

Labour market change

# **Associations of workplace practices, innovation and performance with changes in employment**

[Third European Company Survey – Overview report:  
Workplace practices – Patterns, performance and well-being](#)

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## Abbreviations used in the paper

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CEO	Chief Executive Officer
CIS	Community Innovation Survey
DF	Degrees of Freedom
DIY	Do-It-Yourself
ECS	European Company Survey
EESC	European Economic and Social Committee
ERM	European Restructuring Monitor
EU	European Union
GEM	Global Entrepreneurship Monitor
HCWS	High Commitment Work Systems
HIWS	High Involvement Work Systems
HPWS	High Performance Work Systems
HR	Human Resources
HRM	Human Resource Management
LCA	Latent Class Analysis
NACE	Nomenclature statistique des Activités économiques dans la Communauté Européenne (Statistical classification of economic activities in the European Community)
R&D	Research and Development
SDG	Sustainable Development Goal
SME	Small- or Medium-sized Enterprise

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## Introduction

Employment growth is at the heart of the European and national policy priorities. Creating more and better jobs was already part of the European employment strategy in the 1990s which set specific objectives for Member States. Meeting the European Union (EU) objective for more and better jobs meant that different mechanisms had to be mobilised. The importance of the work environment and work organisation was also acknowledged as contributing to better jobs and better organisations. The European Commission policy document (European Commission, 1998) ‘Modernising the organisation of work - a positive approach to change’, recognised that new ways of working would contribute towards creating productive, learning and participative organisations. Employment issues and priorities continued to be a priority and are part of the Europe 2020 strategy (European Commission, 2010) which promotes smart, sustainable and inclusive growth.

In 2011, the European Economic and Social Committee (EESC) launched its opinion on innovative workplaces as a source of productivity and quality jobs (EESC, 2011) which argued it is the task of the EU to support Member States in increasing workplace innovation. The EESC invited the European Commission and Member States to reflect on ways of organising work that enhance innovativeness. This was followed by the creation of the European Workplace Innovation Network which has been a European initiative to stimulate workplace innovation and disseminate successful experience across Member States and workplaces.

With the 10 EU policy priorities for 2015-2019<sup>1</sup>, the European Commission entered a new approach to policies on the key challenges for the European economies and societies. The jobs, growth and investment plan (European Commission, 2014) aims at strengthening job creation in Europe as, it is pointed out, *‘it is mainly companies that create jobs, not governments or EU institutions’*.

The European Semester process systematically monitors and coordinates the Europe 2020 growth strategy. This entails a close cooperation between Member States and EU institutions. The Innovation Union strategy, which is a Europe 2020 flagship initiative, aims to improve Europe’s capacity to innovate. In the 2017 State of the Union Address, President Juncker presented his new proposals. Among them, the new Industrial Policy Strategy features prominently as it aims to help the European industry to lead globally in innovation, digitisation and decarbonisation. In the Communication ‘Next steps for a sustainable European future’ (COM(2016)739) the European Commission presents its commitment to the 2030 Agenda and the Sustainable Development Goals (SDGs). Full and productive employment and decent work (SDG 8) as well as innovation (SDG 9) are among the goals to be monitored by the European Commission.

This illustrates that issues to do with job creation, innovation and business performance feature prominently on the EU policy agenda, and, with the recent economic crisis, have become even more important. Apart from policy initiatives that are particularly geared at stimulating innovation, policy is oriented towards promoting workplace practices that increase the innovativeness and performance of European workplaces and with that employment growth. However, very little evidence is available that explicitly links workplace practices with employment change. Furthermore, most debates about employment growth and job creation refer to the net effect on the level of the economy or a sector, whereas the impact of workplace practices on innovation, performance, and ultimately employment is likely to be different at different levels.

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<sup>1</sup> ([https://ec.europa.eu/commission/priorities\\_en](https://ec.europa.eu/commission/priorities_en))

This paper focuses on changes in employment at the workplace level. From an analytical and policy point of view, the establishment level is important as most company decisions to hire or fire take place at this level. Such company decisions can affect local or regional areas and have implications for policy priorities (for instance, training, unemployment benefits) in the short term and the long term. Also, workplace practices such as work organisation, human resource management, and employee participation are implemented at the establishment level. Workplace practices are closely related with the innovativeness and performance of workplaces. Furthermore, in the policy debate outlined above, innovation is often perceived to be a key part of ensuring competitiveness. In the academic debate, it is argued that different types of innovation (product, process, and marketing) have different effects on employment at the workplace level. However, the empirical results are ambiguous, indicating a need for further evidence to support policy making in this area. Similarly, performance and labour productivity are often argued to affect company growth, but evidence is scant and inconsistent. This paper will therefore not only look at the associations of workplace practices, innovation and performance with employment, but also at the way they are associated with each other.

The third European Company Survey (ECS 2013) dataset is used to analyse the associations between these concepts. This third edition of the ECS was conducted in 2013 and gathered data at establishment level through interviews with managers and, where available, employee representatives. The interviews contained questions on workplace practices regarding work organisation, human resource management, direct employee participation and social dialogue, as well as on innovation and establishment performance.

### *Research questions*

The aim of this paper is to explore the links between innovation, performance, workplace practices and employment change. Previous Eurofound work showed that certain bundles of workplace practices are associated with better performance (Eurofound, 2015), and that they are also associated with innovation (Eurofound, 2017). In this paper, these associations will be explored further, and it will be assessed how workplace practices, innovation, and performance are associated with employment change. The research questions are the following:

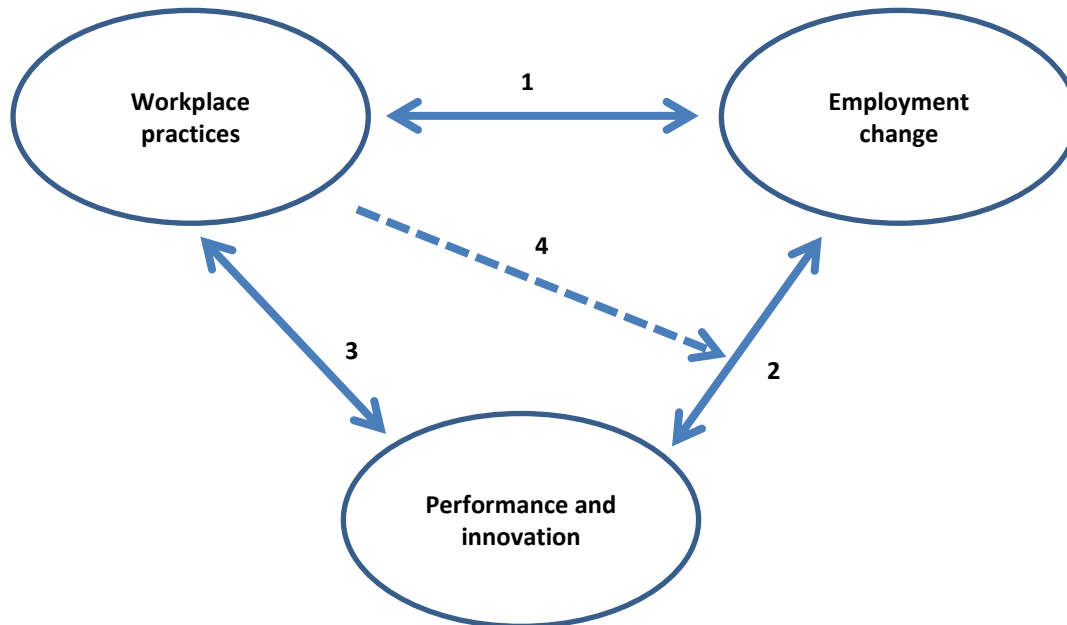
1. *What is the relationship between changes in employment and:*
  - a. *workplace practices regarding work organisation, human resource management, direct participation and social dialogue;*
  - b. *innovation;*
  - c. *financial performance, productivity and production volume?*
2. *To what extent do associations between innovation and productivity and changes in employment differ between workplaces that have different bundles of workplace practices in place?*

The paper investigates four broad associations that are outlined in figure 1. It will look at the direct relation between workplace practices and employment change (arrow 1) and between performance and innovation and employment change (arrow 2).

It will also look at the indirect relationships between workplace practices and changes in employment (increase, decrease or stability). It will explore to what extent the relationship between workplace practices and changes in employment is mediated by the associations between performance and innovation and changes in employment (arrows 2 and 3). In other words, the paper will look at the extent to which workplace practices are associated with performance and innovation, and to what extent the direct link between workplace practices and employment change can still be observed when taking performance and innovation into

account. Another type of indirect relationship that will be analysed is the extent to which the associations between performance and innovation and employment change differ across establishments in which different bundles of workplace practices are in place (arrow 4).

Figure 1: Research model



Source: authors

The next section will cover insights gained in previous research with regard to each of the arrows in figure 1. The paper will then go on to discuss in more detail what data are used to explore the expected relationships. It will then provide a detailed overview of the direct relationships between workplace practices, innovation, performance and employment change, followed by a more rigorous test of the broad and some of the more detailed expectations. Finally, conclusions are drawn and the implications of the findings as well as the drawbacks and advantages of the analytical approach will be discussed.

## Expectations based on previous research

### Internal and external factors affecting employment growth

Different economic theories and approaches have discussed company growth. One stream, which had a significant influence on the development of strategic management field, has approached company growth as an evolutionary and cumulative process of learning in which ever-increasing knowledge helps creating opportunities for expansion (Penrose, 1959). The way company resources are combined creates rather idiosyncratic configurations for which management's role is critical.

A large body of empirical work has focused on employment growth in small and medium-sized companies (SMEs; for instance, Ardic et al. 2011; Criscuolo et al., 2014; De Kok et al., 2011; Forth et al., 2006; Neumark et al., 2011; Onkelix and Sleuwaegen, 2010; Westhead and Cowling, 1995). Eurofound, in the 2015 Annual Report of its European Restructuring Monitor (ERM) has identified dynamic and non-dynamic job creators among SMEs as well as

drivers and barriers to job creation in SMEs (Eurofound, 2016). Based on the literature and a series of interviews the report distinguishes between external and internal factors. External factors include the macroeconomic situation, business environment, public support, access to finance, labour law, availability of required workforce, etc. A number of structural factors (for instance, size, age), but also strategy, market, capacities and skills, attractiveness of the business in the labour market, characteristics of the owner/manager were among those internal factors influencing job creation in SMEs.

Beyond the SME literature, several other studies have looked in more detail at determinants of growth in companies of all sizes, looking at size and age of the company, strategy (mergers and acquisitions, diversification level, business strategy), governance (board characteristics, ownership structure), CEO characteristics, outcomes for individuals (for instance, job satisfaction, trust), sectoral factors (for instance, sector-specific, demand, technological and capital intensity, competition), and macroeconomic or macro-environmental factors (such as economic environment, institutional environment).

Size and age of a company have been found to be associated with employment growth: small and young companies tend to grow faster than large and older ones (for instance, Hall, 1987; Hart, Oulton, 1996; Lotti et al., 2003; Coad, 2009). However, some researchers (Caves, 1998) have argued that above a certain size threshold the negative association with growth is not present anymore.

Evidence suggests that multi-establishment companies have higher growth than single-establishment companies (Variyam and Kraybill, 1992; Geroski and Gugler, 2004). Also, establishments which are part of a large company appear to grow faster than single stand-alone establishments (Dunne et al., 1989).

Several studies investigated the effects of mergers and acquisitions on employment. Budros (2000) found that mergers in manufacturing were more likely to result in employment decrease than mergers in the financial sector. Few studies have examined the relationship between business strategy at corporate or business level and employment. Hillier et al. (2006) and Coucke et al. (2007) studied product diversification strategy and the likelihood of employment decline but they produced diverging results.

Other company-specific factors include governance and CEO manager/owner characteristics. Perry and Shivdasani (2005) found that boards with a large share of independent, outside directors were more likely to downsize. CEO skills and demographics have been shown to affect growth (Budros, 2000, 2004; Hallock, 1998).

There are a number of studies showing difference between sectors of activity in employment growth. High technology industries have been found to be associated with higher growth rates. Baumol et al. (2003) found that these types of companies were less likely to decrease employment. The so called 'gazelles, fast growing companies that create a large share of new net jobs seem to exist in all industries, including services, however the positive employment effect tends to decline over time (for instance, Henrekson and Johansson, 2009).

Furthermore, market concentration is also linked with employment growth (Geroski and Gugler, 2004).

Macroeconomic and macro-environmental conditions have been found to be linked with employment growth. Some researchers support the argument that under conditions of declining demand companies are more likely to decrease employment (Baumol et al., 2003; Wagar, 1997). Furthermore, in cross-national comparisons, it was found that the GDP growth rate is positively correlated with company growth (Beck et al., 2005). Others present evidence of growth variation over the business cycle (Higson et al., 2004). Deregulation and privatisation has been found to be associated with employment decrease (Budros, 1997, 2002). Reviewing relevant literature, Coad (2007) notes that variation in company growth rates is greater between sectors than between countries.



It is important to acknowledge that companies do not follow a constant growth pattern. Employment growth is not a linear phenomenon and it should not be assumed that once companies establish certain conditions they will continuously grow. There may be fluctuations (Dobbs and Hamilton, 2006) in activity and employment; during certain phases of the company life employment might grow while in other phases companies might undergo stability or even decline (Smallbone et al., 1995; Beaver, 2002; Tarantino, 2004). Finally, as desirable as the company growth may be from a policy perspective, it is however 'neither irresistible nor inevitable' (Coad, 2007, pp.39). Companies may simply not wish or be able to grow. Pursuing a strategy of moderate employment growth or stability may better ensure company sustainability (securing existing jobs) than short-lived employment expansion.

The analysis presented in this paper considers many of the internal factors associated with employment growth presented above. Controls will be included for the size, type, age and sector of activity of the establishment. By including country dummies, external factors such as macro-environmental and macroeconomic conditions are, at least partially, accounted for. Due to lack of data, mergers and acquisitions and characteristics of the owner or CEO are not examined or controlled for in this paper.

## **Employment and workplace practices**

Research on the relationship between workplace practices and employment usually starts from management theories, which aim to explain differences in company performance, and in which employment, if considered at all, is often seen rather as a possible explanation.

The strategic management theory and particularly the resource-based view analysed the role of strategic resources, including human resources, as primary determinants of performance (for instance, Barney, 1986, 1991; Rumelt, 1984). These resources on their own may not be productive; however, their combination enables a company to devise and implement strategies which can improve its efficiency. It is argued that this combination is unique to each company. This can offer the possibility for expansion and growth to a company.

The Human Resource Management (HRM) literature defines the HR system as a set of work practices and employment practices. Work practices refer to the way work is organised, decisions are taken, teams and individuals work together, how they solve problems, how work processes are changed, etc. Employment practices refer to practices dealing with how organisations recruit, retain, develop, motivate, consult their workforce about work issues, etc. (Boxall and Macky, 2009). The High Performance Work Systems (HPWS) school of thought argues that there are systems of workplace practices that lead to superior performance. These systems are based on a clear identification of the tasks that need to be done in the workplace, close alignment – by recruitment and training – of the skills of the workers and the tasks they are assigned, as well as high levels of involvement of staff in the way work processes are designed, and high levels of autonomy in tasks are executed. Variations of HPWS put more emphasis on employment practices that ensure high levels of commitment among staff (High Commitment Work Systems, (HCWS), Walton, 1985) or put more focus on the motivational factors that enhance involvement and engagement (High Involvement Work Systems (HIWS), Lawler, 1986). Examples of practices that are considered important in different industries are among others, employee suggestion schemes, quality circles, problem solving teams, team work, job rotation, decision-making, etc.

### *Direct links between workplace practices and employment*

Few empirical studies explored the direct link between workplace practices and employment change and findings are often contradictory.

Osterman (2000), Zatzick and Iverson (2006), and Iverson and Zatzick (2007) found that companies making greater use of HCWS are more likely to engage in workforce downsizing. Their explanation for this finding is that in these workplaces, the use of HCWS tends to be part of a more general movement towards increased efficiency and productivity. Downsizing is part of their transformation away from traditional management structures – which includes the reduction of managerial ranks to empower front line workers. The redesign of work requires fewer people and the elimination of positions that do not fit in the new work environment. For example, team-based work often reduces the need for managers (Osterman 2000). Moreover, the use of these HR practices leads to a more competent, committed workforce and a possibility to use leaner staffing. Osterman (2000) suggests that employees may be willing to accept a reduction in the number of jobs as a trade-off against the benefits of working in a high-commitment environment. This flexibility allows high-commitment workplaces to respond quickly to competitive changes in the environment. Using data from the Canadian workplace and employee survey Zatzick and Iverson (2006) examined the associations between HIWS and workplace trends of downsizing and the intersection between them. The authors argue that ‘[a]lthough layoffs may not be the first option for managing workforce capabilities, our results suggest that layoffs may be tolerable within high involvement workplaces, as long as investments in high involvement workplace practices are continued’ (Zatzick and Iverson, 2006, pp.1009).

On the other hand, a stream of HRM research (Arthur, 1994, Huselid 1995, Ball and Colvin 2011) demonstrates that HPWS/HIWS are associated with lower dismissal rates, employee turnover and higher productivity and corporate financial performance. Batt and Colvin (2011) distinguished between voluntary staff turnover and dismissals and found that high involvement work organisation practices are associated with significantly lower quit and dismissal rates.

The presence of employee representatives in the workplace can also be seen as an important aspect of human resource management. Looking at large companies Wager (1997) found no relationship between downsizing and the presence of trade unions in the workplace while others provided evidence of a negative relationship (Baumol et al, 2003; Redman and Keithley, 1998).

### *Workplace practices and innovation and performance*

As is illustrated in figure 1, links between workplace practices and employment might be indirect rather than direct. The presence of certain workplace practices could boost innovation, which in turn might increase employment through better performance results. Alternatively, the employment effects of innovation and performance might be different, depending on the workplace practices that are in place.

A few large-scale quantitative studies in the field of the empirical economics of management (for instance, Bloom and Van Reenen, 2010a; Bloom et al., 2014) provide evidence that management practices matter both qualitatively and quantitatively for company level performance. It is argued that some types of HRM (and management in general) are ‘on average likely to be the right ones for all companies to adopt’ (Bloom and Van Reenen, 2010b pp.49). Some of the management practices positively associated with performance include training of staff, recognising the importance of skills and training, variable pay schemes, work organisation, monitoring performance, setting targets, etc.

In an extensive literature review Seeck and Diehl (2017, pp.1) concluded that practices fostering ‘employee commitment, loyalty, learning and intrinsic motivation are conducive to innovation’. Jimenez-Jimenez et al. (2008) identified positive links between innovation and flexibility, communication, teamwork, autonomy, employee participation, training, employment security, career paths, systematic performance appraisals and variable pay

rewards. Using a sample of Danish companies Lundvall (2002) found that learning organisations were more likely to innovate. Kim et al. (2012) and Zhang et al. (2016) found positive associations between quality management practices (process management) and innovation. Eurofound (2017) examined the associations between workplace practices and innovation. With regard to work organisation, the study provided evidence that a number of single practices and their combinations were significantly and positively associated with innovation. Those included quality management and knowledge transfer, task rotation, collaboration and outsourcing and employee autonomy in decision making. Certain HRM practices were positively and significantly associated with innovation; those included training, variable pay and skilled workforce. Bundles of work organisation and HRM practices which encouraged employee participation were very strongly associated with innovation.

This paper will further examine the extent to which workplace practices are associated with changes in employment. It will look at the direct associations of individual practices, as well as at the associations of bundles of practices. With regard to the latter, the literature suggests that bundles of practices that resemble HPWS are positively associated with innovation and performance, whereas the evidence with regard to direct links with employment is limited and inconsistent. This paper will look at these direct associations but will also explore to what extent associations between workplace practices and employment are mediated by innovation and performance and to what extent associations between innovation and performance and employment are moderated by workplace practices.

## **Employment and innovation**

Historically, economists have recognised that innovation is a main source of economic growth and influences employment at company, sector, and economy levels. Certain forms of innovation can have a labour friendly effect or may be linked with employment shedding at company level. At sector or economy level, the workforce may shift from a less productive sector to a more productive one, and therefore the overall effect may be the opposite of the effect observed at the individual company level.

Literature usually distinguishes between product and process innovation. Both types of innovation are expected to affect employment, but their effects are not entirely clear. In the case of product innovation, the quality and variety of products is improved, which may open up new markets (increased demand), resulting in higher production and consequently the need for increased employment. However, it is also possible that new products displace the existing ones, so having a negative effect on employment related to the initial products (substitution effect) (for instance, Antonucci and Pianta, 2002; Edquist et al., 2001; Katsoulakos, 1984; Piva and Vivarelli, 2003, 2004).

The introduction of process innovations may result in efficiency gains (lower unit cost). Process innovation has been argued to be efficiency-driven and efficiency mainly aims at reducing production cost (Davenport, 1993 Flynn et al., 1999). Usually the outcome is higher input productivity (same or increased amount of output produced with lower input) at lower cost and loss of employment. However, process innovation can also lead to a reduction of prices which can drive an increase in demand, production volume and ultimately employment.

There has been a proliferation of microeconomic studies in this field in the last 10 to 15 years, using longitudinal datasets and sophisticated econometric analyses. Earlier studies (Van Reenen, 1997; Blanchflower and Burgess, 1998, Piva and Vivarelli, 2004) found overall positive relationships between product innovation and employment. Less straightforward results with regard to the relationship between employment and innovation were found by Klette and Forre (1998) who analysed a database of more than 4,000 Norwegian manufacturing companies over a ten-year period. Distinguishing between product and process

innovation some scholars (Greenan and Guellec, 2000; Hall et al., 2008) found a positive link regardless of the type of innovation. More diverging findings have emerged with regard to process innovation. Harrison et al. (2008), using the Community Innovation Survey (CIS) company level data in the manufacturing and services sector in Germany, France, Spain and the UK, found that process innovation tends to displace employment. On the other hand, Lachenmaier and Rottman (2011), who analysed panel data (1982-2002) of German manufacturing companies, reported stronger positive employment effects of process innovation than product innovation.

More recent studies exploring the role of high tech and high employment growth companies (Coad and Rao, 2011) found a strong link between innovation and employment, particularly for high growth companies. Bogliacino et al., (2012) analysed panel data of 677 European companies in the manufacturing and services sector for the 1990-2008 period. Their work shows positive employment impacts of innovation (research and development (R&D)) in the services and high-tech manufacturing sectors but not in traditional manufacturing. Similar findings were reported by the Van Roy et al. (2015) study of an EU-wide panel database of 20,000 patenting companies in the manufacturing and services sectors for the study period 2003-2012. The positive employment impact of innovation was significant only for the high and medium-tech firms in manufacturing and non-significant in low-tech manufacturing and services. In a study to explore better ways of measuring the share of high growth innovative companies, and based on the CIS 2012 dataset, Vertesy et al. (2017) argue that high growth firms are less likely to be associated with new-to-market product innovation and more with process innovation.

In addition to these two forms, marketing innovation can have an impact on employment growth. Marketing methods usually improve access to markets and consumers. Often market innovation is complementary to the product and process innovation. Bhaskaran (2006) and Rammer et al. (2009) found that marketing innovation may be a very attractive form of innovation for small and medium-sized enterprises as it is less costly than other innovation forms. Medrano and Olarte-Pascual (2016) also showed that some sectors are more likely to introduce marketing innovation. The outcomes of marketing innovations may increase demand for the product or service and hence employment, but this has not been much researched.

The evidence suggests that the type of innovation matters when it comes to the effect on employment change at company level. Many studies show that at company level product innovation is often associated with employment growth but that there is variability in the strength of the association. Process innovation is sometimes found to be positively, and other times found to be negatively associated with employment growth. Marketing innovation is much less explored in literature. This paper will explore the associations of the three types of innovation with employment. It is expected that those establishments that have introduced new products or services are more likely to report increases in employment; that those that introduced new processes and technological changes are more likely to report decreases in employment; and that those that introduced new marketing methods are more likely to report increases in employment. However, these associations might differ, depending on the workplace practices that are in place.

## **Employment and performance**

Theory suggests that more profitable companies grow while less profitable ones decline (Nelson and Winter 1982). The argument is that profitable companies can expand their services and products and gain a bigger market share. As much as these arguments appear to be common sense, there is a lack of empirical research and the empirical studies have found it hard to find support for them. In this context Coad (2007, pp. 26) hypothesised that 'many of the productive companies may not actually seek to grow or may be unable to grow'.

Regarding financial performance, the evolutionary theory put forward the principle of the 'growth of the fittest' (Alchian, 1950, Winter, 1971, Metcalfe 1998). Financial performance can be taken as a proxy for economic fitness. Empirical evidence is lacking, and the few studies (Bottazzi et al., 2006) have shown a weak link between financial performance and growth in terms of sales.

The relationship between productivity and employment growth is an ambiguous one, with some researchers failing to find a significant relationship between productivity and employment growth (for instance, Bottazzi et al., 2002 and 2006; Foster et al., 1998) while others found that among companies that experienced increases in labour productivity the group that also experienced increases in employment was equally large as the group of companies that experienced decreases in employment (Baily and Farrell, 1996). Aghion et al., (2008) found a higher positive relationship between productivity and growth in the US than in Europe.

The relationship between the production volume and employment growth is often linked with other organisation outcomes, such as productivity. All other things equal, an increase in production volume would require additional human effort, which would ultimately require an increase in employment. Similarly, if production volume decreases, it can be expected that less staff is needed.

There is a recognised need for empirical work on company growth (Coad, 2010). This paper will look at associations between the current financial situation, as well as changes in the financial situation, changes in labour productivity and changes in production volume and changes in employment. As indicated above, it will also assess whether those associations differ, depending on the workplace practices that are in place.

## **Data and methodology**

### **Third European Company Survey**

The data that are used in this paper were collected in Eurofound's third European Company Survey (ECS 2013).<sup>2</sup> The ECS 2013 was carried out in probability-based samples of establishments with at least 10 employees, in all Member States of the European Union and the candidate countries. Fieldwork was carried out in 2013 by Gallup Europe. Interviews were held by telephone in the language(s) of the country. The ECS 2013 looked at workplace practices with regard to work organisation, human resources management, employee participation and social dialogue in European workplaces. It also captured a range of variables on the structural characteristics of the establishment, as well as on innovation, workplace wellbeing and establishment performance.

The samples are stratified by sector and establishment size, and cover all sectors of activity, apart from agriculture, households as employers, and extraterritorial organisations (NACE Rev 2 categories A, T, and U). The sample size for the ECS 2013 ranged between just over 300 interviews in the smallest countries and around 1,650 in the biggest countries adding up to a total of 30,113 establishments.

A special feature of the survey is that interviews take place with the manager responsible for human resources in the establishment and when possible with an employees' representative. Two different questionnaires were administered as part of the survey.

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<sup>2</sup> See: <https://www.eurofound.europa.eu/surveys/european-company-surveys/european-company-survey-2013>

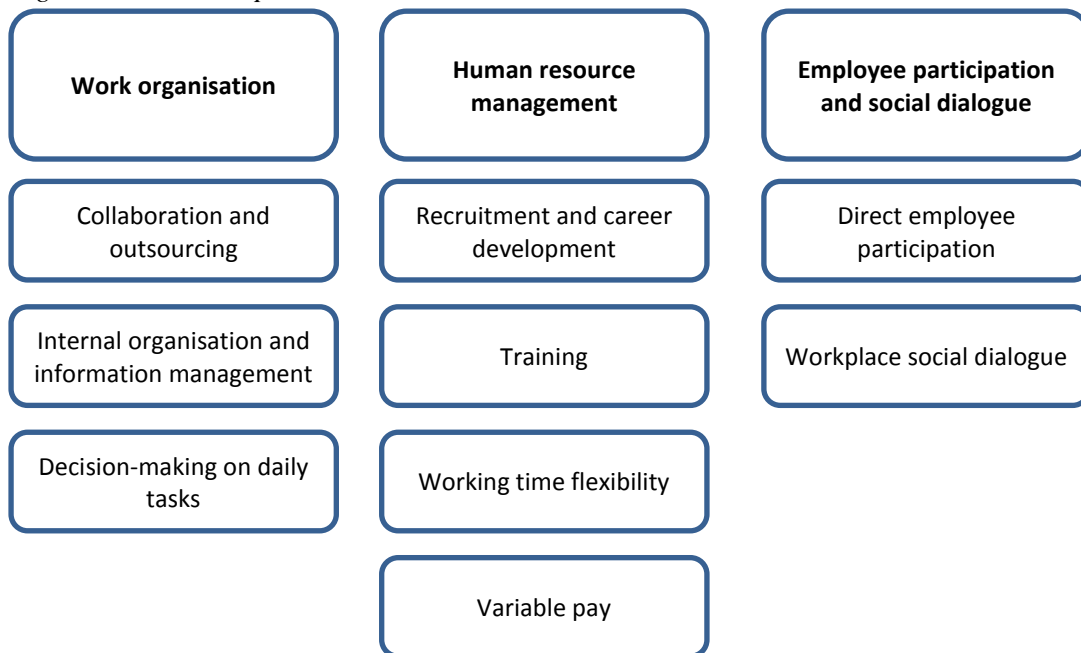
The analyses for this paper are based on the answers provided by the management representative only. Furthermore, they are limited to establishments in the 28 EU Member States that are carrying out market activities (NACE Rev 2 categories B-N, R and S). Implications for sample size are discussed below.

As the analysis uses many summary variables, it is not feasible to discuss the question wording for all the questionnaire items that are included in the analyses. An overview of the questionnaire items that were used for the construction of the variables in the analysis is provided in annex 2.<sup>3</sup>

### Latent class analysis

Latent class analysis (LCA) is a multivariate statistical technique which can be applied to a set of observed variables in order to identify categorical latent constructs. Latent class models allow for inclusion of broad range of observed variables such as ordinal, continuous and counts, but also for creation of ordinal latent classes, thus allowing for identification of dimensional constructs along with categorical ones (see, for example, Magidson and Vermunt, 2003; Vermunt, 2003). In order to determine how many classes are necessary to correctly describe variation in observed variables, models with increasing number of classes were estimated and then compared in terms of fit, sparseness and interpretability. Analyses were carried out using Latent GOLD (Vermunt and Magidson, 2005, 2008).

Figure 2: Nine subtopics



Source: authors

In the overview report of the ECS 2013 LCA were used to summarise the information on a wide variety of indicators (Eurofound, 2015). Establishments were grouped together based on

<sup>3</sup> The question wording can be found in the questionnaire which is published here: [https://www.eurofound.europa.eu/sites/default/files/ef\\_files/surveys/ecs/2013/documents/3ecsquestionnairemm.pdf](https://www.eurofound.europa.eu/sites/default/files/ef_files/surveys/ecs/2013/documents/3ecsquestionnairemm.pdf)

common characteristics – such as the bundles of workplace practices they have put in place. Groupings were created for nine subtopics (see figure 2). The results from the LCA on each of the subtopics were subsequently included in a final model which ‘bundled the bundles’ and grouped establishments together in five groups.<sup>4</sup>

Ideally, the LCA solutions reported in Eurofound (2015) would have been used in the analyses for this paper, to assess the associations between bundles of workplace practices and changes in employment. However, one of the nine subtopics - recruitment and career development – would create a problem of endogeneity when relating the results of the final model to changes in employment. The analyses therefore had to be replicated, while excluding the subtopic of recruitment and career development. Having to replicate the results also offered the opportunity to increase the granularity of the solutions for collaboration and outsourcing and for internal organisation and information management, as well as to address some minor issues that were detected with the analyses reported in Eurofound (2015). All LCA solutions presented in this paper were estimated while including country, sector of activity and workplace size as active covariates.<sup>5</sup>

### **Multinomial logistic regression analyses**

Not all the workplace characteristics of interest have a linear relationship with employment levels. In other words, it is possible that certain characteristics are positively associated with both increases and decreases in employment – for instance, product innovation might result in a need for more staff in some companies, but in a need for less staff in others. Reversely, certain characteristics might be negatively associated with both increases and decreases in employment levels, because they tend to coincide with stable employment. To capture these non-linear associations a binomial logistic regression model is used, which simultaneously estimates the associations with a reported increase and a reported decrease in employment, as compared to stability.

Basic multinomial logistic regression models have been estimated to back-up the bivariate associations that are presented throughout the paper. These models test whether bivariate associations are significant when controlling for country, sector of activity, establishment size, establishment age, and establishment type. Differences are only highlighted when associations were found to be statistically significant.

To test for the expectations outlined in figure 1, five models have been estimated. The first model (Model 0) only looks at the associations between the background characteristics country, sector of activity, establishment size, establishment age, and establishment type and changes in employment, and serves as a baseline, to assess the model improvement when adding the variables of interest. Model 1 includes the bundles of workplace practices and the background characteristics (and is equal to the model that was used to check the bivariate associations between the bundles of workplace practices and changes in employment). Model

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<sup>4</sup> In the final model the LCA solution for social dialogue was not included as this was based on the subsample of establishments where an official body for employee representation was present. Including this solution would have greatly reduced the sample size, so instead only a variable indicating the presence of an official body for employee representation was included.

<sup>5</sup> For the estimation of the final model, when using the LCA solutions as independent variables in regression analysis, and when showing the descriptive results, the modal class membership is used. Arguably, it would be preferable to use the predicted probabilities, as these are more informative. A selection of analyses has been replicated using predicted probabilities and results have been found to be robust. For the sake of simplicity of presentation and interpretation it was decided to use and present the modal class based results.

2 includes the measures of innovation and performance and the background characteristics. Model 3 includes the bundles of workplace practices as well as the measures of innovation and performance and the background characteristics. Model 4, finally, includes the bundles of workplace practices, the measures of innovation and performance and the background characteristics as well as a number of interaction terms between the bundles of workplace practices and measures of innovation and performance. To arrive at Model 4 a range of models was estimated in which the interactions between the bundles of workplace practices and measures of innovation and performance were tested one by one. This pseudo-step-wise approach was taken to avoid over-specifying the model. Only those interaction terms that rendered significant effects when analysed individually were included in the final Model 4.

### **Structure of the data**

As mentioned above, the analyses for this paper were carried out on a subset of the dataset of the ECS 2013. Not only were the candidate countries and the public sector excluded – due to issues with the reliability of measurement and the representativeness of the sample, respectively – the sample included in the analysis was further reduced due to item missings.

Table 1 shows the descriptive statistics of the variables that are included in the descriptive analyses and the regression analyses.<sup>6</sup> The table shows that there is quite a bit of variability in the item missings. Data for all 24,251 establishments in the subsample are available for country, sector of activity and establishment size.

Item missings are fairly limited for the dependent variable employment change and the background characteristics establishment age and type. Item missings are most problematic for the variables indicating bundles of workplace practices. This is not surprising as these are summary variables that are based on a larger number of components. Because listwise deletion is applied in LCA, a missing value on any of the components will result in a missing value on the summary variable. Consequently, the overarching bundles of workplace practices could only be determined for roughly three quarters of the sample. The problem is further exacerbated when regression analyses are carried out and listwise deletion is applied again: 16,507 cases remain that have valid scores for all variables in table 1. Analysis was carried out to assess whether there are important differences between those cases that do and those cases that do not have valid scores for all variables. It was found that smaller establishments are somewhat more likely to have valid scores for all variables.

This can be explained by the fact that the respondent in a smaller establishment is more likely to have an overview of all the topics that are asked about in the questionnaire. A multinomial regression analysis was estimated of a variable, indicating whether or not valid scores were available for all variables, on the dependent variable employment changes, controlling for country, sector of activity, establishment size, establishment age, and establishment type. This analysis did not find a significant effect of the absence of item missings on employment change. This suggests that the bias due to item missings is largely corrected for by including the background characteristics in the analysis.

To allow for straightforward comparison of the results, analyses are carried out on the subsample of 16,507 cases that had no item missings. In all regression analyses country, sector of activity, establishment size, establishment age, and establishment type are included as control variables.

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<sup>6</sup> Many more variables were included in the latent class analyses carried out to arrive at the nine variables indicating ‘bundles of workplace practices’. It goes beyond the scope of this paper to illustrate the structure of these variables in detail.



*Table 1: Descriptive statistics*

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Employment change	24,144	2.026	0.762	1	3
Product innovation	23,912	0.460	0.498	0	1
Process innovation	23,828	0.432	0.495	0	1
Marketing innovation	23,369	0.370	0.483	0	1
Change in technology	23,934	0.482	0.500	0	1
Current financial situation	23,389	1.452	0.648	1	3
Improved financial situation	23,103	0.308	0.462	0	1
Deteriorated financial situation	23,103	0.301	0.459	0	1
Improved productivity	23,293	0.483	0.500	0	1
Deteriorated productivity	23,293	0.124	0.330	0	1
Increased production volume	23,128	0.473	0.499	0	1
Decrease production volume	23,128	0.207	0.405	0	1
Collaboration and outsourcing	22,441	2.668	1.399	1	5
Internal organisation and information management	21,794	3.802	1.311	1	5
Decision-making on daily tasks	23,711	1.418	0.730	1	3
Training	23,579	1.997	0.818	1	4
Working time flexibility	23,651	2.198	0.711	1	3
Variable pay	23,589	2.255	0.674	1	3
Direct employee involvement	22,199	1.512	0.803	1	3
Official body for employee representation present	24,251	0.509	0.500	0	1
Overarching bundles of workplace practices	18,125	2.725	1.765	1	6
Country	24,251	14.482	8.330	1	28
Sector of activity (NACE Rev2 in six categories)	24,251	3.082	1.916	1	6
Establishment size	24,251	1.661	0.749	1	3
Establishment age	24,140	2.071	0.594	1	3
Establishment type	24,210	1.438	0.684	1	3

Source: ECS 2013, calculations by authors

## **Patterns in changes and employment**

This section will show how reported changes in employment differ across establishments, particularly across establishments that have different bundles of workplace practices, and different levels of innovation and performance.

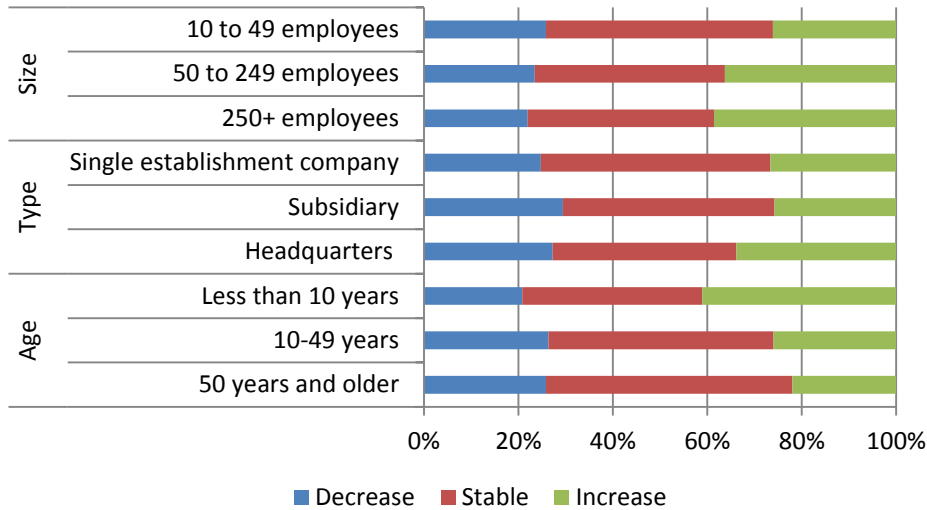
### **Changes in employment**

In the ECS 2013, respondents were asked whether, in the three years preceding the survey, the number of employees at their establishment had increased, decreased, or stayed about the same. Overall, 25% of establishments reported a decrease, 47% reported levels to have stayed the same, and 28% reported employment levels to have increased.

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Reported changes in employment differ considerably across establishments of different sizes, with employment levels being more likely to have increased in larger establishments (figure 3). Single establishment companies appear to be more stable than subsidiaries and headquarters of multi-establishment companies: among subsidiaries and headquarters the proportion of establishments having seen decreases in employment is larger, and among headquarters the same is true for the proportion of establishments having experienced increases in employment.

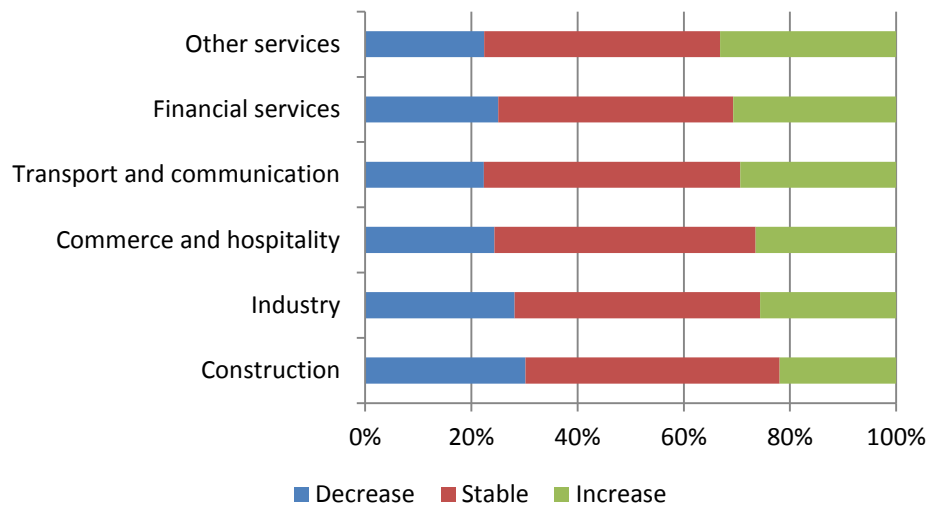
Figure 3: Changes in employment in the past three years, by establishment size, type and age



Source: ECS 2013, calculations by authors

Younger establishments are more likely to report increases in employment than older establishment, and less likely to report decreases, although differences in decreases in employment are much less pronounced.

Figure 4: Changes in employment in the past three years, by sector of activity

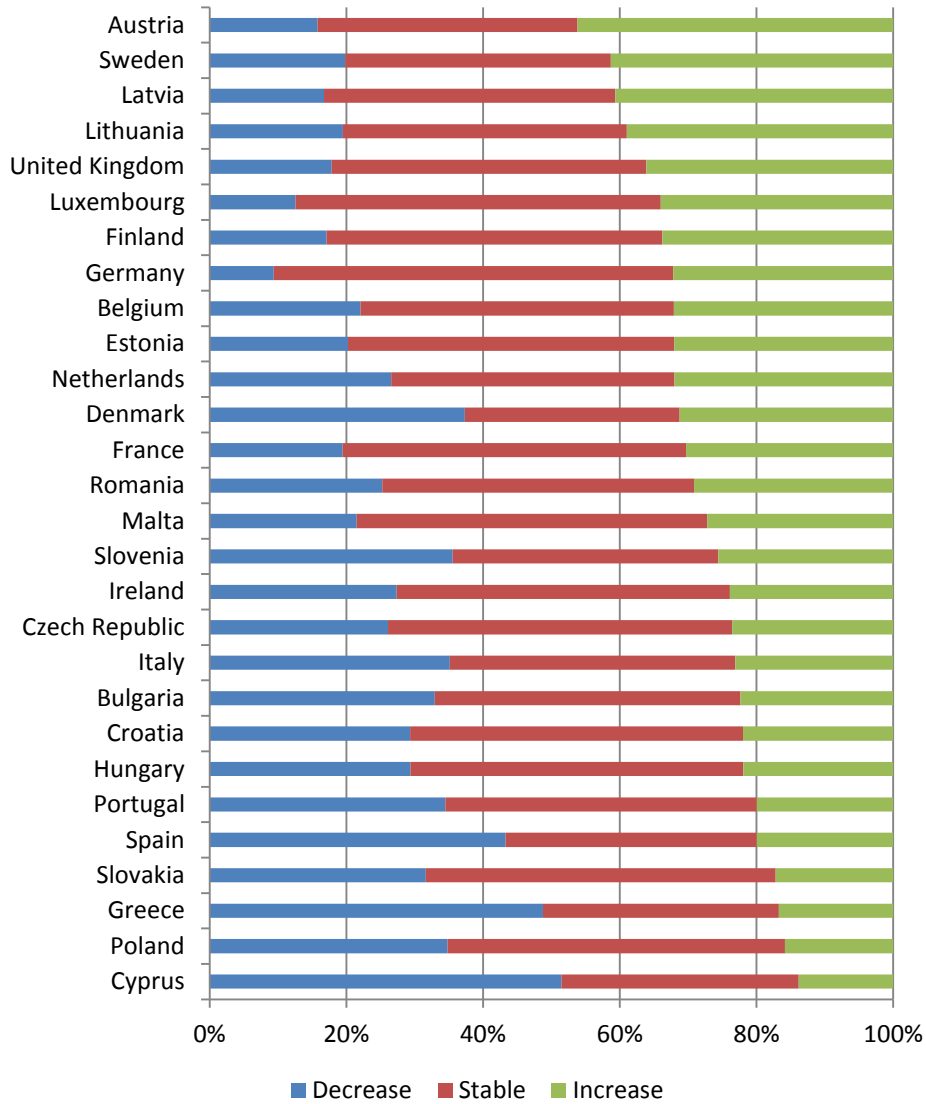


Source: ECS 2013, calculations by authors

In terms of sector of activity (figure 4), sectors delivering services are more likely to report increases in employment and less likely to report decreases in employment than the producing sectors. Decreases in employment are reported most frequently in construction.

The effects of the recession are also apparent when looking at differences between countries (figure 5). Decreases in employment are reported relatively frequently in Cyprus, Greece, Spain, and, perhaps more surprisingly, Denmark. Increases in employment are reported relatively frequently in Austria, Sweden, Latvia and Lithuania.

Figure 5: Changes in employment in the past three years, by country



Source: ECS 2013, calculations by authors

### Workplace practices and changes in employment

As discussed above, the latent class analyses carried out for the overview report of the ECS 2013 were replicated for this paper. Whenever a different solution is selected than the solution presented in the overview report, these differences will be elaborated. For those subtopics where the same (or a very similar) solution is selected, the grouping will not be discussed in detail, as this description can be found in the overview report (Eurofound, 2015).

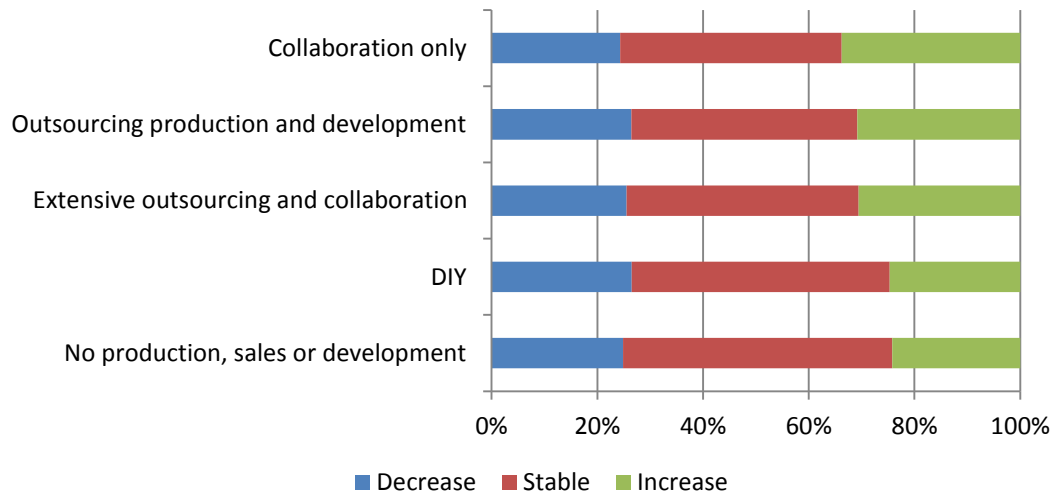
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### *Collaboration and outsourcing*

With regard to collaboration and outsourcing, Eurofound (2015) distinguished three categories. Upon further inspection of the results of the latent class analysis, it was decided that the five-class solution offered a similar fit, was equally interpretable, and more informative. The five classes are establishments that engage extensively in outsourcing and collaboration with other establishments with regard to production or services delivery, design and development and sales and marketing (extensive outsourcing and collaboration, 11%), establishments that tend to outsource (part of their) production or services delivery and design and development activities (outsourcing production and development, 14%), establishments that tend not to outsource but engage in collaboration across all three types of activities (collaboration only, 18%), establishments that mainly carry out these three types of activities in-house (Do-It-Yourself (DIY), 24%) and establishments that are not engaged in these three types of activities (no production, sales or development, 34%).

Figure 6 shows that bundles of workplace practices with regard to collaboration and outsourcing are not very strongly associated with decreases in employment.

*Figure 6: Changes in employment in the past three years, by workplace practices with regard to collaboration and outsourcing*



Source: ECS 2013, calculations by authors

However, establishments that tend to outsource or collaborate more (collaboration only, outsourcing production and development, and extensive outsourcing and collaboration), are more likely to report increases in employment than those that do not (DIY) or those that are not engaged in these three types of activities at all (no production, sales or development).

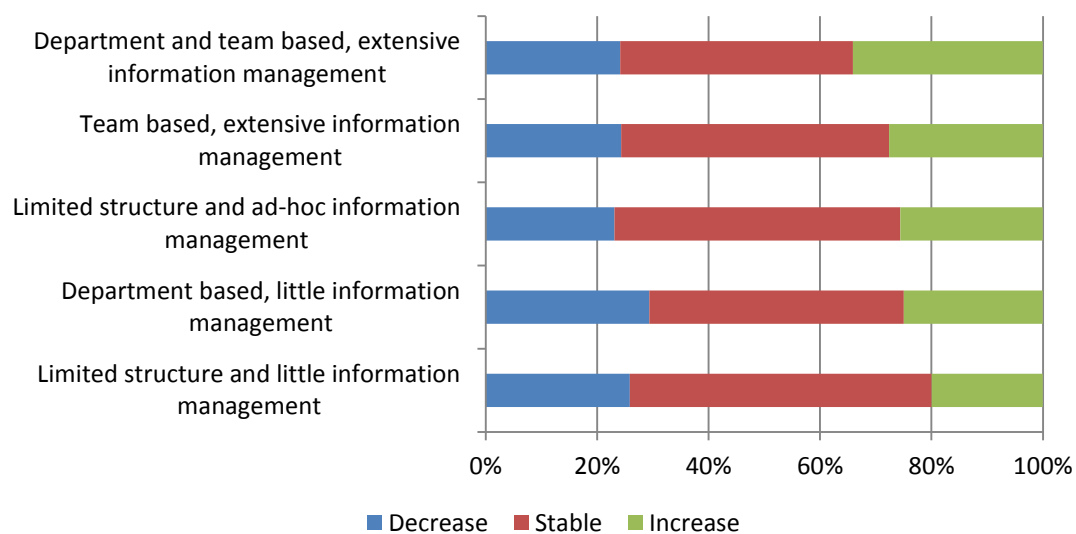
### *Internal organisation and information management*

As for collaboration and outsourcing, Eurofound (2015) distinguished three categories of establishments in terms of their internal organisation and practices for information management. Here as well, it was found that a five-class solution was more informative. It distinguishes establishments that are characterised by an internal organisation that combines a departmental structure with team-based task allocation and that have extensive practices with regard to information management (for instance, monitoring quality of production and external ideas or developments, and keeping record of good practices; department and team based, extensive information management, 30%), establishments whose internal organisation

is mainly team based, and that also have extensive practices with regard to information management (team based, extensive information management; 28%), establishments with a department based internal organisation and little information management (department based, little information management, 20%), establishments that are characterised by an internal organisation that is not or hardly formalised and that only engage in information management on an ad-hoc basis (limited structure and ad-hoc information management, 5%) and establishments with little structure to their internal organisation and limited practices for information management (limited structure and little information management, 17%).

Again, differences are more pronounced with regard to reported increases in employment than with regard to reported decreases (figure 7).

*Figure 7: Changes in employment in the past three years, by workplace practices with regard to internal organisation and information management*



Source: ECS 2013, calculations by authors

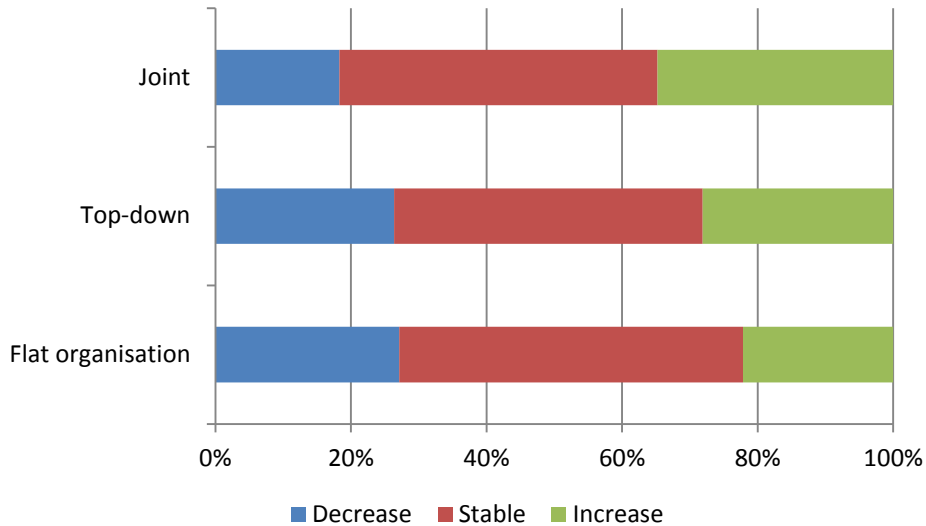
Only establishments with a department based structure and limited investment in information management stand out in relatively frequently reporting decreases in employment. Increases in employment are reported by far the most frequently in establishments that are characterised as department and team based with extensive information management. They are reported by far least frequently by establishments with limited structure and little information management.

### *Decision-making on daily tasks*

The solution presented in Eurofound (2015) with regard to decision-making on daily tasks was based on only two variables (task autonomy and team autonomy). Closer inspection showed that the solution was not entirely stable. To improve the stability of the model a third variable was added: levels of hierarchy. This resulted in a solution with three classes that, on a conceptual level, does not differ much from the two-class solution provided in Eurofound (2015). It distinguishes between establishments with a flat organisation (23%), establishments with a joint approach to decision-making (13%) and establishments with a top-down approach to decision-making (64%). It is important to note that establishments with a relatively flat organisation have relatively few levels of hierarchy, but this does not imply that decision-making is not hierarchical.

Establishments with a joint or a top-down approach to decision-making are significantly more likely to report increases in employment than establishments with a flat organisation (figure 8).

*Figure 8: Changes in employment in the past three years, by workplace practices with regard to decision-making on daily tasks*



Source: ECS 2013, calculations by authors

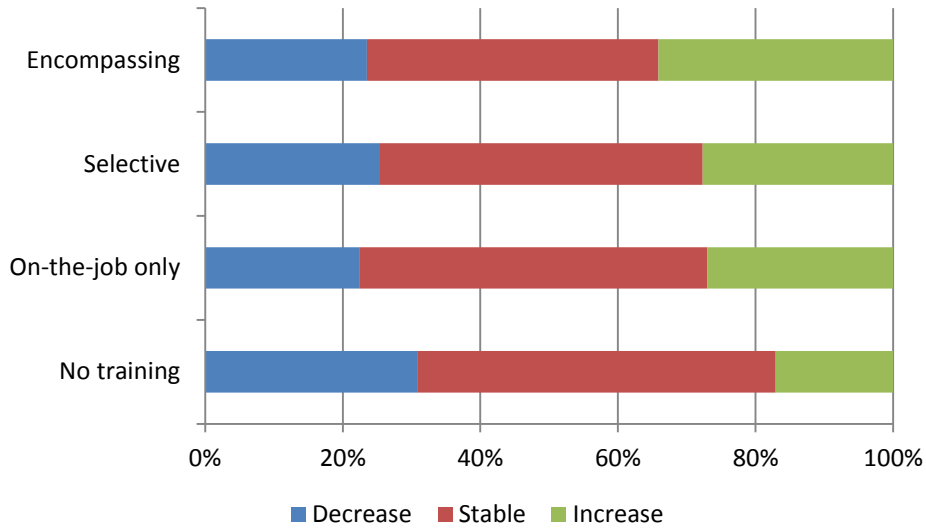
Differences between establishments with a joint approach and establishments with a top-down approach to decision-making are not significant when controlling for background characteristics.

### *Training*

The solution for training presented in figure 9 is the same as the solution described in Eurofound (2015). Most establishments (61%) take a selective approach to training, which implies that both paid time-off and on-the-job training are offered but only to some employees. A sizeable minority of establishments (21%) have an encompassing approach to training, which implies that both types of training are provided to a large proportion of staff. Few establishments (6%) provide on-the-job training only, but do provide it to most of their staff, and a larger minority of establishments (13%) offers no training at all.

Figure 9 shows that those establishments that take an encompassing approach to training are most likely to report increases in employment and establishments that do not offer any training are least likely to do so. The differences between the groups with regard to decreases in employment are not statistically significant.

Figure 9: Changes in employment in the past three years, by workplace practices with regard to training

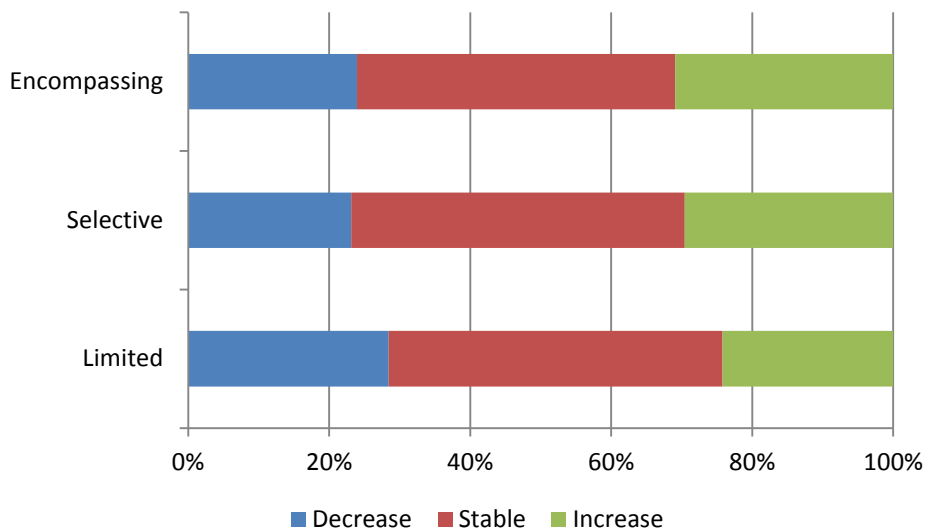


Source: ECS 2013, calculations by authors

### Working time flexibility

The ECS captures three types of practices with regard to working time flexibility: flexibility in starting and finishing time, accumulation of overtime that can be redeemed by taking days off, and working part-time. Like in Eurofound (2015), three approaches are distinguished: 41% of establishments tend to not offer these arrangements, and if they do, usually only to a small proportion of staff (limited), 39% of establishments do offer the three types of practices, but only to some employees (selective), and 20% offer all three types of practices to a large proportion of staff (encompassing).

Figure 10: Changes in employment in the past three years, by workplace practices with regard to working time flexibility



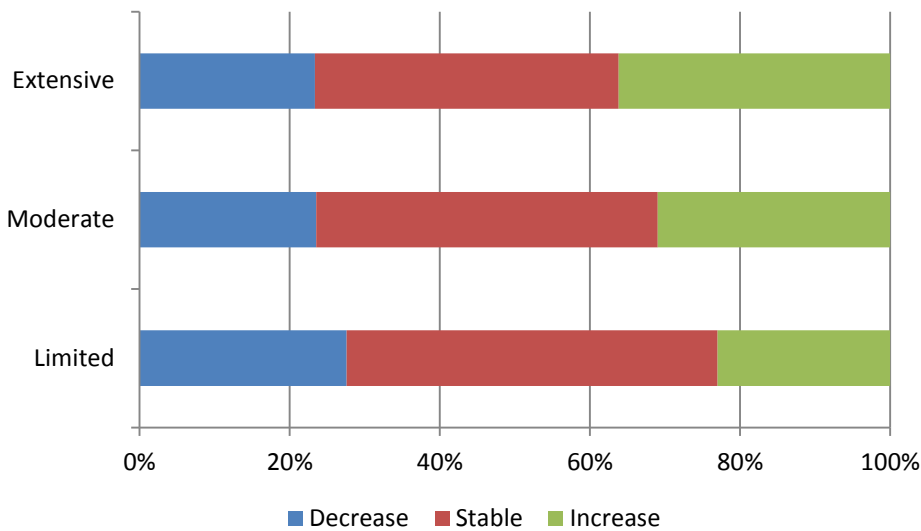
Source: ECS 2013, calculations by authors

Figure 10 shows some small differences between these groups of establishments in terms of changes in employment, but none of the differences are statistically significant.

**Variable pay**

The ECS asks whether or not establishments make use of payment by results, variable pay based on individual performance or group-performance, profit-sharing and share-ownership. Latent class analysis – here, as in Eurofound (2015) – distinguishes between establishments that make extensive use of various types of variable pay (9%), establishments that use them to a moderate extent (44%), and establishments that make limited use of them (47%).

*Figure 11: Changes in employment in the past three years, by workplace practices with regard to variable pay*



Source: ECS 2013, calculations by authors

Figure 11 shows that practices with regard to variable pay are not associated with the reporting of decreases in employment, but are associated with increases in employment. The more extensive the application of variable pay schemes, the more likely establishments are to report increases in employment.

**Direct employee involvement**

To classify establishments with regard to direct employee involvement, three indices were constructed. The first indicator captures the level of effort that is made to enable direct employee participation, and is constructed by counting the number of instruments used for direct employee participation (such as meetings, online discussion boards, suggestion box etc.). The second indicator captures the extent to which employees participated directly in decision-making on the most recent important organisational change (as perceived by management). The third indicator measures management’s opinion on the consequences of employee participation. Based on these three indicators three types of establishments are distinguished (as was the case in Eurofound (2015)).

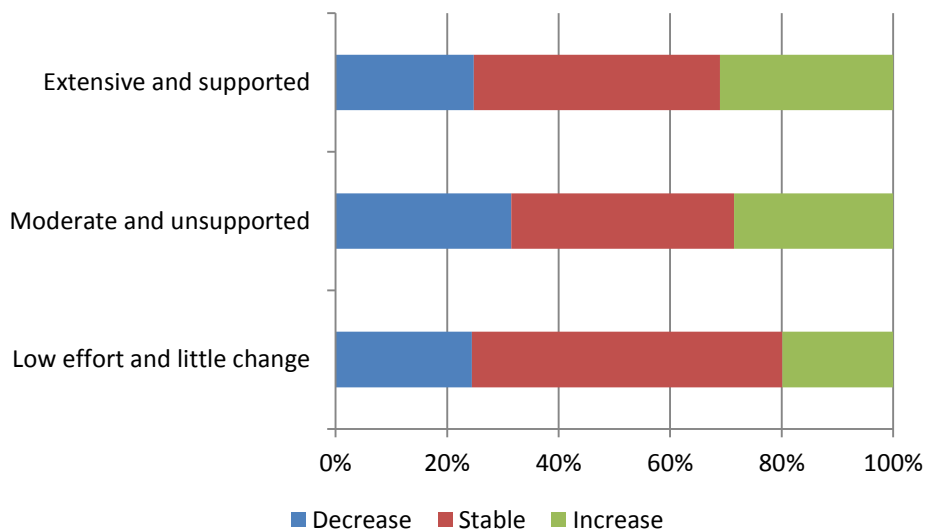
Over half of establishments (61%) make a relatively large effort in terms of the number of instruments, are likely to involve employees in joint decision-making on important decisions

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and show positive management attitudes towards direct employee participation (extensive and supported). In around 28% of establishments little opportunity arose to involve employees, as no major change had taken place in the three years preceding the survey. In those few establishments where a major change had taken place, employees were most likely to be only informed or not involved. Establishments of this type make limited efforts to enable direct employee participation, despite management attitudes being predominantly positive (low effort and little change). Finally, in 11% of establishments, there is some involvement of employees in decision-making, but efforts in terms of the number of instruments for direct employee participation are moderate and the management attitude is relatively often not very positive (moderate and unsupported).

*Figure 12: Changes in employment in the past three years, by workplace practices with regard to direct employee involvement*



Source: ECS 2013, calculations by authors

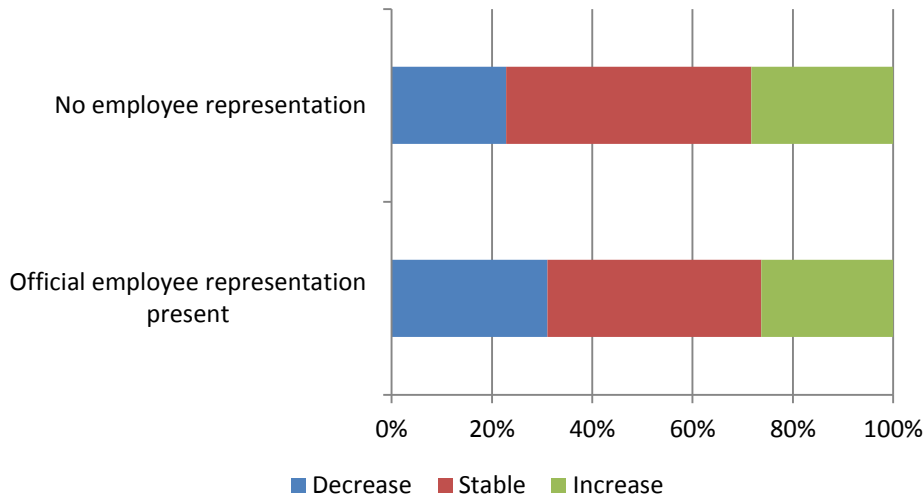
Figure 12 shows that establishments whose approach to direct employee involvement can be classified as ‘moderate and unsupported’ are more likely to report a decrease in employment. Establishments that are classified as ‘low effort and little change’ are less likely to report an increase in employment.

### *Official body for employee representation present*

An official body for employee representation is present in 32% of establishments. The presence of employee representation is much higher in larger establishments.

Figure 13 shows that establishments where an official body for employee representation is present are considerably more likely to report decreases in employment. This difference remains when controlling for country, sector of activity, establishment size, type and age. It is important to note that the analysis does not show causal relationships: it might very well be the case that workers in establishments where employment is decreasing are more likely to organise themselves in bodies for employee representation.

Figure 13: Changes in employment in the past three years, by presence of an official body for employee representation



Source: ECS 2013, calculations by authors

### Bundles of workplace practices

#### Six bundles

As was discussed above, the latent class analysis carried out for the overview report of the ECS (Eurofound, 2015) was replicated for this study, to address issues of endogeneity and adding some more detail in the process. As a consequence, the results of the final model – in which establishments are classified, based on the classifications on nine subtopics – differ somewhat from the results presented in Eurofound (2015). Most importantly, a six class solution was selected, instead of the five class solution that was presented before. Table 2 shows the characteristics of each of the six classes, or bundles, in terms of their scores on the nine subtopics. In short, the six bundles can be described as follows:

##### *Systematic and involving (16%)*

These establishments are likely to collaborate with other organisations and/or outsource activities. They tend to have a department and team-based internal organisation and extensive information management systems. They are likely to have a top-down approach to decision-making, and are characterised by relatively high investment in HRM and extensive practices for direct participation. Almost all of them have an official body for employee representation. Most large establishments (89%) are classified as ‘systematic and involving’ as are around half of medium-sized establishments. The class is much less prevalent among small establishments. It is more prevalent in industry and financial services than in other sectors. It is found relatively frequently in older establishments and it is more prevalent in multi-establishment companies than in single establishment companies.

##### *Systematic, direct involvement only (22%)*

These establishments are likely to collaborate with other organisations and/or outsource activities. They relatively frequently have a team-based or a department and team-based internal organisation and extensive information management. They are likely to have a top-down approach to decision-making, and are characterised by relatively high investment in HRM and extensive practices for direct participation. An important distinction with the ‘systematic and involving’ class is the virtual absence of official bodies for employee

representation, which are only found in 7% of establishments in this class. This class is relatively prevalent in small establishments and is more prevalent in the construction sector and in the commerce and food and accommodation sectors than in other sectors of activity. It is found relatively frequently in younger establishments and it is more prevalent in multi-establishment companies than in single establishment companies.

*Interactive and involving (12%)*

These establishments are likely to collaborate with other organisations or to combine collaboration with the outsourcing of activities. They relatively frequently have a team-based or a department and team-based internal organisation and extensive information management. Almost half of them have a joint approach to decision-making; most of the others are flat organisations. Investment in HRM tends to be high, particularly working time flexibility practices tend to be offered to a large proportion of staff.

They offer extensive practices for direct participation, but the presence of bodies for employee representation is just below average. This class is relatively prevalent in small establishments and is more prevalent in financial services and other services than in other sectors of activity. Its prevalence is not associated with establishment age and type.

*Moderate structure and investment in staff (13%)*

Establishments in this class are relatively likely not to be involved in production, sales or development at all, or to outsource production and development. They often have little structure in terms of internal organisation, or are department based, and have limited practices for information management. Decision-making tends to be top-down. Practices with regard to HRM are limited as are practices to facilitate direct employee involvement, which is often not supported by management. However, an official body for employee participation is present in a large majority (77%) of these establishments. This class is relatively prevalent in medium-sized establishments, and more prevalent in construction, transport and communication and financial services than in other sectors. Its prevalence is not associated with establishment age and type.

*Internally oriented (17%)*

Establishments of this class tend to carry out production, sales and development in-house, although aspects of production and development are relatively frequently outsourced as well. Most of them have a team based or a department and team based internal organisation and extensive practices for information management, although some are department based and have little information management. Decision making tends to be top-down, and investment HRM is limited. Relatively many of these establishments put little effort in direct employee involvement, but also have limited opportunity to do so. In those establishments that do engage in direct employee involvement, management attitudes tend to be positive. Official bodies for employee representation are present in only 14% of these establishments. This class is relatively prevalent in small establishments, and more prevalent in industry than in other sectors of activity. Its prevalence is not associated with establishment age. Internally oriented establishments are more prevalent among single-establishment companies than among multi-establishment companies.

*Passive management (21%)*

Establishments in this class are relatively likely not to be involved in production, sales or development at all. They tend to have a limited structure in terms of their internal organisation, and practices for information management are limited or ad-hoc. Most of these establishments have only few hierarchical layers. They tend not to invest in HRM practices, or in practices for direct employee involvement, and bodies for employee representation are virtually absent in these establishments. Passive management is most prevalent in small

companies, and found more in construction, commerce and food and accommodation, and transport and communication than in other sectors. It is more prevalent in younger companies and in single-establishment companies than in multi-establishment companies.

Table 2: Characteristics of the six bundles of practices (%)

	Systematic and involving	Systematic, direct involvement only	Interactive and involving	Moderate structure and investment in staff	Internally oriented	Passive management	EU28
<b>% of all establishments</b>	<b>15.7</b>	<b>21.7</b>	<b>11.9</b>	<b>13.2</b>	<b>16.8</b>	<b>20.7</b>	<b>100.0</b>
<b>Collaboration and outsourcing</b>							
No production, sales or development	12.3	27.1	20.3	54.4	11.6	69.2	33.7
DIY	17.4	15.4	20.0	17.9	56.4	15.9	23.6
Collaboration only	36.0	22.8	30.8	5.8	12.3	4.3	18.0
Outsourcing production and development	16.1	14.5	12.0	17.1	16.2	8.7	13.9
Extensive outsourcing and collaboration	18.1	20.4	16.9	4.7	3.6	1.9	10.9
<b>Internal organisation and knowledge management</b>							
Limited structure and little information management	0.2	5.2	2.5	28.1	4.3	53.3	16.9
Limited structure and ad-hoc information management	0.0	6.1	5.5	7.8	0.0	12.0	5.5
Department based, little information management	12.5	16.4	19.6	28.6	24.8	19.9	19.9
Team based, extensive information management	18.1	35.6	29.7	29.4	39.6	13.8	27.5
Department and team based, extensive information management	69.1	36.8	42.8	6.1	31.3	1.1	30.2
<b>Decision-making on daily tasks</b>							
Top-down	84.7	84.2	39.4	70.6	71.0	31.8	64.1
Joint	11.7	8.8	49.0	4.3	9.4	7.6	13.3
Flat organisation	3.5	7.0	11.6	25.1	19.6	60.6	22.6
<b>Training</b>							
Encompassing	28.0	33.8	33.7	17.1	4.2	11.3	21.0
Selective	70.5	60.3	58.1	68.2	61.0	49.4	60.6
On-the-job only	1.2	4.7	4.5	2.8	5.8	12.2	5.6
No training	0.3	1.2	3.6	12.0	28.9	27.1	12.8
<b>Working time flexibility</b>							
Encompassing	15.9	9.9	64.9	11.2	17.2	16.1	20.1
Selective	61.3	53.1	29.0	35.9	27.7	24.6	39.1
Limited	22.9	37.0	6.2	52.9	55.1	59.3	40.9

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(Table 2 continued)

	Systematic and involving	Systematic, direct involvement only	Interactive and involving	Moderate structure and investment in staff	Internally oriented	Passive management	EU28
<b>Variable pay</b>							
Extensive	19.3	16.2	10.8	4.0	0.8	0.7	8.6
Moderate	56.8	62.8	55.9	33.1	26.9	28.8	44.0
Limited	24.0	21.0	33.4	62.9	72.4	70.5	47.3
<b>Direct employee involvement</b>							
Extensive and supported	87.3	74.3	90.8	41.2	52.4	27.8	60.6
Moderate and unsupported	8.8	17.5	1.6	18.4	7.8	9.7	11.1
Low effort and little change	4.0	8.2	7.6	40.4	39.8	62.5	28.3
<b>Employee representation at workplace</b>							
No	9.8	92.6	71.0	22.6	86.5	98.3	68.0
Yes	90.2	7.4	29.0	77.4	13.5	1.7	32.0

Source: ECS 2013, calculations by authors

These six bundles closely correspond to the five bundles identified in Eurofound (2015) (see Eurofound, 2015, table 10, pp. 123-124).<sup>7</sup> Arguably the ‘Systematic and involving’, ‘Systematic, direct involvement only’, and ‘Interactive and involving’ classes show features that most closely resemble the high-performance work systems that were discussed above.

### Associations with employment

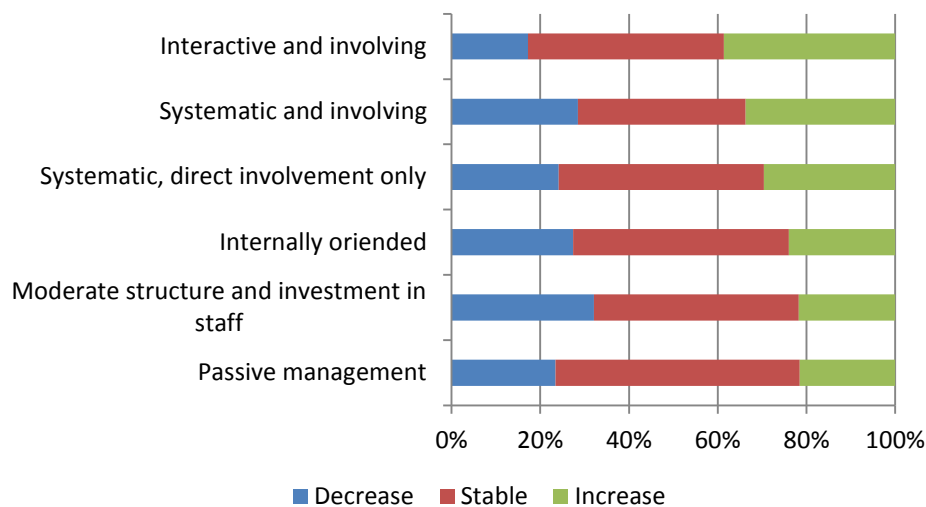
Figure 14 shows that those establishments that are classified as ‘systematic and involving’ or ‘moderate structure and investment in staff’ are relatively likely to have seen decreases in employment in the past three years. Establishments that are classified as ‘systematic, direct involvement only’ are significantly less likely than average to have reported decreases in employment (the differences for ‘interactive and involving’ and ‘passive management’ are not statistically significant). Employment increases are relatively prevalent among ‘interactive and involving’, ‘systematic and involving’ and ‘systematic, direct involvement only’

<sup>7</sup> The additional class that was distinguished here (systematic, direct involvement only) appears to mainly have absorbed establishments that were classified as ‘systematic and involving’ in Eurofound (2015). Some further reallocation has taken place, with the ‘passive management’ class being larger in the current analysis, absorbing cases from the ‘externally oriented’ and ‘top-down’ and internally oriented’ classes distinguished in Eurofound (2015). As mentioned in the methodology section, these reallocations were to be expected, given the higher level of granularity in the subtopics ‘collaboration and outsourcing’ and ‘internal organisation and knowledge management’, and the inclusion of country, sector of activity and establishment size as active covariates.

establishments, and are reported relatively infrequently for establishments classified as ‘moderate structure and investment in staff’ and ‘passive management’.

So, whereas the bundles of practices found in the ‘interactive and involving’ and ‘systematic, direct involvement’ are associated with a reduced likelihood of decreases in employment and an increased likelihood of increases in employment, ‘systematic and involving’ establishments appear to be more likely to have experienced changes in employment in general, be they negative or positive. On the other side of the spectrum are establishments characterised by moderate structure and investments in staff which are less likely to have reported increases in employment and more likely to have reported decreases in employment.

Figure 14: Changes in employment in the past three years, by bundles of workplace practices



Source: ECS 2013, calculations by authors

In establishments characterised as ‘passive management’, employment levels are most likely to have remained stable.

In the next sections it will be assessed whether these patterns remain, when looking at the extent to which they are mediated by, or moderate, associations between innovation and performance and changes in employment.

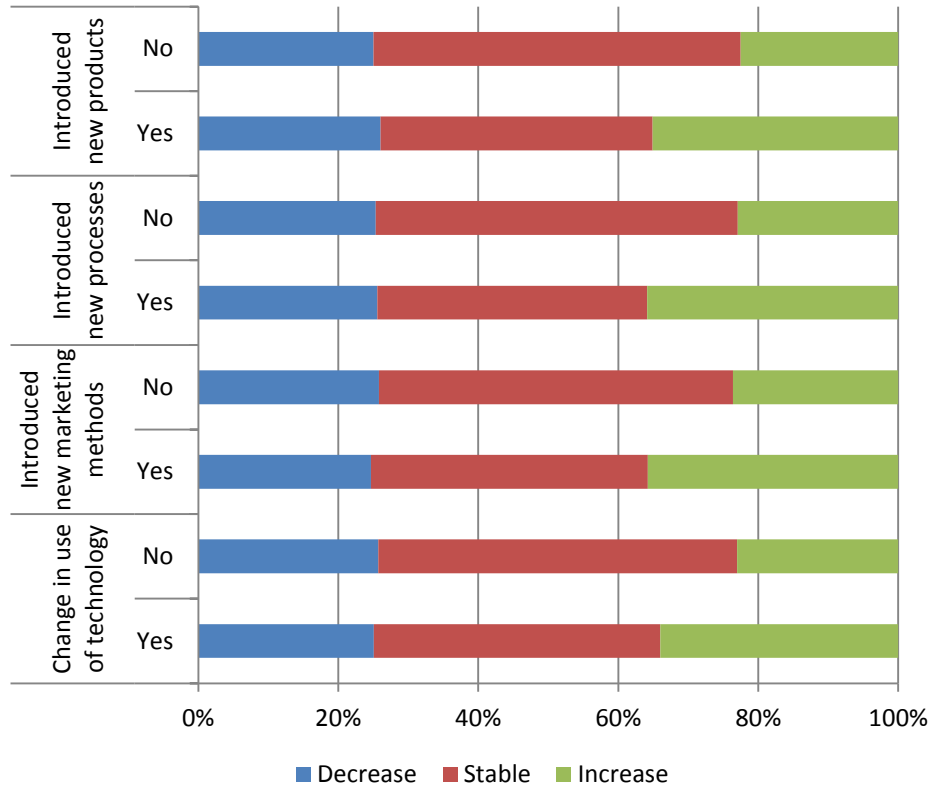
## Innovation and changes in employment

Innovation was captured in the ECS 2013 by asking managers whether in the three years preceding the survey new or significantly changed products and services (reported in 41% of establishments), processes (36%), or marketing or communication methods (33%) were introduced in the establishment. As part of a battery of questions on important changes, it was also asked whether in the three years preceding the survey there had been changes in the use of technology (reported in 42% of establishments). Changes in the use of technology could be the consequence or the instigator of all three other types of innovation.

Figure 15 shows that those establishments that have introduced new products are slightly more likely to report a decrease in employment, and considerably more likely to report an increase. The same pattern is found for establishments that have introduced new processes. And, although it does not become apparent from figure 15, the same holds for establishments that have introduced new methods for marketing or communication, when controlling for country, sector of activity and size, type and age of the establishment. Establishments that

have experienced a change in technology are more likely to have reported an increase in employment.

Figure 15: Changes in employment in the past three years, by types of innovation



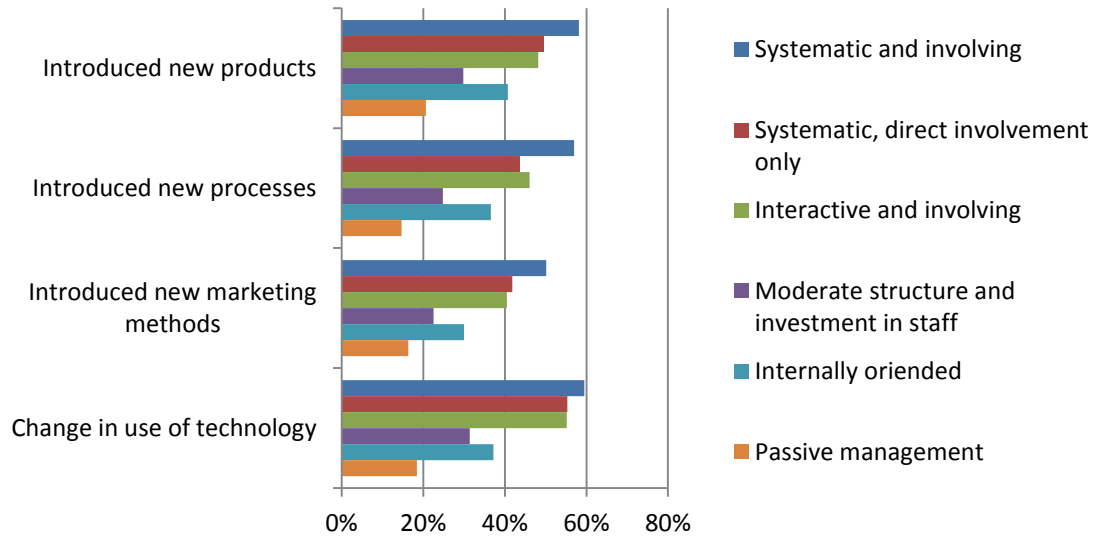
Source: ECS 2013, calculations by authors

Figure 16 shows clear associations between the bundles of workplace practices and innovation.<sup>8</sup> Establishments classified as ‘systematic and involving’, ‘systematic, direct involvement only’ and ‘interactive and involving’ are relatively likely to have introduced new products or services, process and methods for marketing or communication, and to have experienced changes in the use of technology. The opposite is true for establishments characterised by moderate structure and investment in staff or by passive management. Establishments that are internally oriented are only significantly below average in terms of their probability to report changes in technology.

The pronounced and robust associations between innovation and changes in employment on the one hand, and between bundles of workplace practices and innovation on the other hand are a first indication that the associations between workplace practices and changes in employment might be mediated by innovation.

<sup>8</sup> These results are very much in line with the findings reported in the report ‘Innovative changes in European companies’ (Eurofound, 2017).

Figure 16: Types of innovation, by bundles of workplace practices

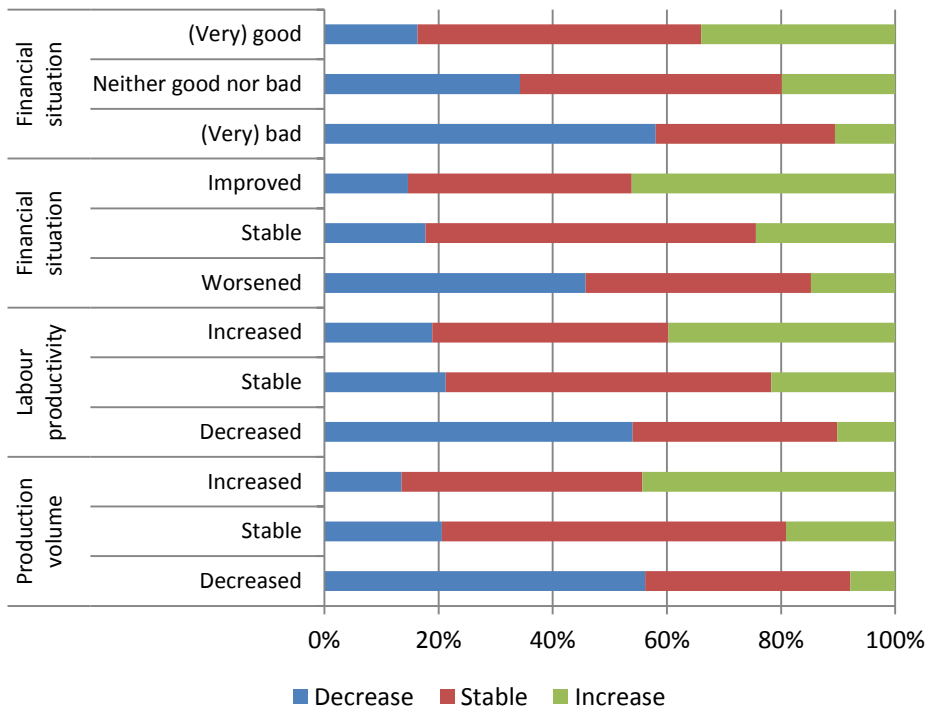


Source: ECS 2013, calculations by authors

### Performance and changes in employment

The ECS 2013 captures four aspects of performance. Managers were asked to provide an indication of the current financial situation of their establishments, which 61% reported to be good or very good, 30% reported to be neither good nor bad and 9% reported to be bad or very bad.

Figure 17: Changes in employment, by changes in performance (both in the past three years)



Source: ECS 2013, calculations by authors

Disclaimer: This working paper has not been subject to the full Eurofound evaluation, editorial and publication process.

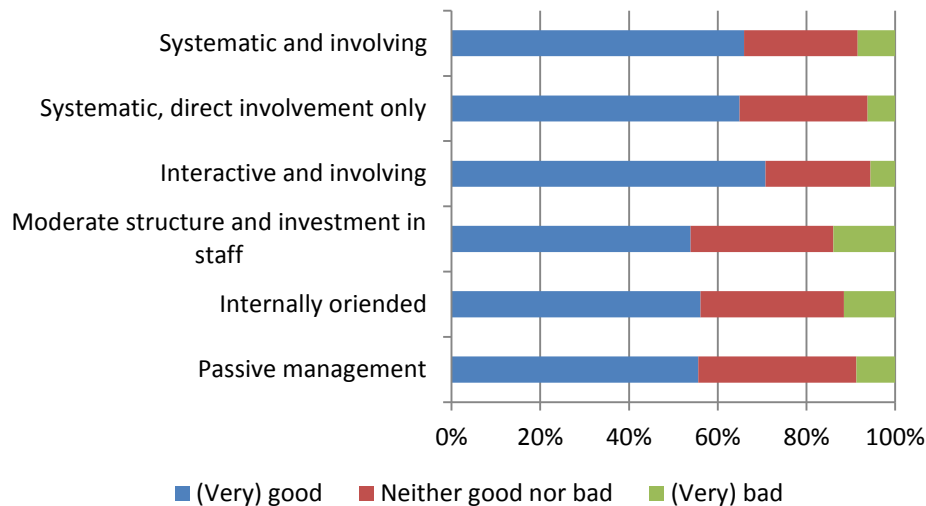


They were also asked whether the financial situation of the establishment had improved (reported by 29%), remained the same (41%) or worsened (31%) in the three years preceding the survey. When asked about recent changes in the labour productivity 43% reported an improvement, 41% no change, and 16% a worsening and when asked about recent changes in the amount of goods and services that were produced, 44% reported an increase, 34% no change, and 22% a decrease.

Figure 17 shows that these performance indicators are closely associated with changes in employment. Improvements in any of the performance indicators are associated with increased employment, and deteriorations in the performance indicators are associated with decreases in employment.

Figure 18 shows differences between establishments with different bundles of workplace practices in terms of their reported financial situation, but not all of these differences remain when controlling for country, sector of activity, and establishment size, age and type.

Figure 18: Financial situation, by bundles of workplace practices

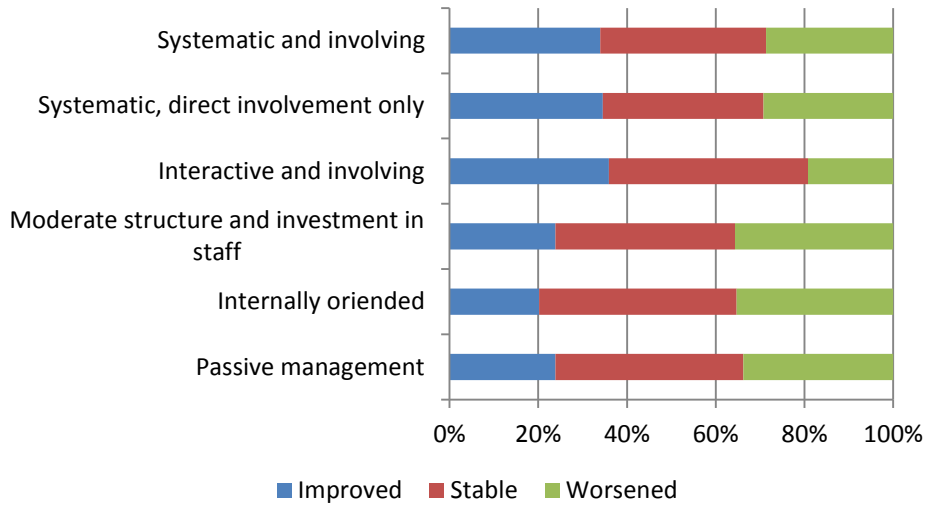


Source: ECS 2013, calculations by authors

Establishments classified as systematic and involving are relatively likely to report a good or a very good financial situation and establishments with passive management are relatively unlikely. Reversely, establishments classified as ‘systematic and involving’ and ‘systematic, direct involvement only’ are relatively unlikely to report a bad or a very bad financial situation, and internally oriented establishments are relatively likely.

With regard to changes in the financial situation, systematic and involving establishments are relatively likely to report this has improved, whereas internally oriented establishments and establishments with passive management are relatively unlikely (figure 19).

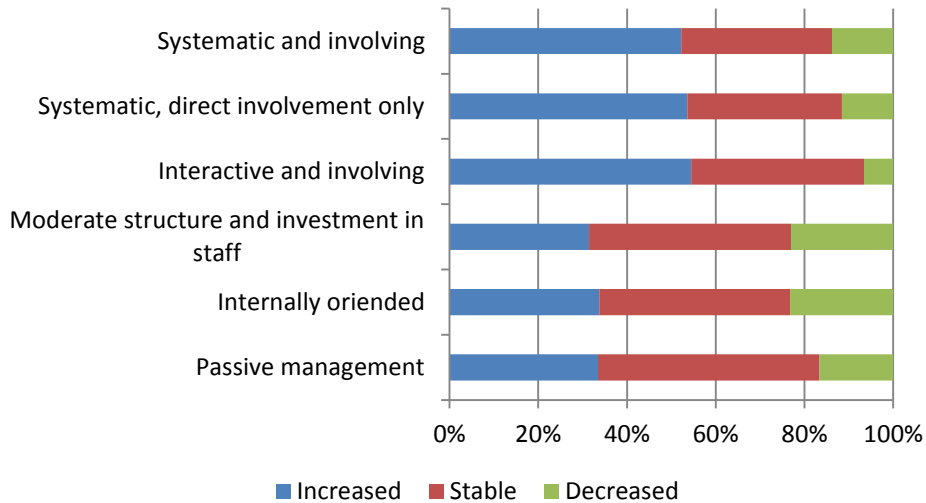
Figure 19: Changes in financial situation in the past three years, by bundles of workplace practices



Source: ECS 2013, calculations by authors

Interactive and involving establishments are relatively unlikely to report a decrease in labour productivity and relatively likely to report an increase (figure 20). Systematic and involving establishments and systematic establishments with direct involvement only are relatively likely to report increased labour productivity, and establishments with moderate structure and investment in staff or passive management are relatively unlikely.

Figure 20: Changes in labour productivity in the past three years, by bundles of workplace practices

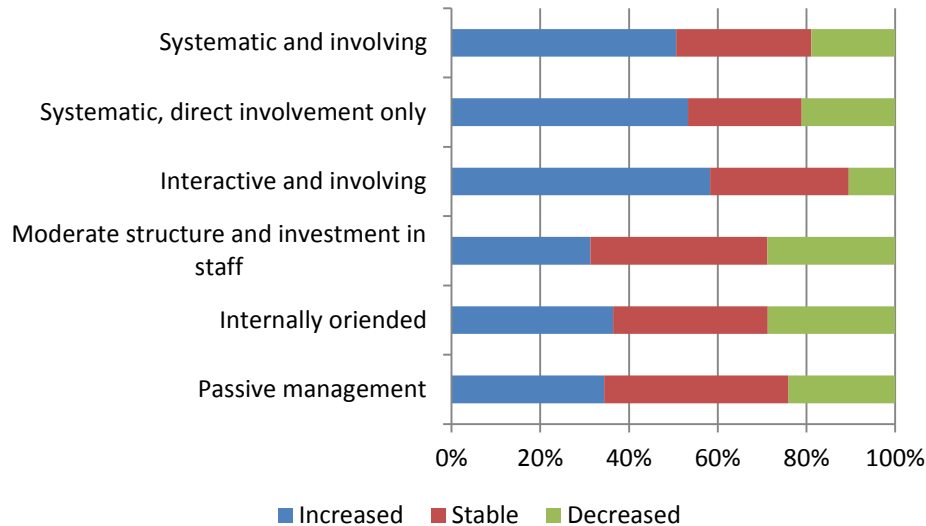


Source: ECS 2013, calculations by authors

Finally, establishments classified as ‘systematic and involving’, ‘systematic, direct involvement only’ and ‘interactive and involving’ are relatively likely to report increases in

production volume, and establishments classified as ‘moderate structure and investment in staff’ and ‘passive management’ are relatively unlikely (figure 21).

*Figure 21: Changes in production volume in the past three years, by bundles of workplace practices*



Source: ECS 2013, calculations by authors

As was the case for innovation, the pronounced and robust associations between performance and changes in employment on the one hand, and between bundles of workplace practices and performance on the other hand indicate that the associations between workplace practices and changes in employment might be mediated by performance. However, in the case of performance the bivariate associations with bundles of workplace practices are more often explained by the background characteristics of the establishments.

## Associations of workplace practices, innovation and performance with changes in employment

The previous section showed that there are associations between bundles of workplace practices and changes in employment, between innovation and performance and changes in employment and between bundles of workplace practices and innovation and performance. As discussed in the methodology section, a range of models was estimated in order to assess whether the expectation that there are direct associations between bundles of workplace practices and changes in employment, the associations between bundles of workplace practices and changes in employment are mediated by innovation and performance, and the associations between innovation and performance and changes in employment are moderated by bundles of workplace practices.

To ensure that adding additional variables to the models resulted in model improvements and to assess the relative importance of each of the sets of variables deviance tests were carried

out.<sup>9</sup> All the deviances presented in table 3 are statistically significant, but it does show that the models vary considerably in the extent to which they improve the model fit.

*Table 3: Comparative improvement in model fit*

	<b>Model 1</b> (workplace practices only)		<b>Model 2</b> (innovation and performance only)		<b>Model 3</b> (workplace practices, innovation and performance)		<b>Model 4</b> (workplace practices, innovation and performance, and selected interactions)	
	<b>Deviance</b>	<b>k (df)</b>	<b>Deviance</b>	<b>k (df)</b>	<b>Deviance</b>	<b>k (df)</b>	<b>Deviance</b>	<b>k (df)</b>
<b>Model 0</b>	157.3	10	3596.6	24	3636.0	34	3726.3	54
<b>Model 1</b>					3478.7	24	3569.1	44
<b>Model 2</b>					39.4	10	129.7	30
<b>Model 3</b>							90.3	20

Source: ECS 2013, calculations by authors; all deviances are statically significant at  $\alpha = .001$

Model 1 – in which the bundles of workplace practices are added – results in only a modest improvement compared to Model 0, which only includes country, sector of activity, establishment size, age and type. The improvement realised in Model 2, in which the measures of innovation and performance are added to the background characteristics, is considerably larger. Model 3, which includes workplace practices and innovation and performance results in a modest improvement compared to Model 2, and Model 4, in which interaction terms are added, again results in a modest improvement on Model 3.

Only the results from the full model are presented.<sup>10</sup> Figure 22 shows the results from Model 4 which includes indicators for the bundles of workplace practices, innovation and performance as well as interaction terms between bundles of workplace practices and changes in labour productivity. Changes in labour productivity were the only aspect of innovation and performance for which statistically significant interaction effects with bundles of workplace practices were found. To allow for the comparison of effect size across the variables, the figure shows the marginal effects.<sup>11</sup>

A first important finding is that the direct associations between bundles of workplace practices, which were shown in the previous section, largely disappear when innovation and

<sup>9</sup> For these tests the difference in log pseudo likelihood of each of the models is calculated and transformed such that it follows a  $\chi^2$  distribution, which can be assessed for statistical significance at a degrees of freedom (df) level that is equal to the number of parameters (k) that are added in the more complex model (see for instance Hosmer, Lemeshof and Sturdivant, 2013).

<sup>10</sup> The results of all models are found in Annex 1.

<sup>11</sup> These are the differences between the predicted probabilities for the category shown and the reference category, at the mean values of all the other variables in the model. For the bundles of workplace practices effect coding was used. Consequently, the marginal effects do not refer to the difference with a reference category, but to the difference between the categories shown, and the mean of the means. The marginal effects for the interaction terms were calculated separately and refer to the difference between the category shown and the reference category for changes in productivity, within each of the bundles of workplace practices, at the mean values of all the other variables in the model.

performance are entered into the model. Only a small negative association between ‘passive management’ and decreased employment remains. So, when controlling for performance and innovation, establishments with ‘passive management’ are somewhat less likely to have experienced decreases in employment.

With regard to innovation, the model shows no associations of any of the types of innovation with decreases in employment, and modest but significant positive associations of all types of innovation with increases in employment.

The current financial situation is closely associated with changes in employment.

Establishments where the current financial situation is good or very good are less likely to report decreased employment and more likely to report increased employment than establishments where the financial situation is stable. Reversely, establishments where the current financial situation is bad or very bad are more likely to report decreased employment. In terms of changes in the financial situation, sizeable positive associations are found between a worsened financial situation and decreased employment and between an improved financial situation and increased employment.

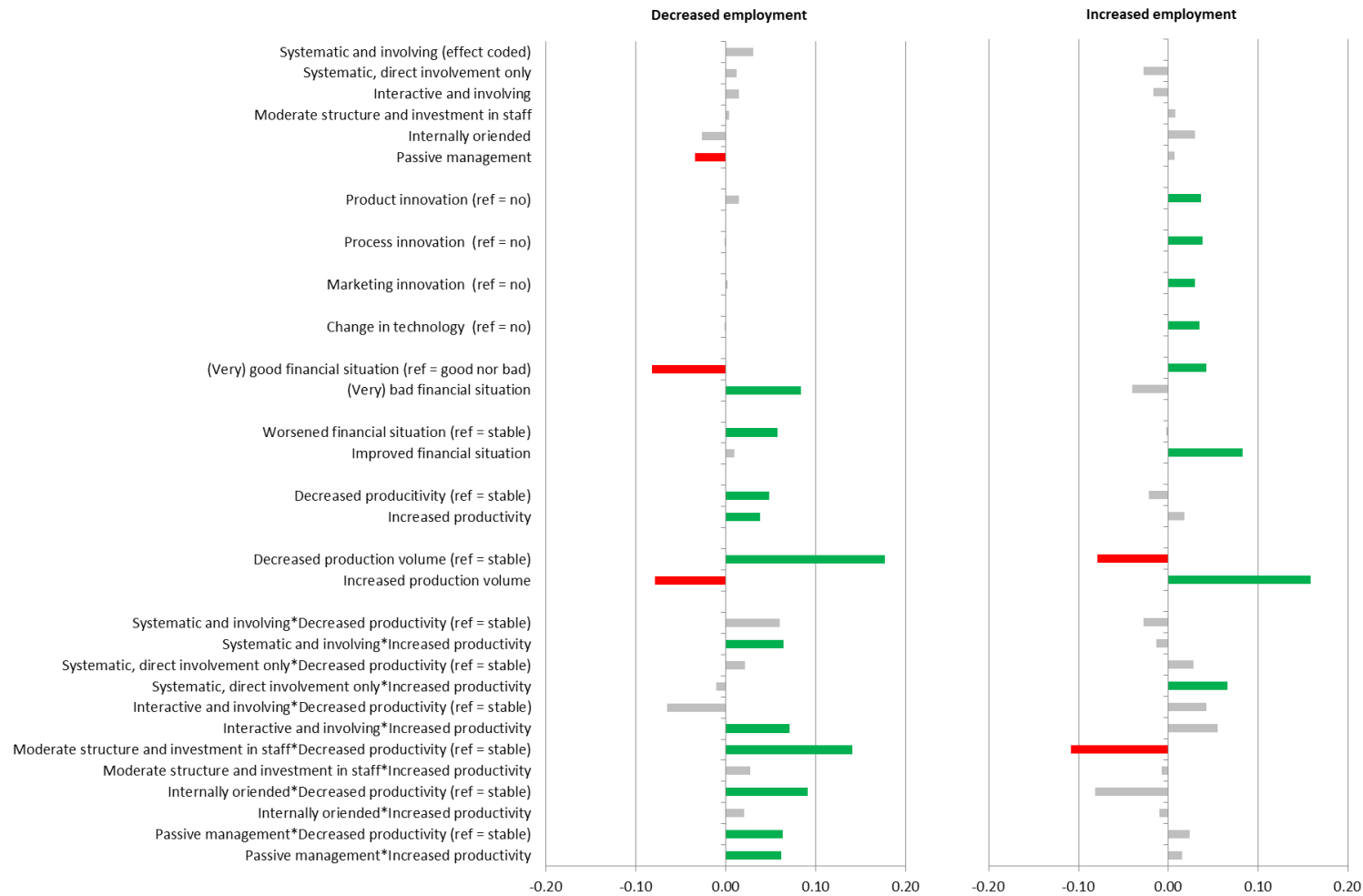
Changes in production volume show the strongest associations with changes in employment, which makes intuitive sense: when there is more work to be done – all other things equal – there is need for more people to do the work, and, reversely, when workload decreases, less people are needed. These general associations hide possible differences, for instance, between size classes, and it needs to be kept in mind that the analysis only shows association and not causation.

The main effects for changes in productivity are less straightforward. Establishments where productivity has decreased as well as establishments where productivity has increased are more likely to report decreased employment than establishments where productivity is stable. However, changes in productivity are not associated with the likelihood of reporting increased employment. These main effects need to be interpreted by also looking at the interaction effects with the bundles of workplace practices. In ‘systematic and involving’ and ‘internally oriented’ establishments and establishments with ‘passive management’ the main effects of changes in productivity on decreased employment are further reinforced.

However, for ‘systematic and involving’ establishments the additional positive association between decreased productivity and decreased employment is not statistically significant and for ‘internally oriented’ establishments the additional positive association between increased productivity and decreased employment is not statistically significant.

For ‘interactive and involving’ establishments more or less the same is found, except that here there is a sizeable but non-significant negative association between decreased productivity and decreased employment, which might counteract the main effect. In establishments classified as ‘moderate structure and investment in staff’ decreased productivity is significantly positively associated with decreased employment and significant negatively associated with increased employment. In establishments classified as ‘systematic, direct involvement only’, no significant additional associations are found between increases or decreases in productivity and decreased employment, but a significant positive association was found between increased productivity and increased employment.

Figure 22: Marginal effects of workplace practices, innovation and performance on changes in employment



Source: ECS 2013, calculations by authors; red/green = negative/positive marginal effects, statistically significant at  $\alpha = .05$

**Disclaimer:** This working paper has not been subject to the full Eurofound evaluation, editorial and publication process.

## Conclusions and discussion

### *Key findings*

Based on the literature, it was expected that bundles of workplace practices with features that more closely resemble those of HPWS have a positive association with employment growth. With regard to innovation, it was expected that product and marketing innovation have a positive association with increased employment but that process innovation and changes in technology are more likely linked with decreased employment. Lastly, performance aspects (such as the current financial situation as well as in improvements of this situation, improvements in labour productivity, and increases of production volume) were expected to have a positive link with increased employment.

The analysis used the ECS 2013 dataset and examined reported changes in the establishments' employment situation as well as their innovation and performance factors in the three years preceding the survey (2010-2013). It should be acknowledged that this period was marked by significant negative employment impacts across the Member States (in some EU countries the negative employment effects were more dramatic than others).

The analyses in this paper show that – when making pairwise comparisons – there are clear associations between bundles of workplace practices, innovation, performance and changes in employment. However, when combining all of the variables in an overarching model a more nuanced picture emerges.

Firstly, the results from the deviance test, as well as the effect sizes found in the final model, imply that innovation and performance are much more closely associated with changes in employment than bundles of workplace practices. The introduction of all three types of innovation (product, process, and marketing) as well as of changes in technology in the workplace is associated with increases in employment. Similarly, good or improved performance tends to coincide with increased employment, and poor or worsened performance tends to go along with decreased employment.

Secondly, a direct association with changes in employment was only found for a single bundle of workplace practices. Establishments with passive management are less likely than average to report decreased employment.

Thirdly, given the associations between bundles of workplace practices and innovation and performance, the disappearance of most of the direct associations between bundles of workplace practices and changes in employment upon including innovation and performance in the analysis suggests a mediation effect.

Fourthly, the results indicate that the associations of changes in productivity with changes in employment are moderated by bundles of workplace practices. However, workplace practices did not significantly moderate the associations for any of the types of innovation, or for the other aspects of performance. Furthermore, the effect sizes and the results from the deviance tests imply that the improvement in explanatory power that is achieved by allowing for this moderation in the model is fairly limited.

### *Discussion*

The findings above suggest that although some support is found for all the expectations outlined in figure 1, the relationship between bundles of workplace practices and changes in employment for the largest part consists of a mediation effect: workplace practices mainly matter for employment to the extent that they affect performance and innovation, which in turn are associated with employment.

In terms of the associations with background characteristics, the descriptive analyses showed a positive association between size and increased employment. This is contrary to previous

findings that suggested that smaller companies are more likely to grow. The finding that younger companies are more likely to show increased employment is in line with the literature. This analysis also replicated the previous finding that multi-establishment companies are more likely to grow than single-establishment companies, but also found that they are also more likely to shrink. In other words, single-establishment companies are found to be more likely to have experienced stable employment, whereas multi-establishment companies are found to be more likely to have experienced changes in employment levels, be they upward or downward. In terms of the sector of activity, the findings replicate earlier findings that the service sectors are more likely to grow. The construction sector was found to be most likely to have experienced a decrease in employment between 2010 and 2013, which is unsurprising given that this was one of the sectors that was hit hardest by the Great Recession.

With regard to workplace practices, the results show that those bundles of workplace practices with features that more closely resemble those of high-performance work systems are positively associated with innovation, performance, and – be it largely indirectly – increased employment.

Innovations of products, processes and changes in technology as well as marketing introduced by companies in the three years prior to the survey are found to be positively associated with employment growth. No support was found for the expectation that different types of innovation have different employment effects. It is of interest to note that changes in the use of technology appear to have a complementary rather than labour replacing effect. This is an interesting finding, given the animated policy debate over the effects of technology on employment. These findings apply to the period between 2010 and 2013; long term effects would need to be further investigated.

Nearly all the performance measures examined show the expected associations with changes in employment. When managers characterise the current financial situation of their establishment as bad, the establishment is more likely to have seen a decrease of employment. Reversely, a good current financial situation is positively associated with increased employment and negatively associated with an employment decrease. In a similar fashion, a worsening of the financial situation in the past three years is associated with employment decrease and an improved financial situation is linked with positive employment results. Very strong positive associations were found between production volume and employment: decreases in the production volume are positively associated with decreased employment and negatively associated with increased employment and, reversely, increased production volume is positively associated with employment growth and negatively associated with employment reduction. In other words, establishments with full order books are more likely to grow their workforce. Changes in labour productivity – both increases and decreases – are found to be associated with decreased employment. However, these associations are moderated by the workplace practices that are in place.

While some caution needs to be used when interpreting the results of this study (see the discussion below), the findings of this paper provide further evidence for positive associations between worker-centred workplace practices and innovation and performance, and ultimately employment. Given the importance of mediation that was observed, policy efforts that are geared at promoting workplace practices that facilitate innovation and enhance performance – such as the initiatives developed by DG Grow in the area of workplace innovation<sup>12</sup> – can be expected to have positive spill-over effects for employment. Meanwhile, policy makers who are interested in stimulating employment growth are advised to focus their attention on

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<sup>12</sup> See <http://ec.europa.eu/growth/industry/innovation/policy/workplace/>



stimulating innovation and competitiveness, as more innovative and more successful companies are shown to be more likely to have experienced increases in employment. Workplace practices that facilitate and encourage direct participation of employees – ranging from regular meetings to online discussion boards – as well as creating an environment in which employees are likely to share their thoughts and make suggestions – which, among other things, requires trusting relations between management and staff, and appropriate reward systems – could be helpful in this regard, and have been shown to benefit workers as well. However, innovation and competitiveness also depend on the macro-economic environment, the institutional setting, the educational system, and many other factors that deserve attention. Similarly, several other factors may affect employment growth, internal or external to the company, as well as the willingness of the owners to grow. In this context, also ‘born global enterprises’ should be mentioned. Previous Eurofound research (2012, 2016) found that these companies, which intensively engage in international activities briefly after induction, are dynamic job creators and likely to create good quality and sustainable jobs. Data from the 2011 Global Entrepreneurship Monitor (GEM) show that on average in European countries, born globals employ 9.6 staff, compared with 5.6 in young enterprises (up to 3.5 years) and 6.7 in SMEs in general. This highlights the relevance for employment growth of the combination of some of the characteristics inherent in born globals – that is, international market orientation, young age and an innovation oriented business model (see also Reinstaller et al, 2010; European Commission, 2014; Wagner, 2002; Serti and Tomasi, 2008). The 2013 ECS does not contain information that allowed looking at the combination of internationalisation and innovation, but the 2019 ECS is intended to include questions that do make this possible.

#### *Limitations and recommendations for future research*

Several cautions apply to the findings presented above. First and foremost, the ECS 2013 is a cross-sectional survey. Consequently, the analyses show associations only and causal links cannot be made.

Secondly, the analysis is based on respondent assessments that are all derived from the same survey interview. This presents measurement issues as well as issues of endogeneity. Some of these assessments can be quite difficult for the respondent, and might be susceptible to bias. For instance, many of the survey questions are asked retrospectively, possibly creating recollection bias. Other questions refer to practices that are perceived as desirable for establishments to have. In this case, respondents might want to impress the interviewer, which could create a desirability bias. Endogeneity problems occur when many managers are optimistic about their workplace practices, performance as well as the employment situation in their establishment, resulting in associations between these variables that are due to this sunny disposition of the manager. The analyses have provided some counterfactuals to this ‘happy manager’ hypothesis, for instance, the negative association between the ‘passive management’ bundle and decreased employment. However, this does not rule out that to some extent a ‘happy manager’ effect has occurred.

Thirdly, and related, the survey might suffer from selection biases – due to unit non-response arising from establishments where the manager is unwilling or unable to take part in the survey, or due to item non-response where respondents are unwilling or unable to answer specific questions. The survey was designed to limit unit non-response, by using an engaging introduction text and by making several contact attempts to optimise the likelihood of finding the manager available. Nevertheless, it might well be the case that the survey sample contains an overrepresentation of establishments where managers are interested in topics surrounding work organisation, HRM and employee participation. With regard to item-nonresponse a test was carried out to check whether the subsample differed from the total sample in terms of the reported changes in employment, and no differences were found that would not be corrected

for by including the appropriate controls in the models. However, this does not rule out that there are other differences between the subsample and the total sample which are not controlled for.

Fourthly, some of the measurements used are rather crude. The measurement of innovation is somewhat limited. The questions about the introduction of new products, processes or marketing methods were intended to innovations which were new to the establishment, and not necessarily to the market. The results need to be interpreted with this rather broad definition of innovation in mind. Similarly, the measurement of changes in employment is not very precise. All that can be derived from the survey is whether overall staff numbers have gone up or down or remained stable over the past three years. It is not known by how much, nothing is known about the drivers of the changes, and nothing is known about the underlying pattern (for instance, an establishment can have a net increase in employment despite having fired half of their employees and replaced them with new staff).

Although some of these measurement issues can be addressed partially by analysis – as was done in this paper as well – there is bound to be some noise. For instance, if two or three people leave an establishment due to retirement and are not immediately replaced, particularly in smaller establishments, this might be reported as a decrease in employment, but might not be related to any of the variables of interest in the analysis.

A final limitation of this analysis and of the ECS 2013 is also one of the strengths, which is the focus on the establishment level. Whereas this allows us to analyse the mechanisms that are taking place at the workplace level, an implication is that findings cannot always be straightforwardly compared with, or related to, macro-level developments.

Future research should focus on the associations between workplace practices and innovation and performance, rather than on the associations between workplace practices and changes in employment at the establishment level. To carry out this type of analysis it would be good to explore the possibility to collect more detailed information on innovation – such that a distinction can be made between things that are new to the establishments and things that are new to the market.<sup>13</sup> Furthermore, to counteract issues of response bias, it would be good to explore the validation of management responses, particularly to the performance questions, by comparing them to data from other sources. Foremost, quantitative, outcome oriented analyses, such as reported in this paper, would benefit greatly from longitudinal data collection. Availing of data from the same companies at different points in time would allow making causal links and to gain closer insight in the underlying mechanisms.

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<sup>13</sup> It is planned to collect this type of information as part of the fourth edition of the European Company Survey, data collection for which will take place in 2019.

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## Annex 1: Results from all regression models

*Marginal effects on changes in employment for all four multinomial logistic regression models*

		<i>Model 1</i>		<i>Model 2</i>		<i>Model 3</i>		<i>Model 4</i>	
		<b>Decreased</b>	<b>Increased</b>	<b>Decreased</b>	<b>Increased</b>	<b>Decreased</b>	<b>Increased</b>	<b>Decreased</b>	<b>Increased</b>
Bundles of workplace practices (effect coded)	Systematic and involving	0.030*	0.028*			0.252**	-0.042	0.031	0.000
	Systematic, direct involvement only	-0.036**	0.040***			-0.020	0.006	0.012	-0.028
	Interactive and involving	-0.007	0.048**			0.011	0.010	0.015	-0.017
	Moderate structure and investment in staff	0.028*	-0.051***			0.017	-0.015	0.003	0.008
	Internally oriented	-0.010	-0.012			-0.023	0.008	-0.027	0.030
	Passive management	-0.005	-0.054***			-0.026*	0.008	-0.034*	0.007
Product innovation	Yes (ref = No)			0.017	0.035**	0.016	0.035**	0.014	0.036**
Process innovation	Yes (ref = No)			0.000	0.037**	-0.002	0.038**	-0.001	0.038**
Marketing innovation	Yes (ref = No)			0.004	0.029*	0.002	0.030*	0.001	0.030*
Change in technology	Yes (ref = No)			0.003	0.034**	-0.001	0.034**	-0.001	0.035**

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Current financial situation	(Very) good (ref = good nor bad)	-0.080 <sup>***</sup>	0.041 <sup>***</sup>	-0.081 <sup>***</sup>	0.041 <sup>***</sup>	-0.082 <sup>***</sup>	0.043 <sup>***</sup>
	(Very) bad	0.086 <sup>***</sup>	-0.043 <sup>*</sup>	0.085 <sup>***</sup>	-0.042 <sup>*</sup>	0.083 <sup>***</sup>	-0.040
Change in financial situation	Worsened (ref = Stable)	0.058 <sup>***</sup>	-0.003	0.057 <sup>***</sup>	-0.002	0.057 <sup>***</sup>	-0.002
	Improved	0.009	0.083 <sup>***</sup>	0.008	0.084 <sup>***</sup>	0.009	0.083 <sup>***</sup>
Change in productivity	Decreased (ref = Stable)	0.069 <sup>***</sup>	-0.025	0.069 <sup>***</sup>	-0.024	0.048 <sup>**</sup>	-0.022
	Increased	0.038 <sup>**</sup>	0.021	0.037 <sup>**</sup>	0.021	0.038 <sup>**</sup>	0.018
Production volume	Decreased (ref = Stable)	0.177 <sup>***</sup>	-0.079 <sup>***</sup>	0.177 <sup>***</sup>	-0.079 <sup>***</sup>	0.177 <sup>***</sup>	-0.079 <sup>***</sup>
	Increased	-0.079 <sup>***</sup>	0.159 <sup>***</sup>	-0.079 <sup>***</sup>	0.158 <sup>***</sup>	-0.079 <sup>***</sup>	0.159 <sup>***</sup>
Systematic and involving	Worsened productivity (ref = Stable)					0.060	-0.027
	Improved productivity					0.064 <sup>**</sup>	-0.013
Systematic, direct involvement only	Worsened productivity (ref = Stable)					0.021	0.028
	Improved productivity					-0.011	0.066 <sup>**</sup>
Interactive and involving	Worsened productivity (ref = Stable)					-0.066	0.043
	Improved productivity					0.071 <sup>*</sup>	0.055
Moderate structure and investment in staff	Worsened productivity (ref = Stable)					0.141 <sup>***</sup>	-0.109 <sup>**</sup>
	Improved productivity					0.027	-0.008
Internally oriented	Worsened productivity (ref = Stable)					0.091 <sup>**</sup>	-0.081
	Improved productivity					0.020	-0.010
Passive management	Worsened productivity (ref = Stable)					0.063 <sup>*</sup>	0.024
	Improved productivity					0.062 <sup>*</sup>	0.016

Source: ECS 2013, calculations by authors; \* significant at  $\alpha = .05$ ; \*\* significant at  $\alpha = .01$ ; \*\*\* significant at  $\alpha = .001$

## Annex 2: Questions used for variable construction

Variable	Questions used	Method of transformation
Employment change	BCHEMP	Recode
Product innovation	BINNPRSE	Recode
Process innovation	BINNOPROC	Recode
Marketing innovation	BINNMAPR, BINNMAPU	Recode
Change in technology	JCHTECH	Recode
Current financial situation	KFINAN	Recode
Improved/deteriorated financial situation	KFINANCH	Recode
Improved/deteriorated productivity	KLABPRCH	Recode
Increased/decreased production volume	KGOSEPR, KSERPROV	Recode
Collaboration and outsourcing	GCOLDEDE, GCOLPROD, GCOLMARK, GOUTDEDE, GOUTPROD, GOUTMARK	Recode, LCA
Internal organisation and information management	DDEPFUN, DDEPTY, DDEPGEO, FTEAMEX, FTEASIN, ELELEDOC, EEXTEMON, EMONQUA, EINFYS	Recode, LCA
Decision-making on daily tasks	EPLANN, FTAUTON, FTEAMEX, EHIERA	Recode, LCA
Training	HTRAIN (HTRAIPC), HONJOB (HONJOBPC)	Recode, LCA
Working time flexibility	HFLEXI (HFLEXIPC), HACCUOV, CEMPPART	Recode, LCA
Variable pay	HVBPRES, HVPINPER, HVPGRPE, HVPPRS, HVPSHOW	LCA
Direct employee involvement	JREGMEE, JSTAFFME, JADHOC, JDISSINF, JSOMEDI, JSUGGS, JSURVEY, JEIRETEN, JEICOMP, JEMPINF, JEMPCONS, JEMPEC	Recode, LCA
Official body for employee representation present	ERTYPE	Recode
Overarching bundles of workplace practices	<i>Based on the LCA solutions of the eight variables indicating bundles of practices</i>	LCA
Country	<i>Captured as part of the survey documentation process</i>	-

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<b>Variable</b>	<b>Questions used</b>	<b>Method of transformation</b>
Sector of activity (NACE Rev2 in six categories)	DMAINACT	Coding of open-ended answers, recoding
Establishment size	ANUMBEMP, AEMPCAT	Recode
Establishment age	AYEARSOP	Recode
Establishment type	ASINGLE, AHEADQU	Recode

For question wording please see:

[https://www.eurofound.europa.eu/sites/default/files/ef\\_files/surveys/ecs/2013/documents/3ecsquestionnairemm.pdf](https://www.eurofound.europa.eu/sites/default/files/ef_files/surveys/ecs/2013/documents/3ecsquestionnairemm.pdf)

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