., DeSarbo, W. S. and Song, M. (2008). Strategic capabilities and radical innovation: an empirical study in three countries. *IEEE Transactions on Engineering Management*, 55(3), 420–433.
- Dobbins, A. and Gunnigle, P. (2009). Can voluntary workplace partnership deliver sustainable mutual gains? *British Journal of Industrial Relations*, 47(3), 546–570.
- Dolan, P., Metcalfe, R., Powdthavee, N., Beale, A. and Pritchard, D. (2008). *Innovation and well-being*. Innovation Index Working Paper. London, UK: National Endowment for Science Technology and the Arts (NESTA).
- Donate, M. J., Peña, I. and Sánchez de Pablo, J. D. (2016). HRM practices for human and social capital development: Effects on innovation capabilities. *The International Journal of Human Resource Management*, 27(9), 928–953.
- Ederer, F. and Manso, G. (2013). Is pay for performance detrimental to innovation? *Management Science*, 59(7), 1496–1513.
- Eller, N. H., Netterstrøm, B., Gyntelberg, F., Kristensen, T. S., Nielsen, F., Steptoe, A. et al (2009). Work-related psychosocial factors and the development of ischemic heart disease: A systematic review. *Cardiology in Review*, 17(2), 83–97.
- Eriksson, T., Qin, Z. and Wang, W. (2014). Firm-level innovation activity, employee turnover and HRM practices: Evidence from Chinese firms. *China Economic Review*, 30, 583–597.
- Eurofound (2012). *Workplace social dialogue in Europe: An analysis of the European Company Survey 2009*. Dublin, Ireland.
- Eurofound (2013a). *Work organisation and innovation*. Dublin, Ireland.
- Eurofound (2013b). *High performance workplaces: Background paper for the Third European Company Survey*. Dublin, Ireland.
- Eurofound (2015). *Third European Company Survey – Overview report: Workplace practices – Patterns, performance and well-being*. Luxembourg: Publications Office of the European Union.
- Eurofound (2016a). *Win-win arrangements: Innovative measures through social dialogue at company level*. Luxembourg: Publications Office of the European Union.
- Eurofound (2016b). *Sixth European Working Conditions Survey – Overview report*. Luxembourg: Publications Office of the European Union.
- European Commission (2010). *Europe 2020: A strategy for smart, sustainable and inclusive growth*. COM(2010) 2050. Brussels, Belgium: European Commission.
- European Commission (2013). *European competitiveness report 2013 – Towards knowledge-driven reindustrialisation*. European Commission Staff Working Document SWD (2013)347 final. Luxembourg: Publications Office of the European Union.
- European Commission (2014). *State of the Innovation Union: Taking stock 2010–2014*. Brussels.

- Eurostat (2016). *Community Innovation Survey*. Retrieved 22 March 2017, from <http://ec.europa.eu/eurostat/web/microdata/community-innovation-survey>
- Friesenbichler, K. and Peneder, M. (2016). Innovation, competition and productivity. *Economics of Transition*, 24(3), 535–580.
- Ganter, A. and Hecker, A., (2014). Configurational paths to organizational innovation: Qualitative comparative analyses of antecedents and contingencies. *Journal of Business Research*, 67(6), 1285–1292.
- Geary, J. and Trif, A. (2011). Workplace partnership and the balance of advantage: A critical case analysis. *British Journal of Industrial Relations*, 49(1), 44–69.
- Gertler, M. S. (2003). Tacit knowledge and the economic geography of context, or the undefinable tacitness of being (there). *Journal of Economic Geography*, 3(1), 75–99.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. and Trow, M. (1994). *The new production of knowledge: The dynamics of science and research in contemporary societies*. London, UK: Sage.
- Görg, H. and Hanley, A. (2011). Services outsourcing and innovation: An empirical investigation. *Economic Inquiry*, 49(2), 321–333.
- Greenan, N. (2003). Organisational change, technology, employment and skills: an empirical study of French manufacturing. *Cambridge Journal of Economics*, 27(2), 287–316.
- Greenan, N. and Lorenz, E. (2009). *Learning organisations*. Draft EDU Working Paper. Report prepared for the OECD's Innovation Strategy, OECD EDU/WKP(2009)6. Paris, France: OECD Publishing.
- Griffith, R., Huergo, E., Mairesse, J. and Peters, B. (2006). Innovation and productivity across four European countries. *Oxford Review of Economic Policy*, 22(4), 483–498.
- Hansen, M. T. (2002). Knowledge networks: Explaining effective knowledge sharing in multiunit companies. *Organization Science*, 13(3), 232–248.
- Hargadon, A. (2003). *How breakthroughs happen: The surprising truth about how companies innovate*. Cambridge, MA: Harvard Business Press.
- Head, J., Kivimäki, M., Siegrist, J., Ferrie, J. E., Vahtera, J., Shipley, M. J. et al (2007). Effort-reward imbalance and relational injustice at work predict sickness absence: The Whitehall II study. *Journal of Psychosomatic Research*, 63(4), 433–440.
- Herrmann, A., Gassmann, O. and Eisert, U. (2007). An empirical study of the antecedents for radical product innovations and capabilities for transformation. *Journal of Engineering and Technology Management*, 24(1–2), 92–120.
- Hermans, M. and Ramioul, M. (2015). *Pathways between representative employee participation and innovation: A literature review*. Paper presented the European Academy of Management (EURAM) Conference, Warsaw, Poland.
- Hogan, S. J. and Coote, L. V. (2014). Organizational culture, innovation, and performance: A test of Schein's model. *Journal of Business Research*, 67(8), 1609–1621.
- Holcomb, T. R. and Hitt, M. A. (2007). Toward a model of strategic outsourcing. *Journal of Operations Management*, 25(2), 464–481.
- Huselid, M. A. (1995). The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Academy of Management Journal*, 38(3), 635–672.
- Ichniowski, C. and Shaw, K. (1999). The effects of human resource management systems on economic performance: An international comparison of US and Japanese plants. *Management Science*, 45(5), 704–721.
- Ichniowski, C., Shaw, K. and Prennushi, G. (1997). The effects of human resource management practices on productivity: A study of steel finishing lines. *The American Economic Review*, June, 291–313.
- Inigo, E. A., Ritala, P. and Albareda, L. (2016). Sustainability-oriented innovation: Identifying its impact on financial performance. In *Proceedings of the XXVII International Society for Professional Innovation Management (ISPIM) Innovation Conference, Porto, Portugal*. Manchester, UK: ISPIM.
- Jensen, M. B., Johnson, B., Lorenz, E. and Lundvall, B.-Å. (2007). Forms of knowledge and modes of innovation. *Research Policy*, 36(5), 680–693.
- Jiang, J., Wang, S. and Zhao, S. (2012). Does HRM facilitate employee creativity and organizational innovation? A study of Chinese firms. *The International Journal of Human Resource Management*, 23(19), 4025–4047.
- Jiménez-Jiménez, D. and Sanz-Valle, R. (2005). Innovation and human resource management fit: An empirical study. *International Journal of Manpower*, 26(4), 364–381.
- Jiménez-Jiménez, D., Sanz-Valle, R. and Hernandez-Espallardo, M. (2008). Fostering innovation: The role of market orientation and organizational learning. *European Journal of Innovation Management*, 11(3), 389–412.
- Johnson, B., Lorenz, E. and Lundvall, B.-Å. (2002). Why all this fuss about codified and tacit knowledge? *Industrial and Corporate Change*, 11(2), 245–262.
- Kesting, P., Song, L. J., Qin, Z. and Krol, M. (2016). The role of employee participation in generating and commercialising innovations: Insights from Chinese high-tech firms. *The International Journal of Human Resource Management*, 27(10), 1059–1081.
- Kim, D. Y., Kumar, V. and Kumar, U. (2012). Relationship between quality management practices and innovation. *Journal of Operational Management*, 30(4), 295–315.
- Klingenberg, B., Timberlake, R., Geurts, T. G. and Brown, R. J. (2013). The relationship of operational innovation and financial performance: A critical perspective. *International Journal of Production Economics*, 142(2), 317–323.

- Kohn, A. (1993). *Punished by rewards: The trouble with gold stars, incentive plans, A's, praise, and other bribes*. Boston, MA: Houghton Mifflin.
- Lam, A. and Lundvall, B.-Å. (2006). The learning organisation and national systems of competence building and innovation. In Lorenz, E. and Lundvall, B.-Å. (eds.), *How Europe's economies learn: Coordinating competing models*, 109–139, New York, NY: Oxford University Press.
- Laursen, K. and Foss, N. (2000). *New HRM practices, complementarities, and the impact on innovation performance*. IVS/CBS Working Paper No. 00-5. Copenhagen, Denmark: Department of Industrial Economics and Strategy, Business School.
- Laursen, K. and Foss, N. J. (2003). New human resource management practices, complementarities and the impact on innovation performance. *Cambridge Journal of Economics*, 27(2), 243–263.
- Lawler, E. E. (1986). *High involvement management*. San Francisco, CA: Jossey-Bass.
- Lawler, E.E., 1992. *The ultimate advantage: Creating the high-involvement organization*. San Francisco, CA: Jossey-Bass.
- Lazear, E. P. (2000). Performance pay and productivity. *The American Economic Review*, 90(5), 1346–1361.
- Lehr, A., Akkerman, A. and Torenvlied, R. (2015). Spillover and conflict in collective bargaining: Evidence from a survey of Dutch union and firm negotiators. *Work, Employment and Society*, 29(4), 641–660.
- Lekkerkerk, L.J. (2016). Organizing innovation and (strategic) decision making. In Mohr, B.J. and Amelvoort, P. van (eds.), *Co-creating humane and innovative organizations: evolutions in the practice of sociotechnical system design*, 99–122. Global STS-D Network.
- Lemeshow, S. and Hosmer, D. W. (1982). A review of goodness of fit statistics for use in the development of logistic regression models. *American Journal of Epidemiology*, 115(1), 92–106.
- Lin, C. H. V., Sanders, K., Sun, J. M., Shipton, H. J. and Mooi, E. (2015). Opening the black-box between HRM and firm innovation: The moderating effect of power distance. *Academy of Management Annual Meeting Proceedings*, XX(1), abstract 11846.
- Löf H. and Heshmati, A. (2003). The link between firm-level innovation and aggregate productivity growth: A cross-country examination. *Research Evaluation*, 12(2), 131–147.
- López-Nicolás, C. and Meroño-Cerdán, Á. L. (2011). Strategic knowledge management, innovation and performance. *International Journal of Information Management*, 31(6), 502–509.
- Lorenz, E. (2013). Innovation, work organisation and systems of social protection. In Fagerberg, J., Martin, B. R. and Andersen, E. S. (eds.), *Innovation studies: Evolution and future challenges*, 71–80, Oxford, UK: Oxford University Press.
- Lucio, M. M. and Stuart, M. (2002). Assessing partnership. The prospects for and challenges of modernisation. *Employee Relations*, 24(3), 252–261.
- Lundvall, B.-Å. (2002). *Innovation, growth and social cohesion: The Danish model*. Cheltenham, UK: Edward Elgar Publishing.
- Lundvall, B.-Å. (2013). Innovation studies: A personal interpretation of the 'state of art'. In Fagerberg, J., Martin, B. R. and Andersen, E. S. (eds.), *Innovation studies: Evolution and future challenges*, 21–70, Oxford, UK: Oxford University Press.
- MacDuffie, J.P. (1995). Human resource bundles and manufacturing performance: Organizational logic and flexible production systems in the world auto industry. *ILR Review*, 48(2), 197–221.
- Mackie, K. S., Holahan, C. K., & Gottlieb, N. H. 2001. Employee involvement management practices, work stress, and depression in employees of a human services residential care facility. *Human Relations*, 54(8): 1065–1092.
- Macky, K. and Boxall, P. (2008). High-involvement work processes, work intensification and employee well-being: A study of New Zealand worker experience. *Asia Pacific Journal of Human Resources*, 46(1), 38–55.
- Mairesse, J. and Mohnen, P. (2005). The importance of R&D for innovation: A reassessment using French survey data. In Link, A. M. and Scherer, F. M. (eds.), *Essays in honor of Edwin Mansfield*, 120–143, New York, NY: Springer.
- Mazzanti, M., Montresor, S. and Pini, P. (2007). Outsourcing and innovation: Evidence for a local production system of Emilia-Romagna. *Innovation*, 9(3–4), 324–342.
- Mazzola, E. and Perrone, G. (2013). A strategic needs perspective on operations outsourcing and other inter-firm relationships. *International Journal of Production Economics*, 144(1), 256–267.
- McCarthy, I., and Anagnostou, A. (2004). The impact of outsourcing on the transaction costs and boundaries of manufacturing. *International Journal of Production Economics*, 88(1), 61–71.
- McCullers, J. (1978). *Issues in learning and motivation: The hidden costs of reward*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- McGraw, K. O. (2015). The detrimental effects of reward on performance: A literature review and a prediction model. In Lepper, M. R. and Greene, D. (eds.) *The hidden costs of reward: New perspectives on the psychology of human motivation* (2nd ed., 33–60). New York, NY and London, UK: Psychology Press.
- Miller, R., Marks, N. and Michaelson, J. (2008). *Innovation and well-being*. Innovation Index Working Paper. London, UK: National Endowment for Science Technology and the Arts (NESTA).

- Mintzberg, H. (1979). *The structuring of organization. A synthesis of the research*. Englewood Cliffs, NJ: Prentice-Hall.
- Mood, C. (2010). Logistic regression: Why we cannot do what we think we can do, and what we can do about it. *European Sociological Review*, 26(1), 67–82.
- Mowery, D. C., Oxley, J. E. and Silverman, B. S. (1996). Strategic alliances and interfirm knowledge transfer. *Strategic Management Journal*, 17(2), 77–91.
- Murphy, K. J. (2002). Explaining executive compensation: Managerial power versus the perceived cost of stock options. *The University of Chicago Law Review*, 847–869.
- Nicholson, N., Audia, P. G. and Pillutla, M. M. (eds.) (2005). Volume XI: Organizational behaviour. In *The Blackwell Encyclopedia of Management: Organizational Behavior* (2nd ed., 330–339). Oxford, UK: Blackwell Publishing.
- Nosheen, S., Sadiq, R. and Rafay, A. (2016). The primacy of innovation in strategic financial management: Understanding the impact of innovation and performance on capital structure. In Proceedings of 2016 IEEE International Conference on Management of Innovation and Technology (ICMIT), 280-285, Bangkok, Thailand: IEEE.
- OECD and Eurostat (2005). *Oslo Manual: Guidelines for collecting and interpreting innovation data* (3rd ed.). Paris, France: OECD Publications.
- Oeij, P. R., Dhondt, S., Kraan, K., Vergeer, R. and Pot, F. (2012). Workplace innovation and its relations with organisational performance and employee commitment. *Lifelong Learning in Europe (LLinE)*, 4, 1–15.
- Peng, J., Kuk, L. L. and Ingersoll, G. M. (2002). An introduction to logistic regression analysis and reporting. *The Journal of Educational Research*, 96(1), 3–14.
- Pianta, M. (2004). Innovation and employment. In Fagerberg, J., Mowery, D., and Nelson, R. (eds.), *The Oxford Handbook of Innovation* (Chapter 21). Oxford, UK: Oxford University Press.
- Pil, F.K. and MacDuffie, J.P. (1996). The adoption of high-involvement work practices. *Industrial Relations: A Journal of Economy and Society*, 35(3), 423–455.
- Piva, M. and Vivarelli, M. (2002). The skill bias: Comparative evidence and an econometric test. *International Review of Applied Economics*, 16(3), 347–357.
- Pontius, R.G. and Schneider, L.C. (2001). Land-cover change model validation by an ROC method for the Ipswich watershed, Massachusetts, USA. *Agriculture, Ecosystems & Environment*, 85(1), 239–248.
- Powell, W. W. (1998). Learning from collaboration: Knowledge and networks in the biotechnology and pharmaceutical industries. *California Management Review*, 40(3), 228–240.
- Prajogo, D. I. and Sohal, A. S. (2001). TQM and innovation: A literature review and research framework. *Technovation*, 21(9), 539–558.
- Preenen, P. T., Vergeer, R., Kraan, K. and Dhondt, S. (2015). Labour productivity and innovation performance: The importance of internal labour flexibility practices. *Economic and Industrial Democracy*, 1–23.
- Prilleltensky, I. and Prilleltensky, O. (2007). *Promoting well-being: Linking personal, organizational, and community change*. Hoboken, NJ: Wiley.
- Rafferty, A. E., and Griffin, M. A. (2006). Perceptions of organizational change: A stress and coping perspective. *Journal of Applied Psychology*, 91(5), p.1154.
- Roche, M. and Rolley, C. (2011). Workplace wellbeing on Maungataturi mountain: The connection between ecological restoration and workplace happiness. *Journal of Applied Business Research*, 27(2), 115–126.
- Rosing, K., Frese, M. and Bausch, A. (2011). Explaining the heterogeneity of the leadership-innovation relationship: Ambidextrous leadership. *The Leadership Quarterly*, 22(5), 956–974.
- Sawyer, R. K. (2006). *Explaining creativity: The science of human innovation*. New York, NY: Oxford University Press.
- Schaufeli, W. B., Bakker, A. B. and Van Rhenen, W. (2009). How changes in job demands and resources predict burnout, work engagement, and sickness absenteeism. *Journal of Organizational Behavior*, 30(7), 893–917.
- Searle, R. H. and Ball, K. S. (2003). Supporting innovation through HR policy: Evidence from the UK. *Creativity and Innovation Management*, 12(1), 50–62.
- Seeck, H. and Diehl, M. R. (2016). A literature review on HRM and innovation: Taking stock and future directions. *The International Journal of Human Resource Management*, March, 1–32.
- Shearer, B. (2004). Piece rates, fixed wages and incentives: Evidence from a field experiment. *The Review of Economic Studies*, 71(2), 513–534.
- Shipton, H., West, M. A., Dawson, J., Birdi, K. and Patterson, M. (2006). HRM as a predictor of innovation. *Human Resource Management Journal*, 16(1), 3–27.
- Slater, S. F. and Narver, J. C. (1994). Does competitive environment moderate the market orientation-performance relationship? *The Journal of Marketing*, 58(1), 46–55.
- Smith, M., Busi, M., Ball, P. and Van Der Meer, R. (2008). Factors influencing an organisation's ability to manage innovation: A structured literature review and conceptual model. *International Journal of Innovation Management*, 12(4), 655–676.
- Sparrow, P., Shipton, H., Budhwar, P. and Brown, A. (2015). On multiple levels of analysis, context, contingency and capital. In Shipton, H., Budhwar, P., Sparrow, P. and Brown, A. (eds.), *Human resource management, innovation and performance*, 328–344, London, UK: Palgrave Macmillan.

- Spitzer, R. (2015). Hierarchy and innovation. *Nurse Leader*, 13(3), 8.
- Stoker, J. C., Looise, O. A. M., Fisscher, H. and De Jong, D. (2001). Leadership and innovation: Relations between leadership, individual characteristics and the functioning of R&D teams. *The International Journal of Human Resource Management*, 12(7), 1141–1151.
- Storper, M. and Venables, A. J. (2004). Buzz: Face-to-face contact and the urban economy. *Journal of Economic Geography*, 4(4), 351–370.
- Taggar, S. (2002). Individual creativity and group ability to utilize individual creative resources: A multilevel model. *Academy of Management Journal*, 45(2), 315–330.
- Talke, K., Salomo, S. and Kock, A. (2011). Top management team diversity and strategic innovation orientation: The relationship and consequences for innovativeness and performance. *Journal of Product Innovation Management*, 28(6), 819–832.
- Teague, P. (2005). *Economic citizenship in the European Union: employment relations in the new Europe*. Abingdon, UK: Routledge.
- Teece, D.J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*, 15(6), 285–305.
- Thompson, N. and Bates, J. (eds.). (2009). *Promoting workplace well-being*. New York, NY: Palgrave Macmillan.
- Totterdill, P., Ennals, J. R. and Exton, R. (2013). *Workplace innovation: The challenge for public policy*. Gower, Farnham 13 –Terra Stern, Change Management –Adopting a Continuous Improvement Program.
- Tsai, W. (2001). Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal*, 44(5), 996–1004.
- Vandenberg, R. J., Richardson, H. A. and Eastman, L. J. (1999). The impact of high involvement work processes on organizational effectiveness: A second-order latent variable approach. *Group and Organization Management*, 24(3), 300–339.
- Van der Hauw, P. A., Asaribu, M. N. and van der Zeijden, P. T. (2009). *Slimmer werken: Gebruik, mogelijkheden en opbrengsten in de praktijk* [Working smarter: Application, opportunities and proceeds in practice]. Zoetermeer, The Netherlands: Economic Institute for Small and Medium Enterprises (EIM).
- Van de Ven, A. H., Angle, H. L. and Poole, M. S. (eds.) (2000). *Research on the management of innovation: The Minnesota studies*. Oxford: UK: Oxford University Press.
- Vargas, M. I. R. (2015). Determinant factors for small business to achieve innovation, high performance and competitiveness: Organizational learning and leadership style. *Procedia – Social and Behavioral Sciences*, 169, 43–52.
- Verburg, R. M., Hartog, D. N. D. and Koopman, P. L. (2007). Configurations of human resource management practices: A model and test of internal fit. *The International Journal of Human Resource Management*, 18(2), 184–208.
- Vermeulen P. A. M. (2005). Uncovering barriers to complex incremental product innovation in small and medium-sized financial services firms, *Journal of Small Business Management*, 43(4), 432–452.
- Wang, Z. M. (2005). Organizational effectiveness through technology innovation and HRM strategies. *International Journal of Manpower*, 26(6), 481–487.
- Wang, T., Zhao, B. and Thornhill, S. (2015). Pay dispersion and organizational innovation: The mediation effects of employee participation and voluntary turnover. *Human Relations*, 68(7), 1155–1181.
- Watson, D., Galway, J., O’Connell, P. J. and Russell, H. (2009). *The changing workplace: A survey of employers’ views and experiences. Volume 1*. Dublin, Ireland: National Centre for Partnership and Performance.
- Wood, S. (1999). Human resource management and performance, *International Journal of Management Reviews*, 1(4), 367–413.
- Wood, S. and de Menezes, L. M. (2008). Comparing perspectives on high involvement management and organizational performance across the British economy. *The International Journal of Human Resource Management*, 19(4), 639–683.
- Wood, S., Noltes, M., Burrige, M., Rudloff, D. and Green, W. (2015). The dimensions and location of high performance work systems: Fresh evidence from the UK Commission’s 2011 employer skills survey. *Human Resource Management Journal*, 25(2), 166–183.
- Yamin, S. and Mavondo, F. T. (2015). Organizational innovation: Relationship with functional strategies and organizational performance. In Spotts, H. E. and Meadow, H. L. (eds.), *Proceedings of the 2000 Academy of Marketing Science Annual Conference*, 296–301, Berlin, Germany: Springer International.
- Zeng, J., Phan, C. A. and Matsui, Y. (2015). The impact of hard and soft quality management on quality and innovation performance: An empirical study. *International Journal of Production Economics*, 162, 216–226.
- Zhang, L., Luo, Y., Tao, F., Li, B.H., Ren, L., Zhang, X., Guo, H., Cheng, Y., Hu, A. and Liu, Y. (2014). Cloud manufacturing: a new manufacturing paradigm. *Enterprise Information Systems*, 8(2), 167–187.
- Zhang, Q., Feng, X. and Xiang, X. (2016). The impact of quality management practices on innovation in China: The moderating effects of market turbulence. *American Journal of Industrial and Business Management*, 6(3), 291–304.

Annex 1: Methodology

Logistic regressions

Logistic regression assumes that the dependent variable is a stochastic event. Has change been implemented or not? Since it can only be either of these two states, logistic regression thinks in likelihoods of change being implemented or not. Multivariate regression provides an indication of the individual contribution of any single factor and possibly identifies dominant patterns. Typically, the method assumes that the variation of a specific item can be decomposed and attributed to a partial relationship with the predictor variable. The characteristics which are thought to contribute to the outcome must therefore be specified in a well-formulated model. For convenience, the analysis is restricted to innovation only and disregards possible interactions.

The logit, which is the underlying mathematical concept of a logistic regression, is the natural logarithm of an odds ratio. To illustrate this, consider a case in which the distribution of a dichotomous dependent variable (such as employed or unemployed) is paired with a dichotomous predictor variable (university degree/no university degree). One could, for instance, apply a test of independence (such as Chi²). Alternatively, it is also possible to assess the non-graduate's odds of being unemployed. The result is an odds ratio, for example of 3.34¹⁵, suggesting that the risk of being unemployed is 3.34 times higher for the non-graduate than for the person with a university degree. Logistic regression is a very popular approach to analyse the relationship of a dichotomous single dependent variable (such as reported change yes/no) which represents the occurrence or non-occurrence of an event and a number of independent variables.

'Generally' as Peng et al (2002) put it, 'logistic regression is well suited for describing and testing hypotheses about relationships between a categorical outcome variable and one or more categorical or continuous predictor variables'. The outcome variable in this case is whether any kind of change in terms of marketing, organisation, products or processes took place within the three years preceding the survey. Logistic regressions produce odds ratios for all independent variables which are related in the case of categorical variables to the reference category. In the case of continuous variables, the odds ratio refers to an increase of one unit in the independent variable when all other predictors are constant. In more technical terms 'odds ratio means the change in the odds of Y given a unit change in X_j' (Peng et al, 2002). For a more intuitive interpretation, marginal effects are computed. In the current context, marginal effects will show the effect of a unit change in a predictor on the likelihood of reporting innovation. For binary variables the change is from 0 to 1, while for continuous items it represents the instantaneous change.

Synthetic measures

Many of the measures used in this report, were originally developed for the overview report of the ECS 2013 (Eurofound, 2015). In order to ensure the validity of synthetic measures – that is, that they measure what they are supposed to measure – a broad spectrum of validity dimensions was analysed. Variables that comprise indices were selected in such a way that they comprehensively covered the majority of the domain of concepts in question, thus assuring their content validity. They were also selected on the basis of their relevance to the theoretical definition of the concept and previous research (conceptual validity).

Workplace well-being

A continuous variable for workplace well-being was created.

1. The frequency was counted at which the manager answered 'Yes' to the following question: Does the management encounter any of the following problems at this establishment currently? High level of sickness leave (KOSICK). Difficulties in retaining employees (KORETEN). Low motivation of employees (KOLOMOT). (Yes, No).
2. This newly created variable was then standardised to range between 0 and 1. The same was done for the variables capturing the answers to the questions: 'How would you rate the current general work climate in this establishment? Is it very good, good, neither good nor bad, bad, or very bad? (KCLIMATE)' and 'Since the beginning of 2010, the general work climate in this establishment... (Improved, Worsened, Remained about the same)? (KCLIMACH)'.
3. The average of these three variables was taken and the resulting scores were transformed such that they ranged between 0 and 100, with 100 indicating extremely good workplace well-being and 0 indicating extremely poor well-being.

15 The real odds ratio is derived from two odds (in this example, 95% of graduates are employed compared to 5% who are unemployed versus 75% of non-graduates being employed and 25% unemployed => $95/5 : 85/15 = 3.34$).

Establishment performance

A continuous variable for establishment performance was also created. It is based on four questions:

- ‘Since the beginning of 2010, has the amount of goods and services produced by this establishment ... (Increased, Decreased, Remained about the same)? (KGOSEPR)¹⁶.’
- ‘How would you rate the financial situation of this establishment? Is it very good, good, neither good nor bad, bad, or very bad? (KFINAN)’.
- ‘Since the beginning of 2010, has the financial situation of this establishment... (Improved, Worsened, Remained about the same)? (KFINANCH)’.
- ‘Since the beginning of 2010, has the labour productivity of this establishment... (Improved, Worsened, Remained about the same)? (KLABPRCH)’.

These variables were standardised, after which the average was calculated and again transformed to range between 0 (indicating extremely poor establishment performance) and 100 (extremely good establishment performance).

Bundles of workplace practices

These are continuous variables ranging between 0 (minimal number of practices applied) and 10 (maximal number of practices). First, variables were constructed indicating whether or not a specific practice or a combination of practices was in place. The answers were then analysed and collated as described below

Work organisation bundle: (collaboration AND outsourcing in development AND/OR production AND/OR marketing) + (Monitoring of internal quality production OR monitoring of external ideas) + (departments based on functions OR departments dealing with different types of products/services OR departments dealing with specific geographical areas) + (task autonomy AND autonomous teams) + teamwork in place.

Questions involved: GCOLDEDE; GCOLPROD; GCOLMARK; GOUTEDE; GOUTPROD; GOUTMARK; EMONQUA; EEXTEMON; DDEPFUN; DDEPTYP; DDEPGEO; EPLANN; FTEASIN; FTEAMEX.

HRM bundle: (on-the-job training OR paid time-off for training) + (flexibility in starting and ending times OR possibility to accumulate overtime) + (number of variable pay instruments in place).

Questions involved: HTRAIPC; HONJOBPC; HFLEXIPC; HACCUOV; HVBPRES; HVPINPER; HVPGRPE; HVPPRSH.

Direct employee involvement (EI) bundle: (degree of involvement of employees in the decision-making process) + (number of instruments of direct employee involvement in place).

Questions involved: JREGMEE; JSTAFFME; JADHOC; JDISSINF; JSOMEDI; JSUGGS; JSURVEY; E0eA-C.

Finally, the scores were transformed to range between 0 and 10.

Resource index

This is a continuous variable ranging between 0 (minimal resources for the employee representation, ER) and 100 (maximal resources for employee representation). First, a variable was constructed indicating whether or not the employee representative has sufficient time for their duties by combining the answers to the questions:

- Q11. Is there a designated number of hours per week of your working time that you are entitled to spend on your duties as an employee representative? (Yes; No, I am not entitled to use my working time; No, but I can use as much of my working time as is necessary; A full-time employee representative).
- Q13. Is the designated time usually sufficient for fulfilling your duties as an employee representative? (Yes, No).

The answers were combined so that those who answered ‘Yes’ to both Q11 and Q13, or who answered, ‘No, but I can use as much of my working time as is necessary’ or ‘A full-time employee representative’ were coded as Yes and the others as No.

Subsequently, it was counted how often employee representatives answered ‘Yes’ to this newly constructed variable and to Q14: ‘In the last 12 months have you received training related to your role as employee representative? (Yes, No)’; and Q15: ‘Does the [ER-body] have access to funding for external advice? (Yes, No)’.

Finally, the scores were transformed to range between 0 and 100.

16 A small group of establishments was classified as providing public services based on the sampling frame, but was classified as carrying out market activities based on the answers of the manager to the question ‘What is the main activity of the establishment? (DMAINACT)’. Because of their initial classification they were asked ‘Since the beginning of 2010, has the amount of services provided by this organisation... (Increased, Decreased, Remained about the same)? (KSERPROV)’. These answers have been added to an updated version of KGOSEPR.

Information index

This is a continuous variable ranging between 0 (minimal information for employee representation) and 100 (maximal information for employee representation). The variable was constructed by counting how many times the employee representative answered 'Yes' to the following Yes/No questions:

- Q21. In the last 12 months, has management provided the [ER-body] with any information on the following issues: The financial situation of the establishment? (Q21_A); The employment situation of the establishment? (Q21_B); The introduction of new or significantly changed products or services in the establishment? (Q21_C); The introduction of new or significantly changed processes to produce goods or provide services in the establishment? (Q21_D); Strategic plans with regard to the establishment? (for example, business targets, plans for investments, plans to expand activities) (Q21_E).
- Q22. You mentioned that management provided information on the financial situation of the establishment. Did this include expectations for the future?
- Q23. You mentioned that management provided information on the employment situation of the establishment. Did this include expectations for the future?
- Q24. Thinking about all the information management has provided you with in the last 12 months, did you usually receive it in good time?
- Q25. And, in general, was the quality of the information satisfactory?

The scores were subsequently transformed to range between 0 and 100.

Employee representatives' level of influence

A continuous variable was constructed, ranging between 0 (minimal influence) and 100 (maximal influence). The variable was constructed by taking the average score of the answers to two questions:

- Q38. Still thinking about the decision in the area of [sole or most important topic] in this establishment, would you say the [ER-body] had no influence, some influence or a strong influence on the management decision? (No influence, Some influence, Strong influence).
- Q40. You identified other areas in which the management of this establishment recently took major decisions. Would you say the [ER-body] had no influence, some influence or a strong influence on the management decisions in the following areas: The organisation of work processes? (Q40_A); Recruitment and dismissals? (Q40_B); Occupational health and safety? (Q40_C); Training and career development? (Q40_D); Working time arrangements? (Q40_E); Restructuring measures? (Q40_F).

The scores were subsequently transformed to range between 0 and 100.

Employee representatives' trust in management

The variable is based on the answers to the following question: Question 42a-c: Do you agree or disagree with the following statements ...? (Strongly agree, agree, disagree, strongly disagree):

- The management can be trusted.

Management's level of trust in the employee representation

The variable is based on managers' answers to the following question: Q15: 'I will now read out a few statements describing views on employee representation at the establishment. Please tell me – based on your experiences with the employee representation at this establishment – whether you agree or disagree with them? (Strongly agree, Agree, Disagree, Strongly disagree):

- The employee representation can be trusted (IERTRUS; scores reversed).

Descriptive statistics

Table A.1.1 provides the main descriptive statistics of all items used for the measurement of establishment performance, workplace well-being and social dialogue. The performance index and workplace well-being indices are composed of the following indicators. Economic performance – the performance index – is composed of (a) on the assessment of the establishment's current financial situation and (b) on the assessment of changes in its financial situation, labour productivity and production volume in the three years preceding the survey (Eurofound, 2015).

Two aspects interpreted as proxies of workplace well-being were contained in the ECS dataset, forming the workplace well-being index:

- work climate;
- (absence of) human resource problems.

In particular, a high degree of sickness absence was considered to indicate physical or mental health issues among employees in the establishment. Similarly, reported difficulties in retaining employees were read as an indicator of challenging working conditions. Finally, the overview report (Eurofound, 2015) took managers' perceptions of poor employee motivation and a poor or deteriorating work climate to represent negative aspects of the well-being of employees at work.

This information was condensed into two indices, which were subsequently transformed to range between 0 and 100. The measure of workplace well-being was constructed by 'taking the average scores on the items on work climate, change in work climate, problems with employee retention, problems with poor employee motivation and problems with high sick leave' (Eurofound 2015, p.30). The establishment performance index was constructed by taking the average of the standardised scores of the four items described above (work climate, employee retention, employee motivation and sick leave).

Items related to social dialogue mainly stem from the employee representative questionnaire and thus are based on fewer observations. Trust in the employee representative could only be asked in establishments that had formal employee representation in place.

Table A.1.1: Descriptive statistics

Dimension	Variable/index	Observations	Mean	Standard deviation	Min.	Max.
Performance	Performance index	24,471	62.0	25.05169	0	100
	Financial situation	24,471	2.6	1.398869	1	9
	Change in the financial situation	24,471	2.3	1.538434	1	9
	Change in production volume	24,471	3.0	9.665588	1	99
	Change in labour productivity	24,471	1.9	1.362328	1	9
Workplace well-being	Well-being index	24,471	73.1	18.24111	0	100
	Work climate	24,471	2.0	0.732924	1	9
	Change in work climate	24,471	1.9	0.987656	1	9
	Low work motivation	24,471	1.9	0.976197	1	9
	High levels of sick leave	24,471	1.9	0.616283	1	9
Work organisation	Collaboration/outsourcing	24,471	1.0	0.796	0	2
	Monitoring processes	24,471	0.7	0.447	0	1
	Department structure	24,471	0.9	0.354	0	1
	Task rotation	24,471	0.7	0.464	0	1
	Team/task autonomy	24,471	1.0	0.527	0	2
HRM practices	Perceived need to reduce staff	24,471	0.2	0.402	0	1
	Training provided to employees	24,471	33.7	31.229	0	100
	Flexi-time practices in place	24,471	1.0	0.562	0	2
	Variable pay schemes in place	24,471	1.7	1.441	0	5
	Human capital	24,471	2.5	1.665	0	7
Employee involvement	Number of instruments for employee involvement	24,455	3.9	1.688	0	7
	Employee involvement in decision-making	24,471	0.4	0.488	0	1
Social dialogue	Resource index	6,918	59.2	28.19834	0	100
	Information index	6,905	73.4	30.12887	0	100
	Influence index	6,905	42.8	13.1373	0	100
	Level of involvement of employee representatives	6,905	78.8	39.34737	0	99
	Occurrence of industrial action	6,878	0.2	0.391659	0	1
	Trust in management	6,919	2.0	0.718236	0	3
	Trust in employee representation	12,600	2.1	0.682841	0	3

Dimension	Variable/index	Observations	Mean	Standard deviation	Min.	Max.
Workplace practices bundles	HRM bundle	24,471	3.9	1.962	0	10
	WO bundle	24,471	4.9	2.192	0	10
	EI bundle	24,455	5.2	2.276	0	10
Interactions of bundles	WO–EI	24,455	2.7	1.893	0	10
	WO–HRM	24,471	2.2	1.636	0	10
	EI–HRM	24,471	2.0	1.533	0	10

Note: 'WO' = work organisation; 'EI' = employee involvement.

Source: ECS 2013 – Management and Employee Representative Questionnaires

Model validation

The final model (4) was assessed on the basis of several goodness-of-fit measures. First, the likelihood ratio test (comparable to the *F*-test of an OLS regression) which examines the global explanation power of the predictors was carried out. Likelihood ratio tests, which involve estimating and comparing two different models, were applied. The log likelihoods of the two models are compared and differences are tested for statistical significance. Several models were tested against each other using different domain variables until the best model was fitted.

Second the Hosmer–Lemeshow Chi² test was performed, dividing subjects into groups (10) on the basis of predicted probabilities (Lemeshow and Hosmer, 1982). It then computes Chi² from observed and expected frequencies. The Hosmer–Lemeshow statistics show a value of 7.56 with a *p*-value of 0.48. Hence, the null-hypothesis that the model fits the data cannot be rejected.

Third, receiver operating characteristic (ROC) curves were produced to estimate the performance of the model and to assess the resulting probability maps. The ROC technique measures 'the relationship between expected and real changes and calculates the percentage of false-positives and the true-positives for a range of thresholds, and relates them to each other in a chart' (Pontius and Schneider, 2001). The area under the curve varies from 0.5 to 1. The closer the value is to 1 the better the probability assignment is. If the area is 0.5 (45 degrees) the model has no predictive power. Model 4 of this study has an area of 0.79 as can be seen from Figure A.1.

Multicollinearity was checked by looking at correlation matrices and performing variance inflation factor (VIF) tables. In practice, multicollinearity is not relevant, unless identical information is represented in various variables (for example, 'size of establishment' and 'number of employees'). Correlation coefficients of independent variables were computed and no problems were identified. A judgement can be made by checking related statistics, such as the tolerance values or VIF, Eigenvalue and condition number. The tolerance value is calculated as $1-R^2_k$. VIF is just the reciprocal of a tolerance value, thus low tolerances correspond to high VIF. VIF shows how 'inflated' the variance of the coefficient is, compared with what it would be if the variable were uncorrelated with any other variable in the model (Allison, 1999, pp. 48–50). Multicollinearity is not seen as a problem when tolerance values are less than 0.1 or VIF smaller than 10 and the mean VIF of all independent variables should not considerably exceed 1, which would roughly indicate significant multicollinearity. In model 4, no variable had a value above 10 and the overall mean VIF was 2.0.

Finally, several pseudo- R^2 measures were compared, indicating the variance that can be explained by the model. As distinguished from OLS regressions, model estimates from logistic regressions are maximum likelihood estimates achieved through an iterative process. Thus, they are not computed to reduce variance. Several pseudo- R^2 measures have been developed to compensate for this shortfall. However, they cannot be interpreted in the same way as R^2 measures from OLS and different measures will show different results. The pseudo- R^2 s that are produced as standard output from Stata show values of 0.146 for model 1 (demographic information only), 0.191 for model 2 (demographic and single items), 0.181 for model 3 and 0.192 for model 4 (single item + interaction terms)¹⁷. Consequently, up to 19.2% of data variation can be explained by the best model. This is obviously not a lot, but represents an average of results from large-scale data analyses where a lot of variation remains unobserved. For model 4, the McFadden- R^2 shows a value of 0.192 and the McKelvey and Zavoina's R^2 a value of 0.316.

Reporting

Logistic regressions produce odds ratios for all independent variables which are related in the case of categorical variables to the reference category. In the case of continuous variables, the odds ratio refers to an increase of one unit in the independent variable when all other predictors hold constant or in more technical terms 'odds ratio means the change in the odds of *Y* given a unit change in X_j ' (Peng et al, 2002). The odds ratios are directly derived from the regression coefficients and must meet three conditions before they can be interpreted sensibly: the independent variable X_j (i) must not interact with another predictor variable, (ii) must be represented by a single term in the model and (iii) a one unit change in the variable must be meaningful.

17 Applying ER weights and including corresponding variables of the dimension 'employee representation' lead to a value of 0.17 but include only a very limited number of observations.

Table A.1.2: Odds ratios of establishment demographics for change in the establishment (model 1)

VARIABLES	Model 1	Model 2	Model 3	Model 4
Organisational change implemented (2010–2013)	0.290*** (0.00535)	0.226*** (0.00559)	0.234*** (0.00558)	0.225*** (0.00558)
ESTABLISHMENT SIZE (Reference: 10–49 employees)				
50–249 employees	0.0290*** (0.00725)	-0.00232 (0.00718)	0.00574 (0.00718)	-0.00234 (0.00717)
250+ employees	0.0655*** (0.00974)	0.0156 (0.00994)	0.0264*** (0.00986)	0.0151 (0.00992)
SECTORS (Reference: Industry)				
Construction	-0.129*** (0.0115)	-0.115*** (0.0112)	-0.119*** (0.0112)	-0.115*** (0.0112)
Commerce and hospitality	-0.000409 (0.00785)	0.00853 (0.00763)	-0.00387 (0.00763)	0.00949 (0.00762)
Transport	-0.134*** (0.0120)	-0.0943*** (0.0117)	-0.113*** (0.0117)	-0.0935*** (0.0117)
Financial services	-0.0687*** (0.0152)	-0.0660*** (0.0149)	-0.0893*** (0.0149)	-0.0667*** (0.0149)
Business, administration and other services	-0.0483*** (0.00811)	-0.0430*** (0.00815)	-0.0679*** (0.00809)	-0.0433*** (0.00815)
ESTABLISHMENT TYPE (Reference: Headquarters/subsidiary sites)				
Single establishment	-0.0506*** (0.00663)	-0.0250*** (0.00649)	-0.0269*** (0.00651)	-0.0250*** (0.00648)
Number of hierarchical levels	0.00566*** (0.00170)	-0.000768 (0.00146)	0.00107 (0.00149)	-0.000636 (0.00146)
WORK FORCE CHARACTERISTICS				
Share of female workers >20%	0.0483*** (0.00787)	0.0358*** (0.00764)	0.0343*** (0.00768)	0.0355*** (0.00763)
Share of workers aged 50+ >20%	-0.0322*** (0.00696)	-0.0242*** (0.00675)	-0.0233*** (0.00680)	-0.0239*** (0.00675)
Number of employees increased (2010–2013)	0.120*** (0.00687)	0.104*** (0.00669)	0.105*** (0.00674)	0.103*** (0.00669)
Number of employees decreased (2010–2013)	0.00950 (0.00730)	0.00874 (0.00720)	0.0115 (0.00708)	0.0102 (0.00702)
WORK ORGANISATION PRACTICES				
Collaboration AND/OR outsourcing		0.0535*** (0.00363)		0.0535*** (0.00451)
Monitoring of production quality/external ideas		0.0887*** (0.00628)		0.0894*** (0.00672)
Structured in departments		0.0842*** (0.00801)		0.0848*** (0.00830)
Task/job rotation		0.0320*** (0.00598)		0.0321*** (0.00598)
Autonomous teams/task autonomy		0.0164*** (0.00540)		0.0173** (0.00836)
HRM-RELATED ITEMS				
Training in place		0.000437*** (9.69e-05)		0.000459*** (0.000139)
Flexibility measures in place		0.00125 (0.00522)		0.00347 (0.00637)
Variable pay schemes in place		0.0197*** (0.00218)		0.0207*** (0.00467)
Skills (% of workers with university degree >20%)	0.0483***	0.0358***	0.0343***	0.0355***

VARIABLES	Model 1	Model 2	Model 3	Model 4
	(0.00787)	(0.00764)	(0.00768)	(0.00763)
EMPLOYEE INVOLVEMENT				
Number of instruments deployed for employee involvement		0.0184***		
		(0.00198)		
Direct employee participation in decision-making		0.0658***		0.0219***
		(0.00592)		(0.00744)
Employee representation structure present in establishment (or company) = 1, Yes		0.00129	0.00176	0.00252
		(0.00679)	(0.00683)	(0.00677)
BUNDLES OF WORKPLACE PRACTICES				
Bundle 1: Work organisation (WO)			0.0240***	
			(0.00142)	
Bundle 2: HRM			0.0177***	
			(0.00166)	
Bundle 3: Employee involvement (EI)			0.0279***	
			(0.00138)	
HRM–EI configuration				0.0235***
				(0.00528)
HRM–WO configuration				-0.0276***
				(0.00566)
WO–EI configuration				0.0204***
				(0.00419)
Country (Reference: Belgium)				
Bulgaria	0.0696***	0.0441*	0.0549**	0.0448*
	(0.0238)	(0.0230)	(0.0227)	(0.0229)
Czech Republic	-0.0864***	-0.114***	-0.114***	-0.113***
	(0.0206)	(0.0200)	(0.0200)	(0.0200)
Denmark	0.0852***	0.0432**	0.0239	0.0406**
	(0.0212)	(0.0205)	(0.0208)	(0.0205)
Germany	0.0126	-0.00866	-0.0225	-0.00925
	(0.0185)	(0.0177)	(0.0179)	(0.0177)
Estonia	-0.00649	-0.111***	-0.0897***	-0.112***
	(0.0246)	(0.0242)	(0.0242)	(0.0242)
Ireland	-0.00404	-0.0387	-0.0350	-0.0389
	(0.0251)	(0.0241)	(0.0242)	(0.0241)
Greece	0.0664***	0.0362*	0.0681***	0.0365*
	(0.0204)	(0.0198)	(0.0194)	(0.0198)
Spain	0.0284	0.00956	0.0177	0.0100
	(0.0187)	(0.0177)	(0.0178)	(0.0177)
France	-0.0121	-0.000792	-0.00134	-0.00112
	(0.0187)	(0.0176)	(0.0177)	(0.0175)
Croatia	-0.0138	-0.0369	0.00299	-0.0369
	(0.0254)	(0.0244)	(0.0240)	(0.0243)
Italy	0.0368**	0.0449***	0.0540***	0.0442**
	(0.0184)	(0.0172)	(0.0173)	(0.0172)
Cyprus	0.115***	0.0675***	0.0939***	0.0678***
	(0.0240)	(0.0236)	(0.0230)	(0.0235)
Latvia	-0.0826***	-0.153***	-0.123***	-0.154***
	(0.0253)	(0.0244)	(0.0243)	(0.0243)
Lithuania	-0.00877	-0.0513**	-0.0473*	-0.0534**
	(0.0250)	(0.0245)	(0.0242)	(0.0245)

VARIABLES	Model 1	Model 2	Model 3	Model 4
Luxembourg	0.117*** (0.0233)	0.0799*** (0.0225)	0.0991*** (0.0222)	0.0808*** (0.0224)
Hungary	-0.0745*** (0.0204)	-0.0768*** (0.0195)	-0.0604*** (0.0195)	-0.0796*** (0.0194)
Malta	0.0836*** (0.0296)	0.0616** (0.0283)	0.0745*** (0.0282)	0.0581** (0.0283)
Netherlands	0.0109 (0.0203)	-0.0342* (0.0193)	-0.0277 (0.0194)	-0.0338* (0.0193)
Austria	0.0296 (0.0210)	-0.0310 (0.0203)	-0.0438** (0.0206)	-0.0317 (0.0203)
Poland	0.00952 (0.0189)	-0.00280 (0.0181)	-0.00401 (0.0181)	-0.00297 (0.0180)
Portugal	0.107*** (0.0196)	0.102*** (0.0185)	0.106*** (0.0186)	0.100*** (0.0185)
Romania	0.0977*** (0.0233)	0.0757*** (0.0221)	0.0874*** (0.0221)	0.0743*** (0.0221)
Slovenia	0.0251 (0.0248)	-0.0594** (0.0244)	-0.0509** (0.0245)	-0.0596** (0.0243)
Slovakia	-0.0209 (0.0245)	-0.0586** (0.0236)	-0.0546** (0.0237)	-0.0605** (0.0237)
Finland	-0.00798 (0.0211)	-0.135*** (0.0208)	-0.134*** (0.0209)	-0.137*** (0.0209)
Sweden	-0.0492** (0.0209)	-0.131*** (0.0200)	-0.144*** (0.0201)	-0.133*** (0.0200)
United Kingdom	-0.00895 (0.0187)	-0.0279 (0.0181)	-0.0218 (0.0181)	-0.0283 (0.0180)
Female sex of respondent	0.0264*** (0.00635)	0.00851 (0.00618)	0.0163*** (0.00620)	0.00878 (0.00617)
Role of respondent (<i>Reference: Manager</i>)				
Owner/proprietor	-0.00546 (0.0108)	0.00867 (0.0104)	0.00677 (0.0105)	0.00821 (0.0104)
HR manager / Personnel manager	-0.0279*** (0.00796)	-0.0262*** (0.00771)	-0.0265*** (0.00776)	-0.0262*** (0.00771)
Other	-0.0474*** (0.00908)	-0.0342*** (0.00878)	-0.0361*** (0.00884)	-0.0342*** (0.00877)
No answer	-0.0683 (0.0528)	-0.0414 (0.0519)	-0.0369 (0.0522)	-0.0404 (0.0516)
Observations	24,471	24,455	24,455	24,455

Notes: Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; Pseudo- $R^2 = 0.146$.

Source: ECS 2013 – Management questionnaire

In the course of this report, the results of various models with changing dependent and independent variables were presented. Hence, the question of comparability of regression coefficients came up. Mood (2010) prominently stated that logistic regression estimates are affected by omitted variables (unobserved heterogeneity) ‘even when these variables are unrelated to the independent variables in the model’. The implication of this is that odds ratios cannot be interpreted straightforwardly as effect measures and cannot be compared ‘for similar models across groups, samples, or time points, or across models with different independent variable in a sample’ (Mood, 2002, p. 67). Mood herself but also others (Auspurg and Hinz, 2011) suggested the use of average marginal effects for group comparisons instead of odds ratios. In these analyses, the proposal to report average marginal effects when it comes to comparisons of different models was followed.

Annex 2: Regression tables

Table A.2.1: Marginal effects and robust standard errors of models 1–4

Variables	Model 1	Model 2	Model 3	Model 4
Organisational change implemented (2010–2013)	0.290*** (0.00535)	0.226*** (0.00558)	0.234*** (0.00559)	0.225*** (0.00557)
Establishment size (number of employees) (Reference: 10–49)				
50–249	0.0290*** (0.00745)	-0.00232 (0.00718)	0.00574 (0.00720)	-0.00242 (0.00718)
250+	0.0655*** (0.0102)	0.0156 (0.00995)	0.0264*** (0.00991)	0.0150 (0.00995)
Sector (Reference: Industry)				
Construction	-0.129*** (0.0115)	-0.115*** (0.0112)	-0.119*** (0.0112)	-0.114*** (0.0112)
Commerce and hospitality	-0.000409 (0.00782)	0.00853 (0.00760)	-0.00387 (0.00758)	0.00945 (0.00758)
Transport	-0.134*** (0.0119)	-0.0943*** (0.0117)	-0.113*** (0.0116)	-0.0935*** (0.0117)
Financial services	-0.0687*** (0.0153)	-0.0660*** (0.0148)	-0.0893*** (0.0148)	-0.0668*** (0.0149)
Business, administration and other services	-0.0483*** (0.00820)	-0.0430*** (0.00820)	-0.0679*** (0.00815)	-0.0433*** (0.00820)
Establishment type (Reference: Headquarters/subsidiary sites)				
Single establishment	-0.0506*** (0.00668)	-0.0250*** (0.00651)	-0.0269*** (0.00653)	-0.0249*** (0.00651)
Number of hierarchical levels	0.00566** (0.00255)	-0.000768 (0.00144)	0.00107 (0.00167)	-0.000648 (0.00143)
Workforce characteristics				
Proportion of female workers >20%	0.0483*** (0.00788)	0.0358*** (0.00771)	0.0343*** (0.00772)	0.0355*** (0.00770)
Proportion of workers aged 50+ >20%	-0.0322*** (0.00698)	-0.0242*** (0.00677)	-0.0233*** (0.00681)	-0.0238*** (0.00677)
Number of employees increased (2010–2013)	0.120*** (0.00686)	0.104*** (0.00669)	0.105*** (0.00675)	0.103*** (0.00670)
Number of employees decreased (2010–2013)	0.00950 (0.00731)	0.00874 (0.00722)	0.0115 (0.00707)	0.0102 (0.00703)
Work organisation practices				
Collaboration and/or outsourcing		0.0535*** (0.00363)		0.0535*** (0.00456)
Monitoring of production quality/external ideas		0.0887*** (0.00627)		0.0894*** (0.00671)
Structured in departments		0.0842*** (0.00794)		0.0848*** (0.00821)
Task/job rotation		0.0320***		0.0320***

Variables	Model 1	Model 2	Model 3	Model 4
Autonomous teams/task autonomy		(0.00599) 0.0164*** (0.00544)		(0.00599) 0.0175** (0.00838)
HRM-related items				
Training in place		0.000437*** (9.75e-05)		0.000459*** (0.000139)
Flexibility measures in place		0.00125 (0.00528)		0.00348 (0.00644)
Variable pay schemes in place		0.0197*** (0.00218)		0.0207*** (0.00469)
Skills (% of workers with university degree >20%)		0.0168** (0.00724)	0.0158** (0.00726)	0.0168** (0.00724)
Employee involvement				
Number of instruments deployed for employee involvement		0.0184*** (0.00198)		0.000859 (0.00359)
Direct employee participation in decision-making		0.0658*** (0.00596)		0.0232** (0.00935)
Employee representation structure present in establishment (or company)		0.00129 (0.00676)		0.00239 (0.00677)
Bundles of workplace practices				
Bundle 1: Work organisation (WO)			0.0240*** (0.00145)	
Bundle 2: HRM			0.0177*** (0.00166)	
Bundle 3: Employee involvement (EI)			0.0279*** (0.00139)	
HRM–EI configuration				0.0228*** (0.00622)
HRM–WO configuration				-0.0270*** (0.00634)
WO–EI configuration				0.0197*** (0.00514)
Country (Reference: Ireland)				
Belgium	0.00404 (0.0251)	0.0387 (0.0241)	0.0350 (0.0242)	0.0390 (0.0241)
Bulgaria	0.0736*** (0.0271)	0.0827*** (0.0259)	0.0899*** (0.0258)	0.0837*** (0.0258)
Czech Republic	-0.0824*** (0.0251)	-0.0751*** (0.0243)	-0.0793*** (0.0243)	-0.0744*** (0.0243)
Denmark	0.0892*** (0.0258)	0.0819*** (0.0253)	0.0589** (0.0254)	0.0796*** (0.0253)
Germany	0.0167 (0.0235)	0.0300 (0.0228)	0.0126 (0.0228)	0.0296 (0.0227)
Estonia	-0.00245 (0.0280)	-0.0723*** (0.0275)	-0.0547** (0.0276)	-0.0734*** (0.0275)
Greece	0.0704***	0.0749***	0.103***	0.0755***

Variables	Model 1	Model 2	Model 3	Model 4
	(0.0247)	(0.0238)	(0.0235)	(0.0237)
Spain	0.0324	0.0482**	0.0527**	0.0491**
	(0.0235)	(0.0227)	(0.0228)	(0.0226)
France	-0.00802	0.0379*	0.0337	0.0379*
	(0.0236)	(0.0227)	(0.0227)	(0.0227)
Croatia	-0.00978	0.00180	0.0380	0.00218
	(0.0292)	(0.0281)	(0.0281)	(0.0279)
Italy	0.0408*	0.0835***	0.0891***	0.0834***
	(0.0235)	(0.0226)	(0.0225)	(0.0225)
Cyprus	0.119***	0.106***	0.129***	0.107***
	(0.0280)	(0.0274)	(0.0271)	(0.0274)
Latvia	-0.0786***	-0.114***	-0.0881***	-0.115***
	(0.0288)	(0.0279)	(0.0279)	(0.0279)
Lithuania	-0.00473	-0.0126	-0.0123	-0.0142
	(0.0283)	(0.0282)	(0.0274)	(0.0281)
Luxembourg	0.121***	0.119***	0.134***	0.120***
	(0.0274)	(0.0267)	(0.0264)	(0.0266)
Hungary	-0.0705***	-0.0381	-0.0254	-0.0406*
	(0.0249)	(0.0239)	(0.0239)	(0.0238)
Malta	0.0876***	0.100***	0.110***	0.0971***
	(0.0324)	(0.0315)	(0.0316)	(0.0315)
Netherlands	0.0150	0.00447	0.00733	0.00517
	(0.0252)	(0.0243)	(0.0243)	(0.0243)
Austria	0.0337	0.00763	-0.00872	0.00724
	(0.0254)	(0.0248)	(0.0249)	(0.0248)
Poland	0.0136	0.0359	0.0310	0.0361
	(0.0238)	(0.0229)	(0.0228)	(0.0228)
Portugal	0.111***	0.141***	0.141***	0.139***
	(0.0242)	(0.0231)	(0.0231)	(0.0230)
Romania	0.102***	0.114***	0.122***	0.113***
	(0.0276)	(0.0265)	(0.0263)	(0.0265)
Slovenia	0.0291	-0.0208	-0.0159	-0.0206
	(0.0289)	(0.0284)	(0.0288)	(0.0285)
Slovakia	-0.0168	-0.0199	-0.0195	-0.0216
	(0.0288)	(0.0279)	(0.0278)	(0.0280)
Finland	-0.00394	-0.0965***	-0.0994***	-0.0983***
	(0.0257)	(0.0253)	(0.0254)	(0.0254)
Sweden	-0.0452*	-0.0919***	-0.109***	-0.0944***
	(0.0257)	(0.0246)	(0.0247)	(0.0247)
United Kingdom	-0.00492	0.0108	0.0132	0.0107
	(0.0235)	(0.0226)	(0.0227)	(0.0225)
Male gender of respondent	0.0264***	0.00851	0.0163***	0.00879
	(0.00638)	(0.00620)	(0.00624)	(0.00619)
LPOSIT [R2] What position do you hold? = 2, Owner/proprietor	-0.00546	0.00867	0.00677	0.00828
	(0.0108)	(0.0104)	(0.0104)	(0.0104)
LPOSIT [R2] Human resource manager / Personnel manager	-0.0279***	-0.0262***	-0.0265***	-0.0262***
	(0.00800)	(0.00772)	(0.00778)	(0.00772)

Variables	Model 1	Model 2	Model 3	Model 4
LPOSIT [R2] What position do you hold? = 4, Other	-0.0474*** (0.00912)	-0.0342*** (0.00882)	-0.0361*** (0.00891)	-0.0342*** (0.00882)
LPOSIT [R2] What position do you hold? = 9, [No answer]	-0.0683 (0.0515)	-0.0414 (0.0487)	-0.0369 (0.0496)	-0.0404 (0.0484)
Observations	24,471	24,455	24,455	24,455

Notes: Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.2.2: Regression coefficients and standard errors of models 5–6

Variables	Model 5		Model 6	
	Performance	Well-being	Performance	Well-being
Organisational change implemented (2010–2013)	2.095*** (0.306)	-0.775*** (0.243)	1.734*** (0.571)	-0.779* (0.467)
Establishment size (number of employees) (Reference: 10–49)				
50–249	1.039*** (0.350)	-2.832*** (0.278)	0.608 (0.705)	-2.553*** (0.577)
250+	1.513*** (0.469)	-4.387*** (0.372)	1.525* (0.854)	-3.449*** (0.699)
Sectors (Reference: Industry)				
Construction	-5.931*** (0.549)	-0.977** (0.436)	-4.328*** (1.108)	-0.654 (0.907)
Commerce and hospitality	-1.998*** (0.388)	0.854*** (0.308)	-2.192*** (0.815)	-0.0545 (0.667)
Transport	-1.694*** (0.575)	-0.492 (0.457)	-1.692 (1.057)	-0.0936 (0.865)
Financial services	1.404** (0.713)	2.198*** (0.566)	2.898** (1.183)	3.182*** (0.968)
Business, administration and other services	-2.379*** (0.399)	0.513 (0.317)	-2.256*** (0.735)	0.00426 (0.601)
Establishment type (Reference: headquarters/subsidiary sites)				
Single establishment	0.115 (0.320)	0.213 (0.254)	0.262 (0.575)	-0.329 (0.471)
Number of hierarchical levels	0.0978 (0.0748)	-0.254*** (0.0594)	0.228* (0.120)	-0.216** (0.0979)
Workforce characteristics				
Proportion of female workers >20%	1.352*** (0.381)	0.643** (0.303)	1.814*** (0.701)	0.559 (0.574)
Proportion of workers aged 50+ >20%	-1.686*** (0.337)	-1.462*** (0.267)	-0.294 (0.631)	-0.183 (0.517)
Number of employees increased (2010–2013)	11.07*** (0.336)	3.398*** (0.267)	9.655*** (0.660)	2.345*** (0.540)
Number of employees decreased (2010–2013)	-13.41*** (0.346)	-7.080*** (0.275)	-11.92*** (0.633)	-7.423*** (0.518)
Work organisation structure (Reference: Weak structure)				
Moderate	1.472*** (0.323)	0.616** (0.257)	0.494 (0.669)	0.0874 (0.547)
Strong	2.270*** (0.554)	1.679*** (0.440)	1.952* (1.004)	1.409* (0.821)
HRM structure (Reference: Weak structure)				
Moderate	2.661*** (0.347)	0.707** (0.276)	2.373*** (0.742)	1.170* (0.607)
Strong	5.021*** (0.561)	3.338*** (0.445)	5.725*** (1.037)	3.373*** (0.849)
Direct employee involvement structure (Reference: Weak structure)				
Moderate	1.401*** (0.387)	0.793*** (0.307)	1.637* (0.844)	1.336* (0.691)
Strong	3.649*** (0.390)	2.940*** (0.310)	4.742*** (0.833)	4.207*** (0.681)

Variables	Model 5		Model 6	
	Performance	Well-being	Performance	Well-being
Social dialogue				
Resource index (0–100)			-0.0105 (0.0106)	0.00158 (0.00868)
Information index (0–100)			0.0122 (0.0102)	0.0155* (0.00831)
Influence index (0–100)			0.0204 (0.0127)	0.0283*** (0.0104)
Industrial action occurred			-1.660** (0.754)	-2.941*** (0.617)
High trust in employee representation (<i>Reference: low trust</i>)			3.218*** (0.986)	7.676*** (0.807)
High trust in management (<i>Reference: low trust</i>)			1.587* (0.957)	4.582*** (0.783)
Employee representation involvement (<i>Reference: Not informed</i>)				
Informed			0.488 (1.139)	1.436 (0.932)
Consulted			-2.049* (1.211)	-0.168 (0.991)
Involved in joint decision-making			-1.920* (1.125)	0.226 (0.921)
Country dummies (<i>Reference: Belgium</i>)				
Bulgaria	0.431 (1.193)	3.961*** (1.492)	5.074** (2.560)	7.643*** (2.095)
Czech Republic	5.156*** (0.987)	3.371*** (1.135)	5.868*** (2.079)	0.973 (1.701)
Denmark	8.887*** (0.992)	10.71*** (1.423)	8.750*** (1.593)	9.275*** (1.304)
Germany	6.419*** (0.898)	-0.516 (1.085)	3.374* (1.834)	-4.493*** (1.501)
Estonia	10.42*** (1.193)	0.513 (1.409)	11.21*** (2.320)	0.0194 (1.898)
Ireland	5.444*** (1.200)	2.805* (1.500)	3.753 (2.640)	2.322 (2.161)
Greece	-3.273*** (0.989)	2.004 (1.300)	-2.993 (2.353)	7.719*** (1.925)
Spain	-9.767*** (0.892)	-0.0609 (1.121)	-8.679*** (1.582)	2.223* (1.294)
France	1.161 (0.892)	-0.291 (1.090)	0.818 (1.615)	1.233 (1.321)
Croatia	0.553 (1.231)	2.373* (1.430)	4.800** (2.191)	0.170 (1.793)
Italy	-8.922*** (0.885)	-4.551*** (1.106)	-4.378** (1.744)	-2.931** (1.427)
Cyprus	-6.025*** (1.235)	5.162*** (1.644)	-4.702** (2.293)	10.32*** (1.877)
Latvia	6.301*** (1.198)	-0.722 (1.390)	6.630** (3.118)	0.841 (2.552)
Lithuania	4.837***	-2.698*	8.877***	-0.280

Variables	Model 5		Model 6	
	Performance	Well-being	Performance	Well-being
	(1.197)	(1.451)	(2.221)	(1.818)
Luxembourg	6.835***	0.728	6.930***	0.466
	(1.184)	(1.603)	(1.966)	(1.609)
Hungary	-2.004**	-4.381***	-3.203*	-8.886***
	(0.972)	(1.125)	(1.840)	(1.506)
Malta	4.526***	0.388	4.523	1.837
	(1.463)	(1.986)	(3.579)	(2.929)
Netherlands	2.209**	4.420***	1.661	1.068
	(0.969)	(1.214)	(1.644)	(1.345)
Austria	7.438***	3.298**	7.098***	1.456
	(0.986)	(1.313)	(1.748)	(1.431)
Poland	6.067***	-1.108	10.16***	2.149*
	(0.906)	(1.113)	(1.566)	(1.282)
Portugal	-5.280***	-1.452	-5.140**	-2.075
	(0.971)	(1.280)	(2.481)	(2.031)
Romania	7.400***	6.397***	9.012***	6.814***
	(1.191)	(1.547)	(1.933)	(1.582)
Slovenia	-2.198*	-4.041***	-0.829	-3.669**
	(1.196)	(1.508)	(1.911)	(1.564)
Slovakia	4.464***	1.886	6.275***	-0.263
	(1.196)	(1.362)	(2.162)	(1.770)
Finland	3.136***	4.000***	3.615**	3.101**
	(1.009)	(1.310)	(1.579)	(1.292)
Sweden	5.477***	8.847***	4.904***	7.366***
	(0.984)	(1.256)	(1.563)	(1.279)
United Kingdom	9.341***	7.455***	1.457	2.117
	(0.899)	(1.105)	(2.189)	(1.791)
Other				
Male respondent	1.936***	-0.219	2.562***	1.175**
	(0.308)	(0.391)	(0.571)	(0.467)
LPOSIT. [R2] What position do you hold? = 2, Owner/ proprietor	-3.336***	-0.310	-1.397	0.850
	(0.543)	(0.659)	(1.481)	(1.212)
LPOSIT. [R2] What position do you hold? = 3, Human resource manager/Personnel manager	-0.212	-0.702	-0.733	-1.321**
	(0.389)	(0.494)	(0.747)	(0.612)
LPOSIT. [R2] What position do you hold? = 4, Other	-0.504	-0.980*	-1.364	-1.844**
	(0.446)	(0.545)	(0.890)	(0.729)
LPOSIT. [R2] What position do you hold? = 9, [No answer]	-2.186	4.304	5.474	-2.337
	(2.599)	(2.821)	(6.808)	(5.572)
Constant	51.55***	71.64***	48.05***	57.86***
	(1.127)	(1.385)	(2.370)	(1.940)
Observations	24,471	9,329	6,863	6,863
R-squared	0.272	0.140	0.246	0.183

Notes: Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Annex 3: Correlations between performance and well-being

What can be seen from Table A.3.1 is that there are strong correlations between performance and well-being suggesting solid links of internal and external outcomes (0.41). As a consequence it can be expected that factors explaining one of the variables will also be valid predictors for the other. It can actually be seen from the analysis that correlations between performance and many of the variables included are comparable to the correlations of well-being and these variables. There are however also notable differences.

Correlations of workplace practice bundles are moderate but strongest between well-being/performance and direct employee involvement, while higher correlations are observed between the HRM bundle and performance (0.167) than between HRM and well-being (0.089).

Among the items covering social dialogue, the highest (negative) but still very moderate correlations are observed between the occurrence of industrial action and both well-being (-0.124) and performance (-0.112). This is an indication that a conflictual organisational climate has negative impacts on the overall outcome of the establishment, a result which is also in line with former research.

Table A.3.1: Correlations between key variables

	Performance	Well-being	HRM bundle	WO bundle	EI bundle	Occurrence of industrial action	Resource index	Information index	Influence index
Performance	1								
Well-being	0.405	1							
HRM bundle	0.1669	0.0885	1						
WO bundle	0.1154	0.1092	0.2624	1					
EI bundle	0.1767	0.1679	0.3088	0.2943	1				
Occurrence of industrial action	-0.1126	-0.124	n.s.	n.s.	n.s.	1			
Resource index	n.s.	n.s.	0.0453	0.0492	0.0825	-0.0389	1		
Information index	0.0867	0.0843	0.1265	0.1139	0.1382	-0.0607	0.1791	1	
Influence index	0.0518	0.0741	n.s.	n.s.	0.0339	-0.0472	0.1706	0.2498	1

Notes: All correlations shown are significant at the 0.01 level.

Source: ECS 2013, unweighted data

Innovation is an important driver of improved competitiveness, productivity and growth potential. This report explores which workplace practices have the strongest links to innovative company behaviour, looking at innovation in the form of new or significantly changed products or processes, new or improved marketing methods, and organisational change. It also explores links between innovation and company performance and workplace well-being, and examines the role of social dialogue in enhancing performance, well-being and innovation. The use of monitoring instruments for internal quality and external developments turned out to be among the strongest determinants of overall innovation; the degree of workers' autonomy was another important factor. The probability of innovation is boosted when strong work organisation structures are combined with direct employee participation – for instance, involvement in solving problems or improving the quality of production.