

Health and safety risks at the workplace: a joint analysis of three major surveys

European Risk Observatory
Report

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Abbreviations

ESENER	European Survey of Enterprises on New and Emerging Risks
EU	European Union
EU-OSHA	European Agency for Safety and Health at Work
EWCS	European Working Conditions Survey
LFS	Labour Force Survey
MSD	Musculoskeletal disorder
MSE	Micro- and small enterprise
ns	Not significant
OSH	Occupational safety and health
PSC	Psychosocial safety climate
PSR	Psychosocial risk
R^2	Variance explained

Executive summary

In order to better protect the more than 217 million workers in the European Union (EU) from work-related accidents and diseases, in 2014 the European Commission adopted the Strategic Framework on Health and Safety at Work 2014-2020 ⁽¹⁾, which identifies key challenges and strategic objectives for health and safety at work. The Strategic Framework aims to ensure that the EU continues to play a leading role in the promotion of high standards for working conditions, to improve implementation of existing safety and health rules, in particular by enhancing the capacity of micro- and small enterprises to implement effective and efficient risk prevention strategies and to improve the prevention of work-related diseases by tackling new and emerging risks, without neglecting existing risks. This Framework proposes to address these challenges with a range of actions, including the improvement of statistical data collection to generate better evidence and to make more appropriate use of the data, as well as further improvements in monitoring tools.

As part of a series of secondary analyses of data from the second European Survey of Enterprises on New and Emerging Risks (ESENER-2), the European Agency for Safety and Health at Work (EU-OSHA) commissioned a study to combine data from the survey with data from two other major European surveys — the LFS 2013 ad hoc module on accidents at work and other work-related health problems, and the 6th European Working Conditions Survey — in one joint analysis. The aim was to provide answers to relevant questions in the area of occupational safety and health (OSH) risk management that could not be answered by analysing the individual datasets in isolation, such as ‘When OSH risks are managed at the enterprise level, do employees perceive that their exposure to OSH risk is reduced or lower?’ and ‘What about their work-related health outcomes?’. To promote risk management, it is important to know which factors influence OSH risk management; for instance whether risk management is impacted by the level of exposure of employees to work-related risks, both general and specific, whether the incidence of health problems gives impetus to the decision to manage OSH risks, and whether drivers of and barriers to OSH risk management — such as management commitment, employee participation or a lack of resources — are also important factors for consideration. This knowledge may be relevant to policy-makers, employer and employee representatives, and OSH professionals, so that all of them can further encourage occupational risk management.

The following research questions were addressed in this study:

1. Is exposure to OSH risks, both in general and more specifically to environmental risks, risks of musculoskeletal disorders (MSDs) and psychosocial risks (PSRs), as reported by employees, related to risk awareness and risk management in enterprises?
2. Are work-related health outcomes and well-being, as reported by employees, related to risk awareness and risk management in enterprises?
3. How well is risk management explained by exposure to work-related risks, both general and specific, and by work-related health outcomes, as reported by employees?
4. Do success factors, such as management commitment and levels of employee participation, or barriers, such as a lack of resources or expertise, explain the relationship between risk management at the enterprise level and the risk perception of employees? If so, what impact do these factors have?
5. Can a typology of enterprises be defined according to either the background of the enterprise (such as country, sector and size) or the main features of its OSH risk management approach, including its drivers and barriers?

One of the surveys considered is at the enterprise level, EU-OSHA’s ESENER-2 ⁽²⁾, which in 2014 surveyed risk awareness, risk management and the presence of drivers and barriers to risk management. The other two are at the employee level, dealing with exposure to risks and health outcomes as reported by employees. One of these surveys, the Labour Force Survey (LFS) 2013 ad hoc module on accidents at work and other work-related health problems (LFS 2013 ad hoc module) ⁽³⁾, inventories risk exposure overall, identifying general OSH and MSD risks and PSRs in general, and indicators for general work-

⁽¹⁾ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0332>

⁽²⁾ <https://osha.europa.eu/en/surveys-and-statistics-osh/esener>

⁽³⁾ http://ec.europa.eu/eurostat/statistics-explained/index.php/EU_labour_force_survey_-_ad_hoc_modules

related health, MSDs and mental health outcomes related to work. The second employee survey used in this analysis, the 6th European Working Conditions Survey (EWCS) ⁽⁴⁾, was carried out in 2015. It inventories more specific work-related risks, such as environmental risks, risks of MSDs and PSRs, as well as some more specific work-related health outcomes.

We used two common background variables, *country* and *sector*, to combine these datasets in multilevel analyses. There were two levels used in the analysis:

- higher level: countries (analysis at country level, reporting at the level of country clusters);
- lower level: sectors within countries (analysis at sector level, taking into account country-level differences).

Company size was also considered as a potential third lower level for combining datasets, but it was not used, as the classification used in the EWCS could not be matched with the other surveys.

Relationships between indicators were studied using correlation and regression analyses.

Risks, work-related health and risk management in enterprises: principal conclusions

The general relationship noted in this study, which supports earlier studies using single datasets, shows that *exposure to risks*, and especially to specific occupational risks, is associated with increased risk management in enterprises. This finding is supported for:

- environmental OSH risks and OSH risk awareness and management;
- general MSD risks, heavy lifting and tiring positions, repetitive movements and MSD risk awareness and management;
- general PSRs and PSR awareness and management;
- violence and harassment, job insecurity and PSR management.

The presence of *health problems* is only marginally associated with more management of OSH risks and MSD risks in enterprises. Only when employees report work-related mental health problems is this associated with increased PSR management in enterprises; this is in addition to the impact from exposure to general and specific PSRs.

The main conclusions for the first three research questions are that:

6. Exposure to risks in general, as reported by employees, is positively related to risk awareness and risk management for all three types of risks studied here (OSH, MSD and PSR): greater risk exposure reported by employees is related to greater risk management in enterprises.
7. The availability of specific information on exposure to risks, as reported by employees, is strongly related to risk management taking place in enterprises.
8. General as well as specific health outcomes, as reported by employees, particularly on work-related general health, MSDs and mental health, are positively related to risk awareness and risk management in enterprises. However, for general health (LFS) as reported by employees, there is no relationship between OSH risk awareness and OSH risk management in enterprises.
9. When information on exposure to general and specific risks is taken into account, information on health problems reported by employees is only marginally related to management of OSH and MSD risks in enterprises taking place. However, when employees report work-related mental health problems, the relation to PSR management in enterprise is increased, even when exposure to general and specific PSRs is taken into account.

These findings suggest that enterprises do respond to high risk exposure reported by employees, and especially to exposure to specific risks. Particularly in the case of PSR management, mental health problems encountered by employees also appear to be positively related to PSR management, on top of the exposure to PSRs.

⁽⁴⁾ <http://www.eurofound.europa.eu/surveys/european-working-conditions-surveys>

With regard to country and sector differences, it was found that sectors are more of a 'driver' of OSH and MSD risk awareness and management. Countries, on the other hand, are stronger drivers of more PSR management and awareness. This may mean that political and cultural factors play a larger role here.

Drivers of and barriers to risk management in enterprises: principal conclusions

Several drivers and barriers are known to directly influence risk management in enterprises. Some drivers and barriers can also influence or moderate the *relationship* between risks and risk management. Drivers that were found to have a direct enhancing impact on both OSH and MSD risk management are the presence of a formal employee representative, management commitment and informal employee involvement in OSH management. For the other drivers, such as meeting employees' expectations, increasing productivity or the organisation's reputation, and barriers, such as a lack of time and staff, lack of resources, lack of knowledge etc., direct relationships were not found. For PSR management, the only relevant and statistically significant driver found is employee involvement in the design and set-up of measures aimed at managing PSRs.

When the moderating effect of drivers to risk management was assessed, and drivers were found to be absent or low, the relationship between the exposure to risk and risk management also appears to be absent. When these drivers are present, in general a positive relationship is found between the risk exposure, as reported by employees, and risk management in enterprises moderated by a specific driver, e.g. employee involvement. Formal employee representation moderates the relationship between specific environmental risks, repetitive movements and OSH and MSD risk management; by comparison, the moderating impacts of other drivers on the relationship between OSH and MSD risk, and risk management, are rather small. The expectations of employees are the only driver that moderates the relationship between repetitive movements and MSD risk management.

For PSR management, some specific drivers were found to moderate the relationship between exposure to PSRs, as reported by employees, and PSR management in enterprises. In general, the main conclusions reported above for OSH and MSD risk management apply here too. However, PSR management particularly benefits from employee involvement in managing PSRs (rather than participation in OSH risk management in general), as well as good OSH communication, a respectful workplace and the opportunity to discuss organisational issues in a more formalised way.

The relationship between job insecurity and PSR management is somewhat different. This relationship is a negative one, which can be interpreted as indicating that, where job insecurity is high (and therefore the value of staff retention may be low), PSR management is low, indicating that it is not a priority.

Barriers to risk management, such as a lack of resources, do not have a major effect on risk management, but do have a moderating effect on OSH management and minor effects on MSD and PSR management: when there are fewer barriers, the relationship between the risk, as reported by employees, and risk management is absent. However, when barriers are present, it is only high levels of exposure to risks such as violence and harassment that are associated with greater risk management.

From these results it can be concluded that improving management commitment, formal employee representation and employee involvement in OSH management are associated with greater OSH and MSD risk management. Employee involvement in managing specific PSRs is positively related to overall workplace PSR management. PSR management may also benefit from a workplace that is respectful towards employees and transparent communication, as well as the opportunity to discuss potential risks.

Enterprise typologies: principal conclusions

The final research question aimed to investigate the possibility of defining typologies of enterprise according to either the background of the enterprise (such as country or sector) or their main features of OSH risk management, including drivers and barriers. The results of the analyses show that typologies can be made for countries, country clusters and sectors based on the main determinants of

risk management. These typologies present the relative status of the drivers for general or specific risk management and indicate room for improvement in risk management in a given country, country cluster or sector.

Several examples are given in the full report building on the characteristics that were found to be related to higher levels of risk management. For example, in Figures 1 and 2 we show the typology for OSH risk management and PSR management in the Nordic countries and the Baltic states, as these are quite different.

The OSH management typology for country clusters shows that, for example, a country cluster such as the Baltic states (Figure 1) rates more favourably than average (0.0 on the horizontal axis) with respect to overall OSH risk management and that this is comparable to overall OSH risk management in the Nordic countries (Figure 2). However, the figures also show that, to a large extent, different drivers contribute to the level of OSH risk management in each of these two country clusters. This suggests that in both country clusters there is considerable room for further improvement of OSH risk management. It may be argued that, in the Baltic states, the focus for improving OSH risk management could be shifted to more employee representation, more actual employee involvement in OSH risk management and more management commitment. In the Nordic countries, more attention could be paid to the environmental risks, and management commitment could also be improved further. OSH barriers, e.g. lack of resources, negatively contribute to OSH risk management in both country clusters, and lowering the barriers may also improve risk management.

Figure 1: The typology of OSH risk management for the Baltic states

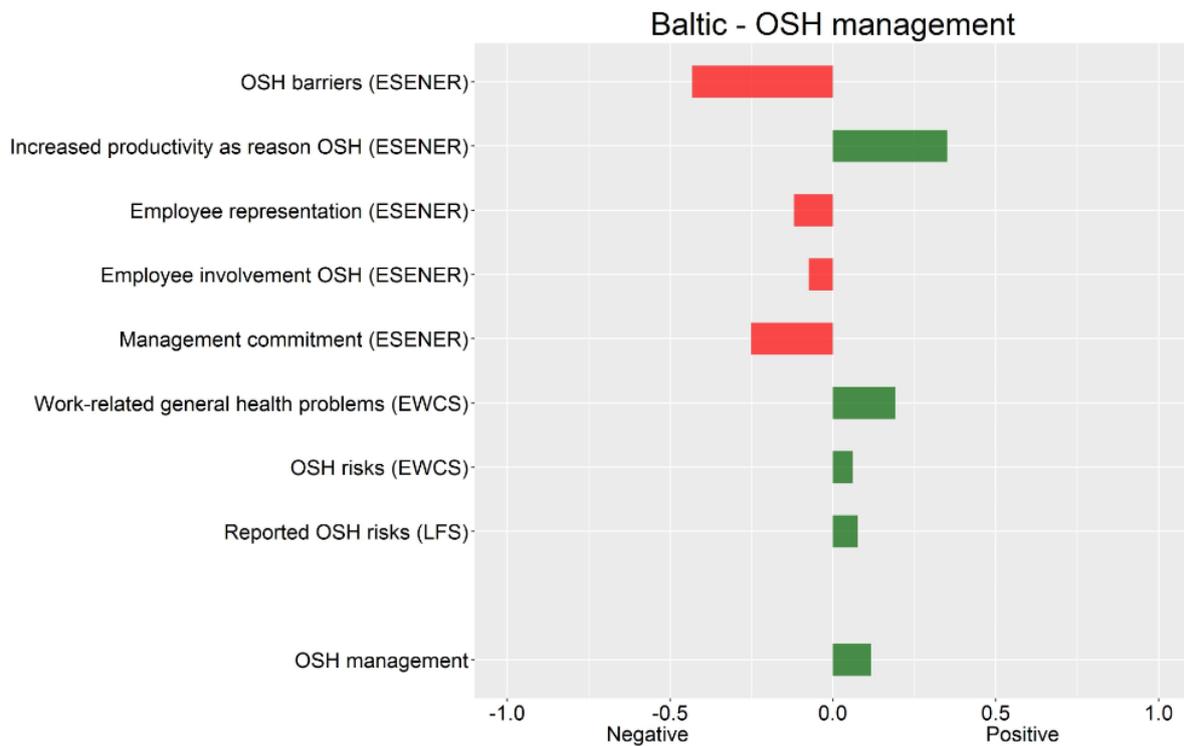
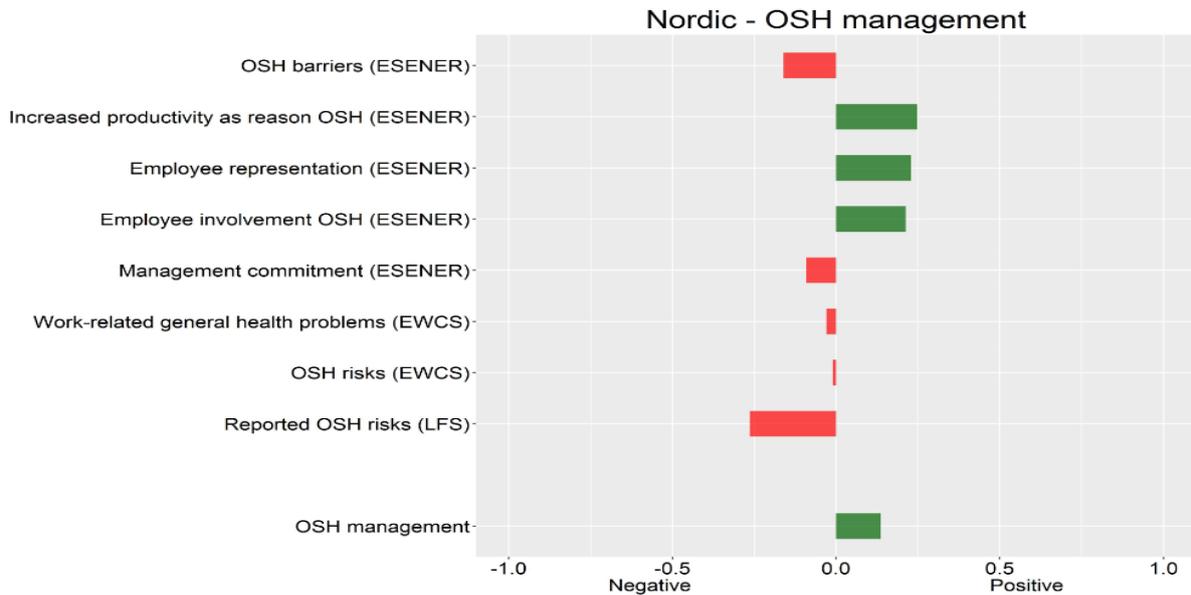


Figure 2: The typology for OSH risk management for the Nordic countries



The explanatory variables for PSR management are quite different from those for OSH risk management. When considering PSR management for the same country clusters discussed above, the typology of the Baltic states shows more room for improvement (Figure 3) than the Nordic countries (Figure 4). PSR management in the Baltic states is relatively poor; exposure to PSRs in general is relatively high; employee involvement in the management of PSRs and the opportunities to discuss these risks are also quite low. Improving all these indicators may result in an increase in PSR management in the Baltic states. In the Nordic countries the typology for PSRs management is much more positive, both on risk management and on the most important drivers of PSR management (Figure 4). However, even here there appears to be room for improvement in tackling barriers to PSR management and in improving management commitment, as well as tackling, job insecurity.

Figure 3: The typology of PSR management in the Baltic states.

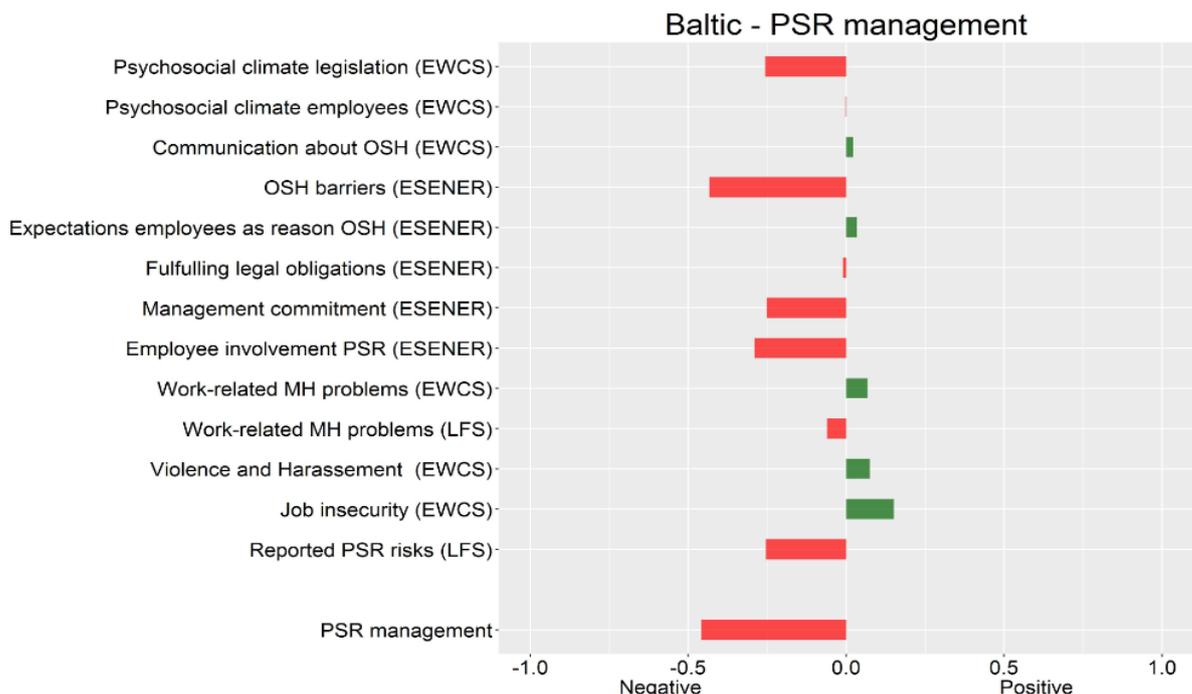
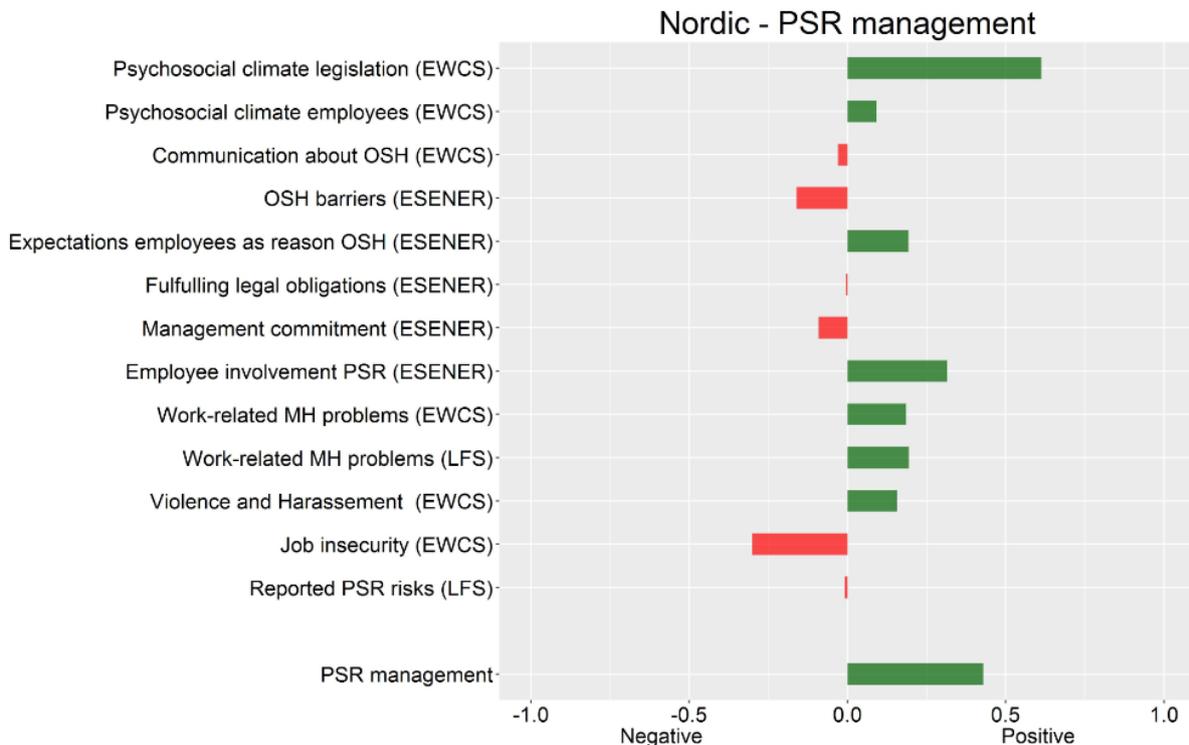


Figure 4: The typology of PSR management in the Nordic countries



Summary findings of the joint analysis

Based on the results of this joint analysis of the three major European surveys on OSH, the following summary conclusions can be drawn:

- Exposure to risks, as perceived by employees, and particularly to specific environmental and specific MSD risks and PSRs, appears to be an important driver of the management of OSH risks, risks of MSDs and PSRs.
- Additionally, information on mental health problems, as reported by employees, significantly and relevantly adds to the management of PSRs in enterprises, as does information on exposure to general and specific PSRs. This is not the case for general work-related health or MSDs.
- Drivers and barriers to risk management may influence how policy-makers and other stakeholders — employers, employees and their representatives, and OSH professionals — manage OSH risks in enterprises, particularly MSD risks and PSRs.

Recommendations for policy-makers, national and sectoral stakeholders

Based on the results of this joint analysis, the following recommendations can be made:

- It is important to support moves to *strengthen management commitment* to OSH management in general, as well as the specific management of OSH and MSD risks. Although this driver was not found to be related to PSR management, the literature suggests that it is relevant to PSR management. The present study suggests that specific support for PSR management is necessary to fully develop PSR management.
- It is also recommended that employer and employee representatives and other relevant stakeholders, such as representatives of sector-level organisations and OSH professionals,

encourage employee participation to facilitate the management of OSH in general, as well as more specific management of MSD risks and PSRs. This is because:

- Improving *formal employee representation* is strongly associated with OSH and MSD risk management. Again, no association with PSR management is found.
- Improving *informal employee participation* can also improve OSH management.
- *Involvement in the design and set-up of measures to manage PSRs* is strongly associated with greater PSR management.

National and sectoral stakeholders could also:

- *Support the development of risk assessment tools.* Examples of such tools are often already available at EU and national levels for general, as well as specific, risks.
- Aim to improve formal employee representation in companies to support OSH management.
- *Encourage formal employee representation* as an important driver in the reporting of exposure to OSH and MSD risks by employees and in risk management by the establishments. Employee representation was found to be important. However, representation does not have to be formal, particularly when considering the findings about PSR management. The key factor is employee involvement in risk management, particularly for PSR management, which is greatly improved when employees are involved in managing specific PSRs.
- *Encourage management commitment to risk management*, as it is important for managing OSH and MSD risks. It may be that management commitment specifically directed at psychosocial issues is also important for PSR management, but information on this type of management commitment is not yet available in ESENER.
- *Promote fair and respectful workplace environments and the presence of employee representation in the workplace* to effectively manage PSRs. These, together with the opportunity to formally discuss organisational issues, are particularly important drivers of PSR management.
- *Aim to increase resources for risk management in enterprises.* In general, limited resources in enterprises mean that there is no relationship between risks reported and risk management. The findings indicate that only in the case of specific risks, such as violence and harassment, are sparse resources allocated to these risks.

Limitations of the joint analysis

The method used to combine data in this study has limitations. It is clear that combining three datasets is quite complex, particularly because there is no option to link the data at the individual worker or enterprise level. As a result, we were restricted to analyses at the higher cluster levels (i.e. country and sector). The variable 'size' could not be taken into account as a level for the linkage of the datasets when the EWCS was included. However, the impact of not including the size level was analysed using the ESENER-2 and LFS 2013 ad hoc module in combination, and was found not to have a major impact when considering only robust and relevant findings.

Another limitation of the study is that causality could not be established using these cross-sectional rather than longitudinal survey data. The data were taken from three different surveys collected around the same time. While we could analyse correlations and associations between all variables, it was not possible to indicate any causal direction in these relationships. Although the typologies are based on the findings of all joint analyses and present the relative impact of drivers of general OSH risk management and more specific MSD and PSR management, a causal relation can still be assumed, since they all suggest room for improvement. In the present study, only cross-sectional correlations could be considered. From the literature, however, some causal direction can be assumed for management commitment, and employee participation in risk management, as well as a lack of resources (e.g. Kompier and Marcelissen, 1990; Leka et al., 2010, 2011; Westgaard and Winkel, 2011; Nielsen and Randall, 2013).

In addition, the questions on specific drivers of PSR management and on PSR management itself in ESENER-2 were asked only of enterprises with 20 employees or more, excluding smaller enterprises. This resulted in some loss of power when analysing the impact of drivers and barriers on PSR management.

Strengths of the joint analysis

Combining datasets like this helps to produce relevant, interpretable results that can go further than what would be possible through separate analysis of these datasets. The analysis of combined datasets, as done in this study, is a cost-effective way to obtain results from several sources that could otherwise be obtained only through costly and time-consuming field work. It also allows us to make more use of existing data. For example, this study allows us to look at the associations between employee and enterprise data on OSH risk exposure at work as reported by employees and risk management at the enterprise level.

However, harmonisation of common variables for linking databases (e.g. country, sector and size) as done in this study is a prerequisite for the successful combination of different datasets. The more levels of information that can be linked, the more reliably and validly the results can be interpreted.

The joint analyses link important steering information (drivers and barriers) to OSH risk management in general as well as to the management of important specific OSH risks, PSRs and MSD risks. For PSR management, part of the information on drivers came from ESENER-2 and part came from the EWCS. Both sources were equally able to provide useful information that can be used to promote PSR management. The drivers are particularly important components of a typology that provides an overview of conditions in countries, country clusters or sectors, and indicates where there is room for improvement to actively promote risk management.

Future work

Joint analyses may become one type of analysis that will merit more use in the future. When datasets collecting information on OSH are better harmonised, including the levels at which the data can be combined, the usefulness of these type of analyses may increase further.

In future, with further adaptation to these surveys, we may also be able to consider other relevant drivers and barriers, particularly for specific types of OSH risks. For now, no specific information on drivers and barriers was available for MSD risk management. There are some specific drivers of PSR management, but, to better grasp the conditions for specific drivers, one may additionally need specific information about management support specifically for PSRs and MSD risks, and communication about these specific types of risks as well.

Although some of the future work proposed here is aspirational, these joint analyses already provide findings relevant both to general OSH risk management and more specifically to MSD risk management and PSR management, and help indicate which factors and potential policy and practice changes could further promote general and more specific OSH risk management in enterprises within different countries and different sectors.

1 Introduction

To better protect the more than 217 million workers in the European Union (EU) from work-related accidents and diseases, in 2014 the European Commission adopted the Strategic Framework on Health and Safety at Work 2014-2020 ⁽⁵⁾. This identifies key challenges and strategic objectives for health and safety at work, presents key actions required and notes instruments that can help achieve these actions.

The framework aims to ensure that the EU continues to play a leading role in the promotion of high standards for working conditions within Europe and internationally, in line with the Europe 2020 strategy⁶. Mechanisms to address challenges include the improvement of statistical data collection, generating better evidence and promoting more appropriate use of data, as well as further improving monitoring tools. There are a number of EU-wide monitoring tools in place to collect information on occupational safety and health (OSH), focused either on the worker or on the enterprise. Eurostat's European Labour Force Survey ⁽⁷⁾ (LFS) is completed annually by *employees*; it included ad hoc modules on work-related risks, accidents at work and other work-related health problems in the 1999, 2007 and 2013 surveys. Another *employee-level* survey is Eurofound's five-yearly European Working Conditions Survey ⁽⁸⁾ (EWCS). The EWCS addresses the 'quality of work' and its sixth and latest wave was conducted in 2015. At the *enterprise level*, the European Agency for Safety and Health at Work's (EU-OSHA's) ESENER (European Survey of Enterprises on New and Emerging Risks) ⁽⁹⁾ addresses how enterprises manage safety and health risks in the workplace, with a focus on psychosocial issues and worker participation. ESENER was administered for the first time in 2009 and for a second time in 2014.

As part of a series of secondary analyses of data from ESENER-2, EU-OSHA commissioned a study to combine its findings with the other two major European surveys — LFS and EWCS — in a single joint analysis. The challenge of this study was to see if these three European surveys, collected in different ways from different sources, could be combined in a statistically sound way, and provide additional answers to relevant questions in the area of OSH risk management, that could not be answered by analysing these datasets in isolation.

1.1 Aims and research questions

The aim of this study was to provide answers to relevant questions concerning OSH risk management, including learning more about 'When OSH risks are managed at the enterprise level, do employees perceive that their exposure to OSH risks is reduced or just lower?' as well as 'What about their work-related health outcomes?'. In order to promote OSH risk management it is also important to know what influences this risk management; whether it is influenced by the level of exposure of employees to general and specific work-related risks, whether the incidence of workplace health problems give impetus to the decision to manage OSH risks and whether drivers of and barriers to OSH risk management — such as management commitment, employee participation or a lack of resources — are also important factors to consider. This knowledge may be relevant to policy-makers, employer and employee representatives, and OSH professionals, all of whom can help further encourage OSH risk management.

The following specific research questions were addressed:

1. Is exposure to OSH risks, both in general and more specifically in relation to environmental risks, risks of musculoskeletal disorders (MSDs) and psychosocial risks (PSRs), as reported by employees, related to risk awareness and risk management in enterprises?
2. Are work-related health outcomes and well-being, as reported by employees, related to risk awareness and risk management in enterprises?
3. How well is risk management explained by exposure to work-related risks, both general and specific, and by work-related health outcomes, as reported by employees?

⁽⁵⁾ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0332>

⁽⁶⁾ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:EN:PDF>

⁽⁷⁾ http://ec.europa.eu/eurostat/statistics-explained/index.php/EU_labour_force_survey_-_ad_hoc_modules

⁽⁸⁾ <http://www.eurofound.europa.eu/surveys/european-working-conditions-surveys>

⁽⁹⁾ <https://osha.europa.eu/en/surveys-and-statistics-osh/esener>

4. Do success factors, such as management commitment and employee participation, or barriers, such as lack of resources or expertise, explain the relationship between risk management at the enterprise level and risk perception by employees? If so, what impact do these factors have?
5. Can a typology of enterprises be defined according to either the background of the enterprise (such as country, sector and size) or the main features of its OSH risk management, including its drivers and barriers?

These research questions are addressed in this report by a combined analysis of the second ESENER-2, the LFS 2013 ad hoc module on accidents at work and other work-related health problems, and the 6th EWCS. All three datasets and their predecessors have been previously analysed⁽¹⁰⁾. They have been shown to provide valid, self-reported data. In this study we combine these data, which differ in their sources and were all collected within the same three-year window (2013-2015). Since we combine worker-level data with enterprise-level data, we excluded responses from self-employed workers from the LFS and EWCS. For this reason, we will describe the LFS and EWCS data as employee-level data and not worker-level data.

In this study we will consider exposure to general OSH risks, general work-related OSH outcomes and general OSH risk management, as well as specific risks of MSDs and PSRs, and their specific outcomes and specific types of risk management. Work-related poor mental health and MSDs are in many European countries the main reasons for long-term absenteeism, disability and early retirement, and thus belong to the most costly types of occupational health problems, for the workers themselves, for enterprises and for society (e.g. Baldwin, 2004; Punnett and Wegman, 2004; Wittchen et al., 2011; OECD, 2012, 2015; Matrix Insight, 2013).

In section 1.2, we provide a short overview of the literature on the relationship between risks, outcomes and risk management, and introduce the relevant drivers and barriers for OSH risk management. In Chapter 2, we will concisely describe the datasets and variables used, the plan for the analysis and some basic principles of the combination of the datasets. For a more extensive description of the methods used we refer to the technical report (Eekhout et al., 2016). In Chapter 3 we present the main findings and address all research questions. In Chapter 4 we summarise the main conclusions, discuss these findings and put forward some recommendations.

1.2 What do we know about the relationship between risks, outcomes and risk management?

The main aim of OSH risk management and intervention is to decrease employees' exposure to work-related health risks, work-related health problems and accidents. In a review, Robson et al. (2007) show that the effects of voluntary and mandatory OSH management system interventions are positive, although the number of studies reviewed is too small to draw firm conclusions. Voluntary OSH management system interventions increased the implementation of measures over time compared with no intervention, positively affected intermediate factors (e.g. creating a safety climate, greater action taken on OSH issues) and resulted in decreased injury rates. Mandatory OSH management system interventions were also found to have a positive effect compared with no intervention. These interventions increased safety and health awareness, improved employee perceptions of the physical and psychosocial environment and decreased lost-time injury rates. The same results are found in a systematic review of job-stress interventions (Lamontagne et al., 2007). They found that interventions that address both the organisational as well as the individual levels, in particular, have favourable impacts on both these levels.

Results of research into the relationship between risk management and risk perceptions, however, are not always conclusive (Nielsen and Randall, 2013; see Box 1). Additionally, in several studies, particularly using large datasets where all information is collected at about the same time, a *positive*

⁽¹⁰⁾ For ESENER see: <https://osha.europa.eu/en/tools-and-publications/publications/second-european-survey-enterprises-new-and-emerging-risks-esener/view>.

For EWCS see: <http://www.eurofound.europa.eu/surveys/european-working-conditions-surveys>.

For LFS ad hoc modules on accidents at work and other work-related health problems see: http://ec.europa.eu/eurostat/statistics-explained/index.php/EU_labour_force_survey_-_ad_hoc_modules.

relationship is often found, indicating that, the more work-related risks or work-related health problems are reported, the more measures are taken in these workplaces (e.g. Houtman et al., 1998; Houtman, 1999; Taris et al., 2010; EU-OSHA, 2012). It makes sense that measures may also be a response to high risk exposure, a high incidence of occupational accidents and many work-related health problems.

Taris et al. (2010) found that sectors and enterprises that have a history of stress prevention programmes, who have thus already taken measures in the past to manage risks, are less active in taking measures to reduce PSRs (because they already have good systems in place to deal with these issues) or perceive these risks as less of a problem than do sectors and enterprises that do not have a history of stress prevention programmes. Taris et al. (2010) performed an in-depth qualitative and quantitative analysis of nine (mainly public) sector-level work-related stress intervention programmes. They concluded that an effective programme will build on experiences and relevant knowledge, and is not only the start of a range of successful organisation-level interventions, but also the result of previous OSH risk management and work-related sickness absence management. In sectors or enterprises with less experience and knowledge, a different approach may be more effective in motivating enterprises to reduce OSH risks and work-related absence by, for example, implementing pilot projects involving the gathering of knowledge and experience, conducting research into the origins of work-related stress and providing 'good practice' guidelines for employees. In this way the enterprise may begin to build a body of knowledge on the effects of OSH interventions.

Westgaard and Winkel (2011) identified and analysed factors that positively influenced the effect of organisational measures directed at managing work-related stress and physical load, as well as the health and well-being of employees. They found that the following factors all had positive effects on risk management: workers' participation (in change processes and in general); providing information to workers about forthcoming events that influence their work; group autonomy; an inclusive management style (clarity and transparency of goals, open dialogue, concern for workers); organisational support (information to workers); social support (from co-workers, supervisors and subordinates); and procedural justice.

Nielsen and Randall (2013) developed a model containing elements that are crucial in process evaluation because they have an impact on the outcome of an intervention. Their criteria for success of interventions are comparable to that of other researchers, such as Kompier and Marcelissen (1990), Leka et al. (2010) and Westgaard and Winkel (2011). The principal criteria are reported in Box 1.

Box 1: Principal criteria for intervention success (adapted from Nielsen and Randall, 2013)

1. The intervention should be targeted at workplace problems. To be able to do so, a thorough risk assessment is necessary. As every organisation is unique, solutions should be tailored to the problem and the organisation.
2. A structured action plan should be developed and executed (if formal plans are not implemented they will not have the desired effect).
3. Employees should be involved. Participation of employees in decision making is a desirable intervention strategy (informal as well as formal, through formal roles and responsibilities).
4. Senior management should be supportive: providing the resources (money, but also time for workers to participate), acting as a role model or being actively involved in the intervention activities can increase the success of the intervention.
5. Middle management is important: middle managers can hinder or facilitate interventions (for example, restricting workers' time spent on the intervention, preventing them from attending workshops). Active involvement of middle management has a positive effect on the outcomes of an intervention. Passive resistance of middle management to change or intervention has a negative effect.
6. Information and communication about the intervention should be transparent and timely. Appropriate communication and information helps employees to understand the intervention and influences the commitment of employees to intervention activities. Information should be followed up by activities, as failure to do so could disappoint employees. Results of risk analyses should be fed back to employees and translated into actions.

The intervention should fit into context: does the intervention fit within the culture and conditions of the intervention group? High job demands may hinder employees' ability to participate in an intervention. A hierarchical workplace culture may also hinder employees' participation. Making time and resources available for employees can promote their participation

Relevant literature about drivers of successful interventions within the field relates to the concept of 'psychosocial safety climate' (PSC). Dollard, 2007; Dollard and Bakker, 2010; Dollard et al., 2012) developed this concept to explain the origins of job demands and resources, psychological health and employee engagement. PSC covers policies, practices and procedures to protect workers' psychological safety and health. This concept refers to contextual factors within the organisation as sources of work stress, and incorporates the same concepts as the success factors for OSH interventions discussed by Kompier and Marcelissen (1990), Leka et al. (2010), Westgaard and Winkel (2011) and Nielsen and Randall (2013): employee participation, employer and supervisor commitment, and communication. It may be that these 'modifiers' or 'active ingredients for effective implementation' may be particularly relevant to PSR management, but they are also part of effective OSH management (e.g. Robson et al., 2007; Walters et al., 2013).

In several studies, the presence of a strong PSC in organisations appears to be related to low levels of PSR, positive mental health and engagement (as opposed to burnout; Dollard, 2007; Dollard and Bakker, 2010). In the teaching profession, PSC predicted a change in teachers' psychological health through emotional job demands and a change in employee engagement through its relationship with skill discretion (i.e. the opportunity to develop skills in one's work; Dollard and Bakker, 2009). Using hierarchical multilevel linear modelling, Dollard et al. (2012) also found that, for a particular nursing unit, PSC, as assessed by the nurses working in it, predicted working conditions (workload, control, supervision and support) and psychological strain on different nurses working in the same unit 24 months later. These results support a multilevel work-stress model with PSC as a plausible primary cause, or 'cause of the causes', of work-related strain. PSC might be a success factor for the implementation of OSH interventions.

The literature described above mainly reports on the importance of the participation of employees in OSH management as well as PSR management. The secondary analysis of ESENER-1 by Walters et al. (2012) also indicates that formal worker representation acts as a driver, in that workplaces with worker representation on OSH tend to be better at managing both general safety and health risks, as well as PSRs. This effect is particularly noticeable when the involvement of workers is combined with a high level of management commitment to OSH management.

Another secondary analysis on ESENER-1 indicated that proper OSH management (e.g. completing risk assessments and having action plans) is also the main predictor for PSR management, next to legislative obligations. In addition, barriers in terms of a lack of resources (e.g. expertise, technical support and guidelines) may hinder proper OSH management, as well as PSR management (EU-OSHA, 2012).

From the literature on OSH interventions, and more specifically for PSR management, it can be concluded that drivers of and barriers to successful risk management should be taken into account when studying workplace OSH relationships, particularly between measures for risk management and risk exposure and work-related health problems. Important drivers of employee participation (formal and informal) and management commitment relate to transparency and proper communication as well as perceived justice. A lack of resources may also act as a barrier to OSH management in general, as well as in more specific risk management, such as PSR management.

2 Methodology

2.1 Datasets and variables used

As indicated in the introduction, the data from three European surveys have been used in this study: ESENER-2, the LFS 2013 ad hoc module on accidents at work and other work-related health problems, and the 6th EWCS. These surveys are described in further detail in this chapter.

2.1.1 ESENER-2 ⁽¹¹⁾

EU-OSHA's ESENER-2 survey asked 'those who know best about safety and health in the establishment' about the way safety and health risks are managed in the workplace, with a particular focus on PSRs, i.e. work-related stress, violence and harassment. In 2014 a total of 49,320 establishments across all sectors ⁽¹²⁾ and employing at least five people were surveyed in 36 countries covering the 28 EU Member States (EU-28), as well as Albania, Iceland, Montenegro, the former Yugoslav Republic of Macedonia, Serbia, Turkey, Norway and Switzerland. On average the dataset included about 1,400 establishments per country.

For ESENER-2, data were collected at the enterprise level by means of telephone interviews with the person 'who knows best about OSH issues'. In micro- and small enterprises (MSEs) this was mostly the owner/director, but in larger enterprises it was an OSH specialist (such as a health and safety officer) or a safety manager. The questionnaire was structured around similar topics to ESENER-1, including:

- day-to-day management of OSH risks;
- special focus on PSRs and risks of MSDs (emerging risks);
- drivers and barriers to OSH management;
- worker involvement.

2.1.2 LFS 2013 ad hoc module on accidents at work and other work-related health problems ⁽¹³⁾

The LFS is a rotating random sample of people in private households, which started in 1983. It provides population estimates for the main labour characteristics of a country. The modules included in the survey cover demographic background, labour status, characteristics of primary job, hours worked, characteristics of any secondary employment etc.

Since 1999 an inherent part of the EU-LFS is the so-called ad hoc modules. In general, the aim of the ad hoc modules is to provide users with statistics on a specific topic concerning the labour market by adding a set of variables supplementing the core EU-LFS. Questions on work-related accidents, health problems and hazardous exposures have been included as the ad hoc module on three occasions: in 1999, 2007 and 2013. In 2013 Germany and the Netherlands did not participate in the ad hoc module. All other EU Member States, as well as Norway, Switzerland and Turkey, did.

The LFS 2013, and more specifically its ad hoc module, provide answers to the questions:

- How many accidents occur at work leading to an injury?
- How many people have health problems caused or made worse by work?
- How many people are exposed to risk factors affecting their physical and mental health?
- Which types of accidents, health problems and risk factors occur?
- What is the impact in terms of lost days or disability?
- Who is affected in terms of individual, occupational and labour market characteristics?

⁽¹¹⁾ www.esener.eu

⁽¹²⁾ We used all NACE sectors, except for private households (NACE T) and extraterritorial organisations (NACE U). NACE is the European industrial activity classification as approved by the European Commission. The term NACE is derived from the French *Nomenclature statistique des activités économiques dans la Communauté européenne*.

⁽¹³⁾ http://ec.europa.eu/eurostat/statistics-explained/index.php/EU_labour_force_survey_-_ad_hoc_modules

The 2013 LFS micro data were received from Eurostat after the data provision was approved by national statistical agencies. The analysis used the responses of employees, and not the self-employed, to allow linkage to the enterprise-level data of ESENER-2, which excludes the self-employed.

2.1.3 EWCS 2015 ⁽¹⁴⁾

In 2015 the 6th EWCS was carried out. The objectives of the EWCS are to provide an overview of working conditions in order to:

- assess and quantify working conditions of both employees and the self-employed across Europe on a harmonised basis;
- analyse relationships between different aspects of working conditions;
- identify groups at risk and issues of concern, as well as progress;
- monitor trends by providing homogeneous indicators on these issues;
- contribute to European policy development, in particular on quality of work and employment issues.

The scope of the survey questionnaire has widened substantially since the first edition, aiming to provide a comprehensive picture of everyday working life in Europe. Topics covered include employment status, working time duration and organisation, learning and training, safety and health, physical and psychosocial factors, and work and health.

In line with the data used from LFS, only employee responses from the EWCS, and not those of the self-employed, were included in this analysis.

2.2 Indicators and their operationalisation including country and sector

Table 1 provides a summary of the indicators from the three surveys (ESENER-2, LFS 2013 ad hoc module and the 6th EWCS), as well as the countries, country clusters and sectors used in the analysis and presented in the main findings in this report. A more extensive overview of questions and reliability indices in the case of composite scores is presented in the technical report that has been prepared as a technical annex to this final report (Eekhout et al., 2016).

Table 1: Overview of indicators used from the three surveys

Indicator	ESENER-2	LFS 2013 ad hoc module	6th EWCS
Risk awareness in enterprises	OSH awareness in general		
	MSD risk awareness		
	PSR awareness		
Risk management in enterprises	OSH management in general		
	MSD risk management		
	PSR management		

⁽¹⁴⁾ <http://www.eurofound.europa.eu/surveys/european-working-conditions-surveys>

Indicator	ESENER-2	LFS 2013 ad hoc module	6th EWCS
Drivers (general)	Management commitment		
	Employee involvement in OSH matters		
Drivers (general)	Employee representation present		
	Reason for risk management: <ul style="list-style-type: none"> ▪ fulfilling legal obligations ▪ meeting expectations ▪ increasing productivity ▪ organisation's reputation 		Communication/being informed about OSH
Drivers (specific to PSR management)	Employees involved in design and set-up of PSR measures		Fair and respectful workplace Opportunity to discuss PSR formally
Barriers	OSH barriers/lack of resources		
Exposure to OSH risks		Exposure to OSH risks	Exposure to environmental risks (e.g. noise, extreme temperatures, inhaling smoke/fumes, exposure to dangerous substances)
Exposure to MSD risks		Exposure to MSD risks	Heavy lifting and tiring positions Repetitive movements Sitting
Exposure to PSRs		Exposure to PSRs	Job demands Job autonomy Support (colleague and supervisor) Violence and harassment Job insecurity
General health		Accidents at work	General OSH-related health outcomes
General work-related health		General work-related health problems	Job satisfaction

Indicator	ESENER-2	LFS 2013 ad hoc module	6th EWCS
Work-related MSDs		Work-related MSD outcomes	Work-related MSD outcomes
Work-related mental health		Work-related mental health outcomes	Work-related mental health outcomes Work engagement Burnout

Although all analyses were performed at the individual country level, for presentation purposes we will use the country cluster level. The countries included in each cluster are listed in Table 2. The clustering is based on the Esping-Andersen typology (Esping-Andersen, 1990), which differentiates based on types of welfare state ⁽¹⁵⁾, but it takes into account differential regions within Europe. An overview of the sector clustering is presented in Table 3.

Table 2: The countries and country clusters used in this study ⁽¹⁶⁾

Country cluster	Countries
Baltic	Estonia; Latvia; Lithuania
Central	Austria; Belgium; Luxembourg
Eastern	Bulgaria; Croatia; Czech Republic; Hungary; Poland; Romania; Slovakia; Slovenia
Nordic	Denmark; Finland; Norway; Sweden
Southern	Cyprus; France; Italy; Greece; Malta; Portugal; Spain
United Kingdom and Ireland	Ireland; United Kingdom

Table 3: The sectors and sector clusters used in this study

Sector clusters	NACE code
Agriculture, forestry and fishing	A
Manufacturing, waste management, water and electricity supply	B, C, D, E
Construction	F
Wholesale and retail trade	G

⁽¹⁵⁾ https://en.wikipedia.org/wiki/G%C3%B8sta_Esping-Andersen

⁽¹⁶⁾ Germany and the Netherlands are not included.

Sector clusters	NACE code
Transportation and storage	H
Food, accommodation, arts and recreation	I, R
Finance, real estate and other technical scientific or personal service activities	J, K, L, M, N, S
Public administration	O
Education	P
Health and social work	Q

NACE = General Industrial Classification of Economic Activities within the European Communities

2.3 The analysis

Before the 'joint analysis' was carried out, preliminary analyses were performed on the datasets and the indicators in Tables 1-3 to investigate whether analysis of the two employee datasets would produce comparable results with regard to the same types of risks and outcomes. Since these analyses corroborated expectations to a large extent, we will not detail these results but refer the interested reader to the technical report (Eekhout et al., 2016).

In the analyses performed to answer the core research questions, the three datasets were combined on country and sector levels, to consider:

- The relationship between risk exposure, as reported by employees, and risk awareness and risk management, as reported by enterprises. The aim was to identify OSH risks in general, and risks of MSDs and PSRs in particular.
- The relationship between work-related health outcomes, as reported by employees, and risk awareness and risk management, as reported by enterprises.
- The importance of exposure to occupational risks, both general as well as specific risks of MSDs and PSRs, as explanatory variables for risk management, the added value of more specific risks, as measured by the EWCS, and the importance of also considering health outcomes.

Subsequently, the impacts of drivers and barriers to risk management were analysed.

Finally, and based on the findings of all the analyses, typologies were constructed for countries, country clusters and sectors, for the main determinants of risk management. These typologies present the relative status of drivers for general or specific risk management, and indicate any room for improvement in risk management in a specific country, country cluster or sector.

2.4 Basic principles of the combination of the datasets and a description of the analysis

It is obvious that observations at the enterprise level (ESENER-2) and at the employee level (2013 LFS ad hoc module and 6th EWCS) cannot be directly combined, as the workers who participated in the LFS and the EWCS do not belong to the same companies and cannot be linked directly to the companies that participated in ESENER-2. To overcome this challenge, a multilevel analysis was performed using background variables as hierarchical levels in the data:

- the highest level for aggregation was 'country';
- the lower level was 'sector' (sectors within countries).

This analysis resulted in a dataset containing variables with variances between countries and a dataset containing variances between sectors within countries. Based on these datasets we calculated the relationship between variances in risk exposure and work-related health outcomes, as reported by employees, and variances in risk awareness, risk management and drivers and barriers for risk management, as reported by enterprises.

To test the added value of specific risks to OSH, of MSDs and to mental health over general risks, and to assess the impact of the drivers and barriers, multivariate regression analyses were also performed.

For ESENER-2 and the LFS 2013 ad hoc module there was a third variable that was relevant for linking the two datasets: company size. However, as this variable was not available for the relevant cut-off point of 50 employees in the 6th EWCS, it was decided to exclude 'size' when linking the three datasets. The impact of this decision is discussed in Chapter 3.

A more detailed discussion of the methods used for this analysis is presented in the technical report of Eekhout et al. (2016).

3 Key findings

When presenting the key findings, only statistically significant relationships are shown. However, since the datasets are quite large and easily reach the generally accepted level of statistical significance ($p < 0.05$), we also included a generally accepted 'relevance' criterion: only correlations of at least $r = 0.30$ are considered strong enough to be 'relevant'.

Irrespective of the correlations, we find that the analyses do not allow us to establish any causation. Both variables in the equation can theoretically be the cause as well as the effect.

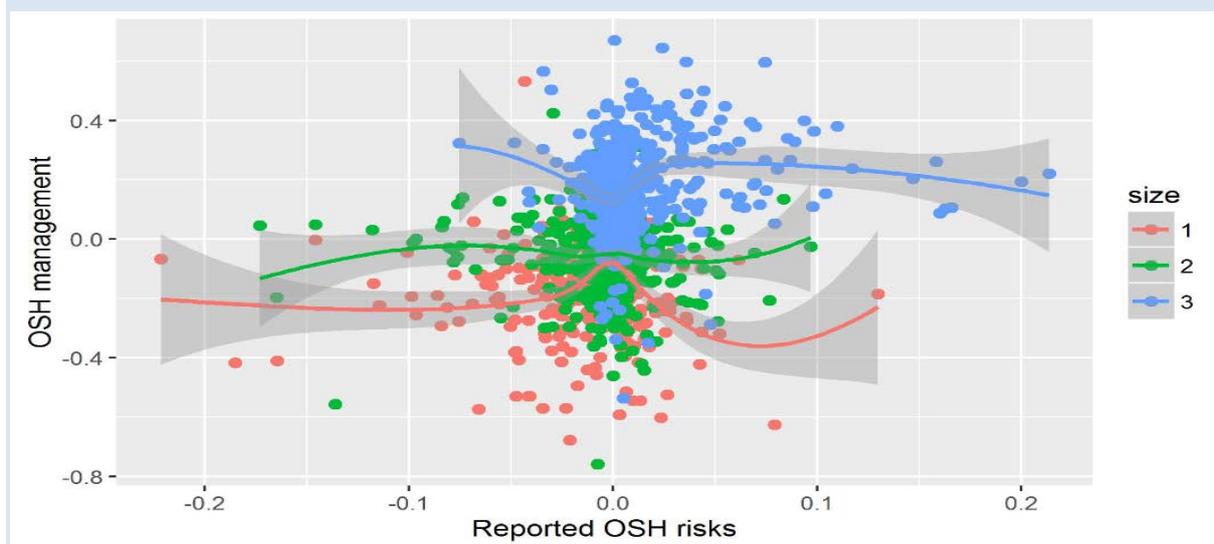
However, before presenting the principal findings of the study and answering our research questions, we first describe the impact of company size, and particularly of not using size as a level for linking datasets. We show this using ESENER-2 and the LFS 2013 ad hoc module.

Box 2: The impact of enterprise size as a third level of data analysis combining ESENER-2 and the LFS 2013 ad hoc module

It is widely known that OSH risk management is related to the size of enterprises. Masi and Cagno (2015) showed that the frequency of barriers to OSH interventions grows with the size from micro-enterprises (≤ 10 employees) to small enterprises (11-50 employees), and then it decreases from small to medium-sized/large enterprises. Larger and medium-sized enterprises often have internal or external advisors to support the setting up of a proper OSH policy. For the MSEs it may be quite difficult, in terms of cost and complexity, to organise an OSH support structure. Several studies have shown that identifying enterprises below and above the size of 50 employees is important in relation to OSH risk management (Masi and Cagno, 2015; Walters and Wadsworth, 2016; Legg et al., 2015; Hasle and Limborg, 2006). As we were unable to split up the enterprise size group of 10-250 employees for the 6th EWCS, it was decided to refrain from combining the three datasets at country, sector and size level and, instead, to use only country and sector levels. In this box we discuss what the impact of this decision is by comparing the two-level and three-level data analyses for ESENER-2 and the LFS 2013 ad hoc module.

In our dataset, size was also related to OSH risk management in general ($r = 0.24$; see technical report (Eekhout et al., 2016)). The correlations were somewhat weaker for the management of specific MSDs and PSRs.

Figure 5: The correlation between exposure to OSH risks as reported by employees (LFS), and OSH risk management as reported in enterprises (ESENER-2), by size.



Note: Size 1 = 1-10 employees; size 2 = 10-50 employees; size 3 = > 50 employees.

In Table 4 we show the impact of being able to link risk exposure and risk management, with and without including the linkage, at the size level for the LFS 2013 ad hoc module and ESENER-2.

Table 4: Correlations between exposure to risk factors, as reported by employees (LFS), and management of risks, as reported by the enterprises (ESENER) — for variances with and without size as an extra level

Type of risk	Including 'size' level			Without 'size' level		
	OSH risk management	MSD risk management	PSR management	OSH risk management	MSD risk management	PSR management
Country level						
OSH	-0.17			-0.17		
MSD		0.29			0.28	
PSR			0.22			0.24
Sector level						
OSH	0			0.16		
MSD		0.44			0.43	
PSR			0.35			0.33
Size level						
OSH	0.25					
MSD		0				
PSR			0.38			

It can be seen in the table that the correlations with and without correction for company size are not very different at the country level. However, we do see some changes in the correlations at the sector level when size is included.

When size is not included, the variance at the lower 'size' level 'goes' into the higher 'sector level'. When the correction for size is included, there is a significant correlation between OSH and OSH risk management at the size level ($r = 0.25$). This relationship is not seen at the sector level ($r = 0.0$). However, when the size level is omitted, the 'explained variance' of the size level goes into the relationship between OSH risks and OSH risk management at the higher sector level, resulting in an increase of the correlation from $r = 0$ to $r = 0.16$. This effect also occurs for the relationships between MSD risks and MSD risk management, and between PSRs and PSR management; however, these effects do not appear to have a significant impact. It should also be considered, though, that a correlation of $r = 0.16$ may be significant, but this is far from robust. We therefore considered the 'relevance criterion', whereby we consider all correlations of 0.30 or higher to be relevant, and robust enough to consider.

The analyses above show that robust correlations between risks and risk management, with or without size correction, and between the levels of analysis, are rather comparable, but that the deletion of the lowest level — in this case, size — may affect the correlations found at the next lowest level — in this case, sector — and may even result in changing the signs associated with the correlations; however, they do not result in correlations becoming relevantly different. For this reason, we inspected the

resulting graphs (see technical report: Eekhout et al., 2016) and decided to report only on significant and relevant associations in this project.

▪ **Conclusion on the impact of not including company size as a level of analysis**

We conclude that the results of the multilevel analyses at the country level are not affected by leaving out size as a third level for combining data and are hardly affected at the sector level when considering not only the significance but also the relevance criterion. Thus, the main outcomes at ‘relevance level’ of this study would not be expected to change if we had the opportunity to include size as a third linking variable in the analysis.

3.1 Is managing OSH risks at the enterprise level associated with a higher or lower perception of exposure to risks and work-related health outcomes, as reported by employees?

In this section we will first consider the relationship between exposure to OSH risks as reported by employees, and risk awareness and risk management regarding OSH as reported by the establishments (see research question 1; section 3.1.1). We may assume that more awareness and management in enterprises results in fewer work-related risk factors and eventually in fewer occupational health problems in employees. However, in many studies, particularly linking work-related risk management to work-related risks and health problems, a *positive* relationship has been found, indicating that, the more work-related risks or work-related health problems are reported, the more measures are taken in these workplaces (e.g. Houtman et al., 1998; Houtman, 1999; Taris et al., 2010; EU-OSHA, 2012). When the information on both OSH risks reported by employees and OSH risk awareness or OSH risk management in enterprises is collected at about the same time — as is the case in the present study — these findings make sense and suggest that measures taken in an enterprise may be a *response* to high levels of risk exposure, or, in other words, high levels of risk exposure within a company may drive increased OSH risk management by the enterprise.

Although the European Framework Directive on Safety and Health at Work (Directive 89/391/EEC) ⁽¹⁷⁾ states that OSH management in enterprises should address the source of the OSH problem identified, a high level of risk may not necessarily be an urgent driver resulting in OSH management. Instead, change may be because work-related health problems have arisen from that risk and may result in productivity losses and sickness absence. Therefore, we will also test whether or not work-related health outcomes further add to the explanation of risk management at the enterprise level (see research question 2; section 3.1.2).

Finally, we will see whether or not the more specific information on risk exposure, as reported by employees in the 6th EWCS, adds to the explained variance of risk management by the more general risks, as reported by employees in the LFS (see research question 3; section 3.1.3).

3.1.1 Exposure to OSH risks, MSD risks and PSRs, as reported by employees, and risk awareness and risk management in enterprises

As expected, we find the exposure to general, but particularly to the more specific OSH risks as reported by employees, to be positively related to both risk awareness and risk management in enterprises. Overall, the exposure to MSD risks and PSRs, as reported by employees, is related to MSD risk and PSR awareness and to MSD risk and PSR management in enterprises. The relationships are all positive and almost all are relevant (see Table 5).

Exposure to more specific environmental OSH risks, as reported by employees in the 6th EWCS, is found to be more strongly related to OSH awareness and OSH management than exposure to the more general OSH risks reported in the LFS. In particular, environmental risks are strongly related to OSH

⁽¹⁷⁾ <https://osha.europa.eu/nl/legislation/directives/the-osh-framework-directive/1>

risk awareness and OSH risk management. Also, 'heavy lifting and tiring positions' as well as 'repetitive movements' showed strong, relevant correlations with MSD risk awareness and MSD risk management, and violence and harassment are significantly linked to PSR management.

However, the relationship with exposure to environmental risks, as reported by employees, is weaker for risk management than risk awareness. This indicates that the fact that (in smaller enterprises) the owner or director of the enterprise or (in larger enterprises) the health and safety officers⁽¹⁸⁾ are aware of environmental risks does not necessarily imply that they do, or are able to do, something to manage these risks. Situations may arise when an employee has to provide services at the premises of a client who does not take into account full safety regulations (e.g. Houtman et al., 2012). Also employers prioritise which risks they do or do not manage. In a large-scale qualitative study, owners and directors indicated that, in particular in the case of PSRs, these risks are associated with the occupation, e.g. working under high pressure in transportation or trans-shipment or working with the public as a bus driver with increased risk of violence and harassment. As employees chose the job with this in mind, employers do not always feel the need to manage these occupational risks, irrespective of whether they could do so or not (Houtman et al., 2012). In larger organisations, the individual with most knowledge of OSH is often an OSH expert, but may not necessarily have the authority or resources to intervene for certain types of risks. In particular, risks caused by the structure of an organisation may be recognised by the company's OSH expert, but the line management may resist implementing their suggestions to mitigate these risks (e.g. Randall et al., 2005). In some cases implementation of risk management strategies might be delayed because the organisation acts slowly, such as some public service organisations (e.g. Randall et al., 2005). As a result, employers or their representatives may give very different reasons to explain why risks are not tackled although they have been acknowledged as a risk by the enterprise-level interviewee.

The relationship between exposure to MSD risks, as reported by employees — both general and specific risks — and MSD risk awareness and risk management, as reported in enterprises, is comparable in strength to those for general exposure to OSH risks. Although we see that MSD risk awareness and risk management are strongly related to more exposure to general and specific MSD risks, there is a negative (significant but not relevant) relationship between sitting, as reported by employees, and MSD risk awareness and management in enterprises. Enterprises may not be aware of sitting as an MSD risk and do not include this potential risk in MSD risk management. They obviously do include general MSD risks, including the more specific MSD risks at work such as heavy lifting and tiring positions, and performing repetitive movements.

Box 3: Sitting — an emerging risk at work?

Sitting is an interesting issue, since it is more and more frequently considered a new occupational risk, which can result in chronic diseases such as obesity, type II diabetes, cardiovascular diseases, pulmonary diseases and cancer. Although the evidence from longitudinal studies is still weak (e.g. O'Donoghue et al., 2016), Ding et al. (2016) conservatively estimated that physical inactivity (including sitting at work) cost health care systems US\$53.8 billion worldwide in 2013, of which \$31.2 billion was paid by the public sector, \$12.9 billion by the private sector and \$9.7 billion by households. In addition, deaths related to physical inactivity contributed \$13.7 billion in productivity losses and were responsible for the loss of 13.4 million DALYs (disability-adjusted life-years) worldwide.

⁽¹⁸⁾ In general terms, the most frequent 'roles' of the respondents in ESENER-2.

Table 5: The correlations between OSH risks, as reported by the employees (LFS and EWCS), and risk awareness and risk management as reported by ‘the one who knows best about OSH’ in enterprises (ESENER), in the same countries and sectors

	ESENER					
	OSH risk		MSD risk		PSR	
	Awareness	Management	Awareness	Management	Awareness	Management
LFS						
OSH risk	0.19	0.15				
MSD risk			0.35	0.43		
PSR					0.39	0.33
EWCS						
Environmental OSH risk	0.71	0.32				
Heavy lifting and tiring positions			0.42	0.49		
Repetitive movements			0.31	0.32		
Sitting			-0.1	-0.19		
Job demands					-0.1 (0.32)	-0.14 (0.47)
Job autonomy (high is favourable)					0.04 (-0.57)	0.05 (-0.47)
Support					-0.08	-0.1
Violence and harassment					0.29 (0.54)	0.30 (0.45)
Job insecurity					-0.21 (-0.62)	-0.24 (-0.60)
Number of hours worked					-0.15 (-0.27)	-0.19 (-0.34)

Note: significant and relevant co-variations are in bold. Where correlations are significant and relevant at country level the figures are shown in brackets.

For PSRs, only the general PSRs, as reported by employees in the LFS, and the specific risks of violence and harassment, as reported by employees in the EWCS, reach significance and relevance when related to risk awareness and risk management. However, several of the relationships for PSRs

are not found to be particularly significant and relevant at the sector level, but do appear to be significant and relevant at the country level only (shown in brackets in Table 5).

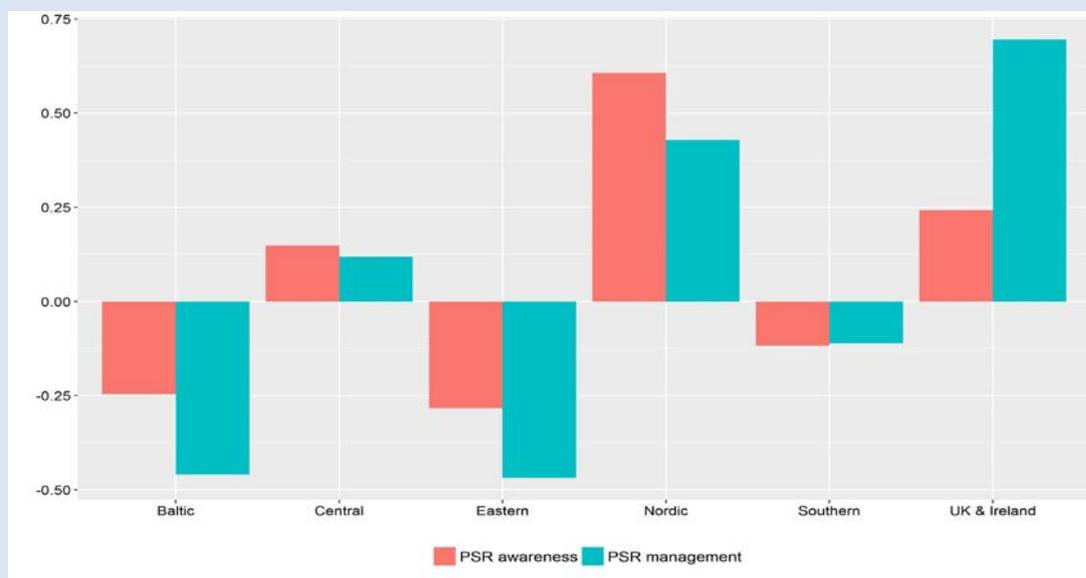
When considering only country-level data, the correlation between exposure to all PSRs, as reported by employees, and both PSR awareness and risk management, as reported by establishments, becomes both significant and relevant. This indicates that the differences in PSRs are better explained by between-country differences than sectoral differences, and suggests that national culture or policies may be more important factors in the management of PSRs. (See further in Box 4, which examines country and sectoral differences in OSH risk management, with a particular emphasis on the area of PSRs.) Graphs of OSH and MSD risk awareness, OSH and MSD risk management and specific risks by country and sector are presented in the technical report (Eekhout et al., 2016).

Box 4: Differences in awareness of PSRs and risk management, as reported by enterprises, as well as exposure to specific risks, as reported by employees, by country and sector

The relationships between exposure to PSRs as reported by employees and both PSR awareness and risk management in enterprises are best explained at the country level, unlike the relationship between OSH and MSD risk exposure, risk awareness and risk management. In this box we focus on the differences at country and sector levels, with a particular emphasis on PSRs, as reported by employees, and risk awareness and risk management at the enterprise level.

Using the country clusters defined in Table 2, Figure 6 shows that risk awareness, as well as risk management, is relatively high in the Nordic countries and in the UK and Ireland, but quite low in the Baltic states and eastern European countries.

Figure 6: PSR awareness and PSR management by country cluster (ESENER 2) ⁽¹⁹⁾



At sector level there is some congruence between PSR awareness and management. This is generally high in the health and social sectors and particularly low in the agriculture and construction sectors, as shown in Figure 7.

⁽¹⁹⁾ Fig. 6 to 9 show so called standardised, weighted means by country and sector. These means represent the variance in standardised means as they differ according to country and sector.

Figure 7: PSR awareness and PSR management by sector (ESENER)

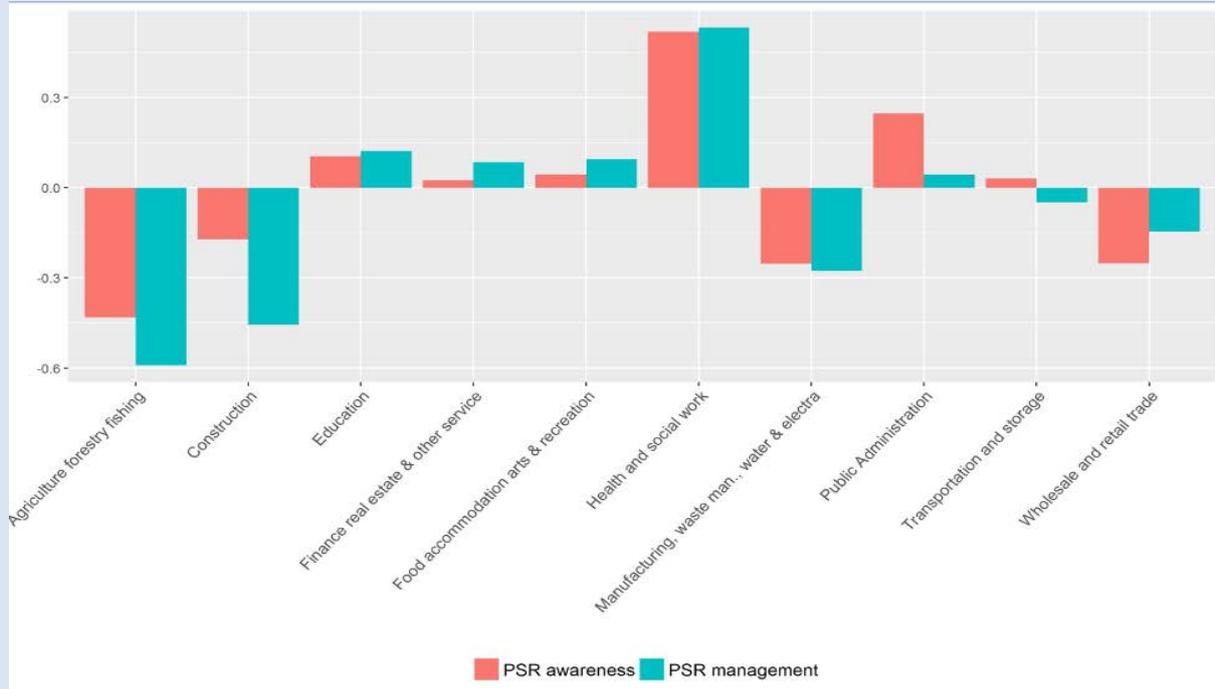


Figure 8 shows the exposure to general and specific PSRs, as reported by employees, by country cluster. The figure shows that general PSRs are low in the Baltic states and in eastern European countries, and are high in southern and central European countries.

High levels of job demands are reported in the United Kingdom and Ireland and in the Nordic countries, but employees in these countries report low levels of risks with regard to autonomy, which is indicative of a relatively low level of work-related stress.

The risk of experiencing occupational violence and harassment was reported frequently in the Nordic countries as well as in the United Kingdom and Ireland, but at a relatively low frequency in southern and eastern European countries.

Figure 8: Specific PSRs by country cluster (LFS and EWCS)

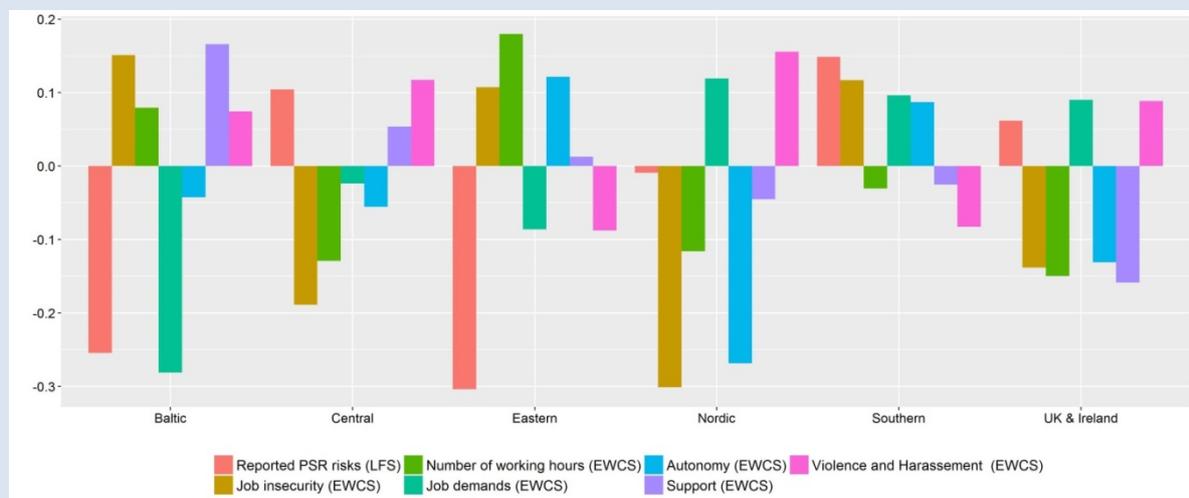
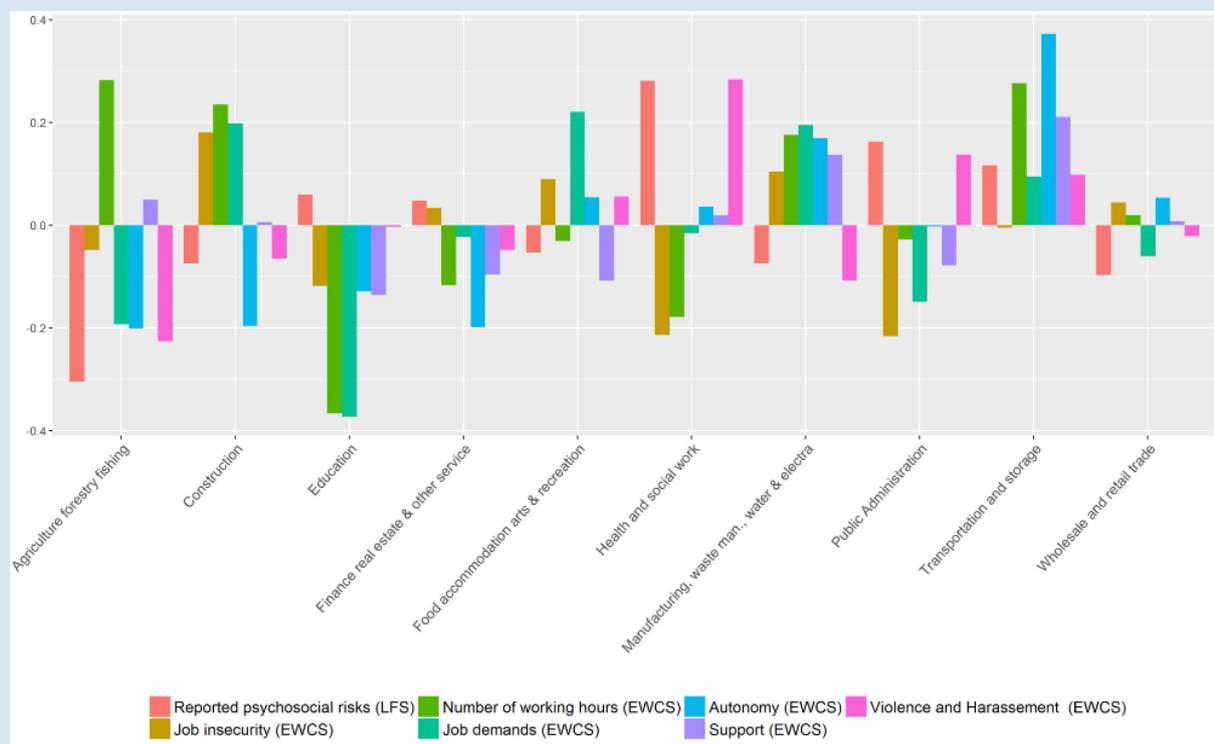


Figure 8 shows that job insecurity appears to be unrelated to violence and harassment, as reported by employees, while job insecurity is particularly low in the Nordic countries, violence and harassment seems to be particularly high. The risk of violence and harassment appears to be particularly low in eastern and southern European countries. An obvious question to ask here is what level of influence cultural factors have on the risk of experiencing or disclosing experience of psychosocial risks at work such as violence and harassment.

Figure 9 shows that high job demands, low autonomy and high job insecurity are prevalent in construction. The combination of high job demands and low autonomy is particularly unfavourable in the transportation sector. The risk of violence and harassment is particularly high in health care and social work, public administration and transportation.

Figure 9: Specific PSRs as reported by employees by sector (LFS and EWCS).



Conclusion

Sectors are a greater driver of OSH risk awareness and OSH risk management, as reported by the enterprises, and of exposure to general and specific OSH risks, as reported by employees, than countries. This is also true of PSR and MSD risk awareness and risk management, and exposure to specific MSD risks, as well as the specific PSR of violence and harassment, as reported by employees. Countries, on the other hand, are greater drivers of exposure to all other specific PSR factors, as reported by employees. This may mean that political and cultural factors play a larger role in occupational PSRs than in other risks.

Summary

Overall, relationships between the exposure to OSH risks, as reported by employees, and the awareness of risks and risk management, as reported by enterprises, are positive, suggesting that management of work-related risks takes place when employees report risks. These findings are mainly corroborated for general OSH risks, as well as risks of MSDs, but not for the potential risk from sitting. This suggests that sitting is generally not perceived to be a risk and, thus, is not managed in enterprises.

For exposure to PSRs, most risks are related to risk awareness and risk management in enterprises at the country level, and the relationships are weaker at the sectoral level. Differences in specific PSRs, such as high job demands, low autonomy and job insecurity, are to a larger extent explained by country-specific differences. Only exposure to violence and harassment is positively and significantly related to risk awareness and risk management in enterprises at both sector and country levels. Issues such as violence and harassment, in particular external violence, can be considered to some extent to be different, since they can be clearly observed, by both employees and management. Exposure to high job demands, low autonomy and, to a lesser extent, job insecurity may be more implicit. Employers and their representatives regularly differ from employees in the way they experience PSRs at work, such as high demands and low autonomy, compared with OSH and MSD risks (e.g. Houtman et al., 1998; Houtman, 1999; Iavicoli et al., 2011). These findings suggest that national-level factors such as policies and culture play a larger role than sectoral factors in exposure to occupational PSRs.

3.1.2 Work-related health and well-being, as reported by employees, and risk awareness and risk management in enterprises

This section presents the relationship between work-related health problems⁽²⁰⁾ and well-being, as reported by employees, and the awareness and management of OSH risks — both general and specific — in enterprises.

Overall, risk awareness and risk management in enterprises are positively related to work-related MSDs and mental health problems, as reported by employees. This suggests that a greater number of specific health problems, as reported by employees, are related to a greater amount of specific risk awareness and risk management in enterprises. However, no relationship was found between general health outcomes (LFS), on the one hand, and OSH risk awareness and OSH risk management, on the other. In Table 6 these relationships are presented for enterprises and employees in the same country and sector, both for general indicators for health outcomes (LFS) and for specific indicators for MSDs and mental health problems (EWCS).

These findings suggest that specific work-related health problems may elicit risk awareness and risk management at the enterprise level; although no causal relationship can be proven, the relationships found support this assumption.

Regarding mental health, some positive health outcomes were also available and here the relationships are partly in the same direction: less satisfaction or less engagement was associated with more risk awareness and more risk management.

In particular for psychosocial and mental health issues, the findings suggest that the country affects the relationship between PSRs at work and work-related mental health outcomes, as reported by employees, and the risk awareness and risk management, as reported by the enterprises. As is shown in Table 5 for the relationship between exposure to PSRs as reported by employees and PSR awareness and risk management in enterprises, Table 6 similarly shows work-related poor mental health indicators, as reported by employees, to be more strongly related to PSR awareness and risk management in enterprises at the country level than at the sector level (Table 6).

For the risk of occupational burnout, as reported by employees, the relationship at the country level was negative for both risk awareness and risk management. These results suggest neglect of these issues at country level, particularly for countries where awareness, and thus management, of these topics is poor.

It can be concluded that these country-level factors appear to be more important for mental health outcomes than for OSH and MSD risk awareness and management. These findings in general corroborate what was established for exposure to PSRs compared with the exposure to OSH and MSD risks in the previous section.

⁽²⁰⁾ Occupational accidents are not included because of their low incidence, resulting in a very low variance. Sickness absence is also not included because of its skewed nature and low variance.

Table 6: The correlation between health outcomes, as reported by the employees in LFS and EWCS, and risk awareness and risk management, as reported in ESENER, in the same countries and sectors

	ESENER					
	OSH risk		MSD risk		PSR	
	Awareness	Management	Awareness	Management	Awareness	Management
LFS						
General health outcomes	0	0				
MSDs			0.33	0.37		
Mental health outcomes					0.36	0.32
EWCS						
Work-related general health outcomes	0.52	0.30				
Satisfaction (high = a great deal of satisfaction)	-0.42	-0.25				
Absence due to work-related health outcomes	0.18	0.11				
Work-related MSDs			0.31	0.38		
Work-related mental health problems					0.22 (0.51)	0.33 (0.30)
Work engagement (higher = less engaged)					-0.11 (-0.1)	-0.1 (-0.31)
Burnout					-0.04 (-0.54)	0.05 (-0.47)

Note: significant and relevant co-variation is indicated in bold. Where correlations are significant and relevant at country level, the figures are shown in brackets.

▪ Summary

This section shows that the relationships between specific work-related health outcomes, as reported by employees, and OSH, as well as MSD and PSR awareness and risk management, as reported by enterprises, are positive overall. This suggests that specific work-related health problems may elicit risk awareness and risk management at the enterprise level. Some positive mental health outcomes are

negatively related to PSR awareness and risk management: less satisfaction or less engagement is also associated with increased risk awareness and increased risk management.

The relationship between work-related mental health problems, as reported by employees, and risk awareness and risk management, as reported by the enterprises, is better explained at the country level. This supports the idea that country-level factors, such as culture and policies, influence the perception of PSRs, work-related mental health problems and PSR management much more than is the case for general and specific OSH-related health outcomes and work-related MSDs, as reported by employees, and their management in enterprises.

3.1.3 The added value of explaining risk management by (a) work-related general versus (b) specific risks and (c) work-related health outcomes

In the previous sections we found support for the general assumption of this research that exposure to risks, as reported by employees, explains risk management and that this relationship is positive. The rationale behind this is that employees' reporting risks may increase the likelihood that risks will be managed at the enterprise level. In this section we test whether or not the provision of additional information on exposure to specific risks by employees makes it more likely that the risks are actually managed. The EWCS provides specific information on both MSD risks and PSRs. General risks of MSDs and PSRs are reported by employees in a specific country and sector; we also know the nature of the risk — whether it has to do with heavy lifting and tiring positions, repetitive movements, high job demands, low autonomy, lack of support, violence and harassment, job insecurity or long working hours.

In addition, the likelihood of risk management may be further increased by the reporting of not only high risks but also work-related health problems that may lead to sickness absence and reduced productivity.

We expect that the provision of more specific information about work-related PSRs and work-related risks of MSDs, as reported by employees in the EWCS, may increase the likelihood of risk management compared with the general information on these work-related risks provided in the LFS. In addition, the presence of work-related health outcomes may increase the likelihood of taking OSH measures in enterprises.

This section separately presents the results of stepwise regression analyses for the variance of OSH management, MSD risk management and PSR management, where:

- in the first step we include the variance in general risks as reported by employees in the LFS;
- in the second step we add information on specific risks as reported by employees in the EWCS; and
- in the third step we add information on work-related health outcomes ⁽²¹⁾.

In the analyses now discussed, we acknowledge that risk awareness may be important for risk management at the enterprise level. However, since risk awareness is not found to be significantly and relevantly related to OSH risk and PSR management (only for MSD management; see the technical report: Eekhout et al., 2016), we do not include risk awareness in the explanatory analyses of risk management in the analyses below.

In Table 7 we present the findings for OSH risk management. These analyses show that the first step, which includes exposure to general OSH risks reported by employees (LFS), has a significant but not relevant association with OSH risk management. Adding exposure to specific OSH risks, as reported by employees (EWCS), in a next step is a significant and relevant improvement of the model explaining OSH risk management. The exposure to specific OSH risks mainly concerns information on environmental risks. This second step explains 11 % of the variance. Adding work-related general health problems increases the explained variance slightly but significantly to 12 %.

⁽²¹⁾ For reasons of statistical power, only those risks and work-related health outcomes that show a significant univariate relationship with the risk management indicator in the previous sections are included.

The finding that the specific environmental risks reported by employees, rather than the general risks, help explain risk management is in line with the univariate analyses in section 3.1.1. The stepwise regression analyses show that, when employees report work-related health problems, the likelihood of more OSH risk management is slightly increased.

Table 7: Explained variance in OSH risk management in enterprises by exposure to general OSH risks as reported by employees (LFS; step 1), exposure to specific OSH risks as reported by employees (EWCS; step 2) and work-related health outcomes as reported by employees (LFS and/or EWCS; step 3); all analyses performed at the sector level

	Estimate	$Pr(> t)$	
Model 1			
M1_general OSH risk (LFS)	0.05	0	
Model 2			
M2_general OSH risk (LFS)	0.03	0.02	
M2_specific environmental risks (EWCS)	0.01	0	
Model 3			
M3_general OSH risk (LFS)	0.03	0.04	
M3_specific environmental risks (EWCS)	0.01	0	
M3_general OSH_health problems (EWCS)	0.11	0.01	
	R²	Delta R²	P-value
model1 (M1)	0.03	0	0
model2 (M2)	0.11	0.08	0
model3 (M3)	0.12	0.01	0.01

In Table 8 we present the findings for MSD risk management. These analyses show that the exposure to general work-related risks of MSDs, as reported by employees (LFS), already explain the variance in MSD risk management for almost 19 % of total variance. Adding the exposure to the specific work-related MSD risks from 'heavy lifting and tiring positions' and 'repetitive movements' to the model in step 2 significantly improves the model to an explanatory value of 26 %. This means that provision of information on the specific MSD risk significantly increases the likelihood of MSD risk management taking place. Considering work-related MSDs only marginally increases this likelihood further.

Table 8: Explained variance in MSDs risk management in enterprises by exposure to general MSD risks as reported by employees (LFS; step 1), exposure to specific MSD risks as reported by employees (EWCS; step 2) and work-related health outcomes reported by employees (LFS and EWCS; step 3); all analyses performed at the sector level

	Estimate	$Pr(> t)$	
Model 1			
M1_general MSD risk (LFS)	0.23	0	
Model 2			
M2_general MSD risk (LFS)	0.10	0	
M2_MSD risk on lifting & tiring positions (EWCS)	0.08	0	
M2_MSD risk on repetitive movements (EWCS)	0.05	0.08	
Model 3			
M3_general MSD risk (LFS)	0.07	0.03	
M3_MSD risk on lifting & tiring positions (EWCS)	0.07	0	
M3_MSD risk on repetitive movements (EWCS)	0.05	0.09	
M3_general musculoskeletal disorders (LFS)	0.28	0.01	
M3_general musculoskeletal disorders (EWCS)	0.04	ns	
	R²	Delta R²	P-value
model1 (M1)	0.19	0	0
model2 (M2)	0.26	0.07	0
model3 (M3)	0.27	0.01	0.02

ns = not significant.

In Table 9 we present the findings for PSR management. This table shows that exposure to general work-related PSRs, as reported by employees (LFS), explains 11 % of the variance in PSR management. Adding information on exposure to specific work-related PSRs, e.g. on violence and harassment and on job insecurity, as reported by employees (EWCS), strongly increases the likelihood that PSR management in enterprises will take place. The variance explained in PSR management increases to 19 %. Contrary to the explanation of OSH and MSD risk management, the provision of information by employees on their work-related mental health strongly increases the likelihood of PSR management in enterprises. Taking into account work-related mental health problems further improves the model to 26 % explained variance.

Table 9: Explained variance in PSR risk management in enterprises by exposure to general PSRs as reported by employees (LFS; step 1), specific PSRs as reported by employees (EWCS; step 2) and work-related mental health problems reported by employees (LFS and EWCS; step 3); all analyses performed at the sector level

	Estimate	$Pr(> t)$	
Model 1			
M1_general psychosocial risks (LFS)	0.21	0	
Model 2			
M2_general psychosocial risks (LFS)	0.15	0	
M2_job insecurity (EWCS)	-0.21	0	
M2_Violence and harassment (EWCS)	0.10	0	
Model 3			
M3_general psychosocial risks (LFS)	0.11	0	
M3_job insecurity (EWCS)	-0.17	0	
M3_Violence and harassment (EWCS)	0.06	0	
M3_general mental health problems (LFS)	2.99	0	
M3_general mental health problems (EWCS)	0.12	0	
	R²	Delta R²	P-value
model1 (M1)	0.11	0	0
model2 (M2)	0.19	0.08	0
model3 (M3)	0.26	0.07	0

▪ Summary

The general relationship found in this study is that the likelihood of risk management in enterprises increases with more exposure to specific risks, as reported by employees, in countries and in sectors.

Information on exposure to specific risks, as reported by employees, is strongly correlated with more risk management in enterprises. In the case of OSH management these specific risks are environmental, such as noise, exposure to dirt, and high and low temperatures. For MSD risk management the specific risks considered are heavy lifting and tiring positions, and repetitive movements. For PSR management the specific risks considered concern violence and harassment, and job insecurity.

Information on health problems reported by employees only marginally increases the likelihood of increased management of OSH risks and MSD risks in enterprises. However, when employees report work-related mental health problems, the likelihood of PSR management in enterprises increases in a significant way.

Overall, the reporting by employees of exposure to general and specific MSD risks and to general and specific PSRs helps explain risk management; explained variance in MSD and PSR management was 27 % and 26 % respectively. General and specific OSH risks explained OSH risk management less well, with 12 % explained variance.

3.2 Drivers and barriers affecting OSH risk management and the relationship between OSH risks and OSH risk management

The importance of drivers and barriers for OSH risk management has been discussed in section 1.2. The literature shows that drivers and barriers may influence risk management in different ways. They may directly stimulate or hinder risk management — an example of this is the impact of formal employee representation on OSH management reported by Walters et al. (2012). Another way in which drivers or barriers may influence OSH management is by changing the relationship between risks and outcomes. A good example of this is the way PSC, or its core components are supposed to have an effect: when employees experience ‘justice’ at the workplace, management is seen as ‘fair’ and committed, communication is transparent and employees are participating, it appears that PSRs are low and employees’ mental health and engagement are positively influenced through their relationship with ‘skill discretion’ (e.g. Dollard and Bakker, 2009).

In this section we therefore consider the ways in which drivers and barriers may influence the management of OSH risks, MSD risks and PSRs. We first consider the ‘added value’ of the drivers and barriers for risk management. We then consider whether or not the presence of drivers and barriers changes the relationship between risks and risk management.

3.2.1 Direct impact of drivers and barriers on the management of risks to OSH, of MSDs and PSRs

To identify the direct impact of the drivers and barriers on risk management, we tested their added value. We studied the impact of each driver separately, and for each analysis we took into account the explanation of the risk factors that significantly contributed to the explanation of risk management in the previous section.

Table 10 shows the direct impact of the drivers and barriers on OSH risk management. The analyses were performed for each driver and barrier composite score ⁽²²⁾ separately, but in each analysis we took the impact of exposure to OSH risks, as reported by employees in the LFS and EWCS, into account. The increased variance explained (R^2) as reported in the table indicates the impact of that specific driver on top of the general OSH risk scales.

Table 10 shows that formal employee representation, management commitment and (informal) employee involvement in OSH management have the greatest impact (in that order) on OSH risk management, on top of the variance already explained by the employees reporting exposure to OSH risks.

The other drivers identified also had significant, but more modest, impacts on OSH risk management, except for ‘increasing productivity’ as a reason for OSH risk management. The barrier composite scale (OSH barriers), like lack of resources, was negatively related to OSH risk management, but this relationship was not significant.

⁽²²⁾ See Table 10 below for the drivers and the barrier (composite score) considered in the project.

Table 10: Direct impact of drivers and barriers on OSH risks management (univariate relations), after taking into account the exposure to general OSH risks (LFS and EWCS)

Driver/barriers (ESENER) Impact on OSH risk management	Estimate	Increased variance due to driver/barrier (R^2)	P-value
Management commitment	0.61	0.21	0
Employee involvement in OSH management	0.16	0.10	0
Formal employee representation	0.15	0.29	0
Fulfilling legal obligations	1.35	0.04	0
Meeting employee expectations	0.60	0.04	0
Increasing productivity	0.01	0	ns
The organisation's reputation	0.40	0.02	0
OSH communication/OSH issues discussed	0.21	0.03	0
OSH barriers	-0.02	0.01	ns

ns = not significant.

Table 11 shows the direct impact of the drivers on MSD risk management on top of the variance already explained by the exposure to general MSD risks (LFS) and more specific risks, such as lifting heavy loads and tiring positions and repetitive movements (EWCS), as reported by employees. The impact of the drivers is similar to that described for OSH management. Management commitment is the most important driver of MSD risk management, followed by the presence of a formal employee representative and the involvement of employees in OSH management.

The other drivers identified also had a significant, but more modest, impact on MSD risk management, with the exception of 'increasing productivity' and 'the organisation's reputation' as reasons for OSH risk management. Here too, the barrier composite scale, indicating lack of resources, had a negative relationship with MSD risk management, but again this relationship was not significant.

Table 11: Direct impact of drivers and barriers on MSD risk management (univariate relations), after taking into account the exposure to general MSD risks (LFS), lifting heavy loads and tiring positions, and repetitive movements (EWCS)

Driver/barriers (ESENER) Impact on MSD risk management	Estimate	Increased variance due to driver/barrier (R^2)	P-value
Management commitment	1.14	0.13	0
Employee involvement in OSH management	0.36	0.08	0
Formal employee representation	0.24	0.12	0

Driver/barriers (ESENER) Impact on MSD risk management	Estimate	Increased variance due to driver/barrier (R^2)	P-value
Fulfilling legal obligations	1.83	0.01	0
Meeting employee expectations	0.91	0.02	0
Increasing productivity	0.18	0	ns
The organisation's reputation	0.10	0	ns
OSH communication/OSH issues discussed	0.47	0.02	0
OSH barriers	-0.03	0	ns

ns = not significant.

Table 12 shows the direct impact of the drivers of PSR management on top of the variance already explained by the exposure to general PSRs (LFS), and to specific ones, such as violence and harassment and job insecurity (EWCS), as reported by employees. The general OSH drivers have a marginal impact on PSR management, and the impact of the OSH barrier composite score is not significant. The only driver that has a significant and relevant impact on PSR management is the employee involvement in the design and set-up of measures specifically aimed at managing PSRs.

Table 12: Direct impact of drivers and barriers on PSR management (univariate relations), after taking into account the general PSRs (LFS), violence and harassment and job insecurity (EWCS)

Driver/barriers (ESENER) Impact on PSR management	Estimate	Increased variance due to driver/barrier (R^2)	P-value
Management commitment	0.2	0.02	0.00
Employee involvement in OSH management	0.10	0.02	0
Formal employee representation	0.10	0.06	0
Fulfilling legal obligations	1.39	0.03	0
Meeting employee expectations	0.56	0.02	0
Increasing productivity	0.18	0	ns
The organisation's reputation	0.30	0.01	0.03
OSH communication/OSH issues discussed	0.06	0.00	ns
OSH barriers	-0.01	0	ns

Driver/barriers (ESENER) Impact on PSR management	Estimate	Increased variance due to driver/barrier (R^2)	P-value
Specific drivers for PSR			
Employees involved in design and set-up of PSR measures (ESENER)	0.98	0.12	0
Fairness and respect at the workplace (EWCS)	0.01	0	ns
Worker representation (experts) and opportunities for discussing organisational issues (EWCS)	0.04	0.01	0.01

ns = not significant.

3.2.2 Drivers and barriers affect the relationship between risks and risk management

The other way drivers and barriers can influence risk management is by changing the relationship between risks and risk management. To restrict the number of analyses only the moderating effect of drivers and barriers on those risk factors that were significant in their univariate relationship with risk management were studied. All analyses were performed with OSH management as a dependent variable, as well as with MSD risk management and PSR management. Graphs of significant moderating effects are presented in the technical report for clarity (Eekhout et al., 2016).

Table 13 highlights the significant moderating effects of drivers/barriers on risk management. It is clear that, among the drivers that have a significant direct impact on risk management, only formal employee representation has a moderating effect as well. This is the case for OSH and MSD risk management, but not for PSR management.

When looking more closely into these moderation effects using graphical representations (see technical report: Eekhout et al., 2016), the general finding is that when moderation is significant, the absence of a driver means that there is no relationship or a weaker relationship between the risk considered and risk management compared with the clear presence of a driver. In addition, the graphical presentations do not always show apparent differences, particularly when the moderating effect is not very strong ($0.01 < p < 0.05$)⁽²³⁾. These relatively small effects will not be extensively discussed.

Table 13: Moderating effect of drivers and barriers on the management of OSH risks, MSD risks and PSRs

Driver/barrier	Risk	OSH risk management	MSD risk management	PSR management
Management commitment	General risk to OSH/of MSD/PSR (LFS)	ns	ns	ns
	Specific environmental risks (EWCS)	ns	ns	
	PSR job insecurity (EWCS)			$P < 0.05$

⁽²³⁾ This is the case for, for example, the moderating effect of management commitment on the relationship between job insecurity and PSR management, and for increased productivity being a reason for taking OSH measures on the relationship between OSH risks and OSH risk management.

Driver/barrier	Risk	OSH risk management	MSD risk management	PSR management
Employee involvement in OSH	General risk to OSH/of MSD/PSR (LFS)	ns	ns	ns
	General risks to OSH/of MSD/PSR (EWCS)	ns	ns	ns
Formal employee representation	General risk to OSH/of MSD/PSR (LFS)	ns	ns	ns
	Specific environmental risks (EWCS)	<i>P</i> < 0.008		ns
	MSD repetitive movements (EWCS)		<i>P</i> < 0.000	
Because of legal obligations	General risk to OSH/of MSD/PSR (LFS)	ns	ns	<i>P</i> < 0.05
	Specific environmental risks (EWCS)	ns	ns	
	PSR job insecurity (EWCS)			<i>P</i> < 0.001
Because of expectations of employees	General risk to OSH/of MSD/PSR (LFS)	ns	ns	ns
	Specific environmental risks (EWCS)	ns		
	MSD repetitive movements (EWCS)		<i>P</i> < 0.0	
	PSR job insecurity (EWCS)			<i>P</i> < 0.05
Because of increasing productivity	General risk to OSH/of MSD/PSR (LFS)	<i>P</i> < 0.05	ns	ns
	General risks to OSH/of MSD/PSR (EWCS)	ns	ns	ns
Image of the organisation	General risk to OSH/of MSD/PSR (LFS)	ns	ns	ns
	Specific environmental risks (EWCS)	ns	ns	Ns
	General risk to OSH/of MSD/PSR (LFS)	<i>P</i> < 0.000	<i>P</i> < 0.05	Ns
OSH Barriers	Specific environmental risks (EWCS)	ns		
	MSD heavy lifting and tiring positions (EWCS)		<i>P</i> < 0.05	
	PSR violence and harassment (EWCS)			<i>P</i> < 0.05
OSH communication	General risk to OSH/of MSD/PSR (LFS)	ns	ns	ns
	Specific environmental risks (EWCS)	ns		
	PSR job insecurity (EWCS)			<i>P</i> < 0.002
Employee involvement in PSR management	General PSR (LFS)			<i>P</i> < 0.004
	Specific PSR (EWCS)			ns

Driver/barrier	Risk	OSH risk management	MSD risk management	PSR management
Experienced PSC (EWCS)	General PSR (LFS)			<i>P</i> < 0.003
	Specific PSR (EWCS)			ns
Formalised PSC (EWCS)	General PSR (LFS)			<i>P</i> < 0.002
	Specific PSR (EWCS)			ns

ns = not significant.

When formal employee representation is absent, the OSH and MSD risk management, as reported by the enterprises, is found to be unrelated to the exposure to OSH or MSD risks, as reported by employees. However, when formal representation is present, increasing OSH or MSD risks, as reported by employees, is associated with increasing OSH or MSD risk management in enterprises. This finding supports the view that formal employee representation stimulates OSH and MSD risk management in enterprises, particularly for repetitive movements.

The perception of legal obligations as a reason for risk management in enterprises was found to have a moderating effect for only PSR management. Here too, we see that when legal obligations are small or absent, there is no relationship between the general PSRs or job insecurity, as reported by employees, and PSR management, as reported by the enterprises. However, when legal obligations are perceived to be present in enterprises, and are a reason for the risk management, more general PSRs as reported by employees are related to greater PSR management in the enterprises (see technical report: Eekhout et al., 2016). When legal obligations are a reason for risk management, job insecurity is found to be negatively related to PSR management. An interpretation of this data might be that, in the presence of high job insecurity, PSR management measures cannot be prioritised in the enterprise.

In enterprises, implementing OSH measures because of expectations of employees is a significant moderator of the relationship between repetitive movements and the management of MSDs, as well as of the relationship between job insecurity and PSR management. When employee expectations are not a reason for implementing OSH measures, there is no relationship between repetitive movements and MSD risk management. However, when employee expectations are a reason for OSH risk management in enterprises, the relationship between repetitive movements and risk management is positive, indicating greater MSD risk management in cases of greater risk from repetitive movements.

When expectations of employees are not a reason for enterprises to take OSH management measures, the relationship between job insecurity and PSR management is flatter than when expectations of employees are a reason. In the latter case the relationship between job insecurity and PSR management is negative, suggesting that where there is job insecurity there is less room for PSR measures than in the situation of less job insecurity.

Barriers to risk management, for instance lack of resources such as time, money or expertise, are found to have a strong moderating effect on general OSH management and minor effects on MSD and PSR management. The moderating effect of resource availability is particularly evident when examining the relationship between violence and harassment, as reported by employees, and PSR management, as reported by the enterprises. When there are few barriers and resources are high, there is *no* relationship between the risk of violence and harassment and PSR management. However, when there are many barriers, such as in the case of low resource availability, there is a positive relationship, indicating that greater risks of violence and harassment are associated with increased levels of PSR management. This finding suggests that, particularly in the case of increased barriers, procedures for the management of risks are in place only when there is a clear exposure to the risk factors.

With regard to the relationship between general OSH risks and OSH risk management, and that between MSD risks and MSD risk management, few differences were observed between scenarios of increased versus decreased levels of barriers. We observed that, in the situation with few barriers, the range in OSH risks was quite small, resulting in little variance.

The presence of high levels of communication on OSH is found to have only a moderate effect on the PSR of job insecurity. If OSH communication is poor, job insecurity is unrelated to PSR management. A negative relationship is found between job insecurity and PSR management where levels of OSH communication are high, indicating that, when job insecurity, as reported by employees, is low or absent, there is some room for PSR management but, if job insecurity is prevalent, there is no room for PSR management.

In addition, the PSR-specific drivers show a significant moderating effect between exposure to work-related PSR, as reported by employees, and PSR management in enterprises. When there is a high level of involvement of employees in the design and set-up of measures to manage PSRs, there is a clear positive relationship between the exposure to general PSRs and PSR management, indicating that greater risk management takes place in enterprises when PSRs are numerous. When employee involvement is low, there is no relationship between PSR and PSR management (see technical report: Eekhout et al., 2016).

When employees are working in a fair, respectful and supportive environment, the relationship between PSRs and PSR management is positive, indicating that greater risk management takes place in enterprises when more risks are reported by employees. However, we also note that, in fair, respectful and supportive working environments, a relatively large number of risks are reported (see technical report: Eekhout et al., 2016).

▪ Summary

Drivers and barriers may influence OSH risk management in different ways. They may have a direct impact on risk management, but they may also affect OSH risk management by influencing the relationship between the exposure to OSH risk and OSH risk management. When looking at management commitment, with formal employee representation and employee involvement in OSH management, a direct impact on OSH and MSD risk management is seen. PSR management is encouraged by employee involvement in managing the specific PSRs. In addition, PSR management also benefits from a workplace that is respectful towards employees, takes the risks they communicate seriously, and provides opportunities to discuss these risks.

3.3 A typology of enterprises defined according to their background (country and sector) and their main features of safety and health management

This section defines a typology of enterprises that characterises those enterprises with a focus on high or improving risk management. The previous sections of this chapter show that characteristics that are related to high or improved risk management are similar for managing general OSH and specific MSD risks, but are quite different for the management of specific PSRs. In the summary table, Table 14, the most important indicators are presented. These indicators will be used to profile countries, country clusters and sectors that are good, average or poor with respect to OSH, MSD and PSR management.

Table 14: Summary table of indicators that important in explaining good or improved risk management for OSH, MSDs and PSRs

Indicator of good or improved risk management	OSH risks and risk management	MSD risks and risk management	PSRs and risk management
General risk information	OSH risks	MSD risks	General PSRs
Specific risk information	Environmental risks	Heavy lifting and tiring positions Repetitive movements	Job demands (country level only) Autonomy (country level only) Violence and harassment Job insecurity
Specific information on health			Mental health problems Burnout (country level only)
Drivers and barriers	Management commitment Formal employee representation Employee involvement in OSH management Barriers for OSH	Management commitment Formal employee representation Employee involvement in OSH management Barriers for OSH	Employees involved in the design and set-up of PSR measures for management Communication on OSH Legal obligations Fair and respectful work environment (PSC) Opportunity to discuss PSRs in a more formalised way

There are different ways to present the typologies, but in principle all include drivers and barriers when relevant. Some examples are included in this report, as not all typologies can be presented here. More examples are given in the technical report (Eekhout et al., 2016).

We have chosen the typologies of OSH risk management and PSR management as examples, as these are quite different. The typology of MSD risk management is comparable to that of OSH risk management and therefore not presented here. We present only one example of a MSD risk management typology (see Figure 18).

The OSH management typology for country clusters shows that, for example, a country cluster such as the Baltic states (Figure 10) rates more favourably than average on OSH risk management and is comparable in OSH risk management to the Nordic countries (Figure 11). However, Figures 10 and 11 show that, to a large extent, different drivers may be contributing to the explanation of these high levels of OSH risk management in each of the country clusters. This suggests that in both country clusters there is still room for further improvement of OSH risk management: it may be argued that in the Baltic states the focus could be placed on greater employee representation, greater employee involvement in OSH risk management and increased management commitment. In the Nordic countries, more attention could be paid to environmental risks, and management commitment could also be improved further. OSH barriers, such as a lack of resources, negatively contribute to OSH risk management in both country clusters.

Figure 10: The typology of OSH risk management for the Baltic states

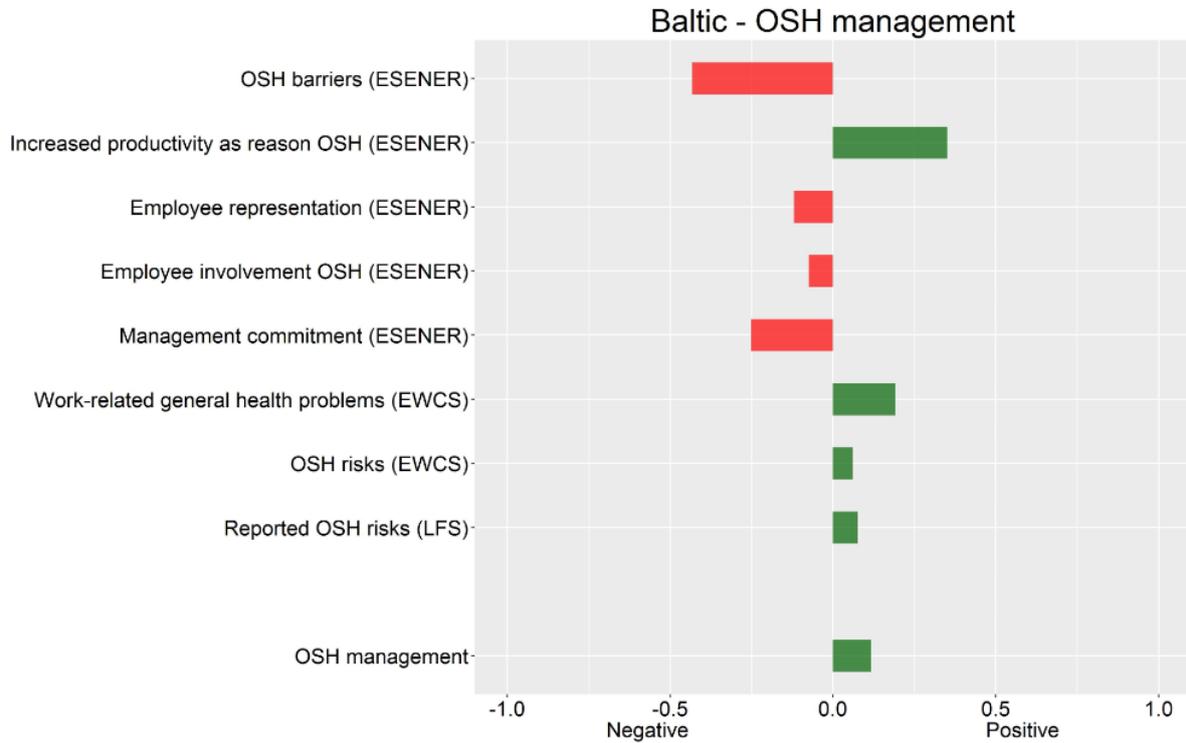
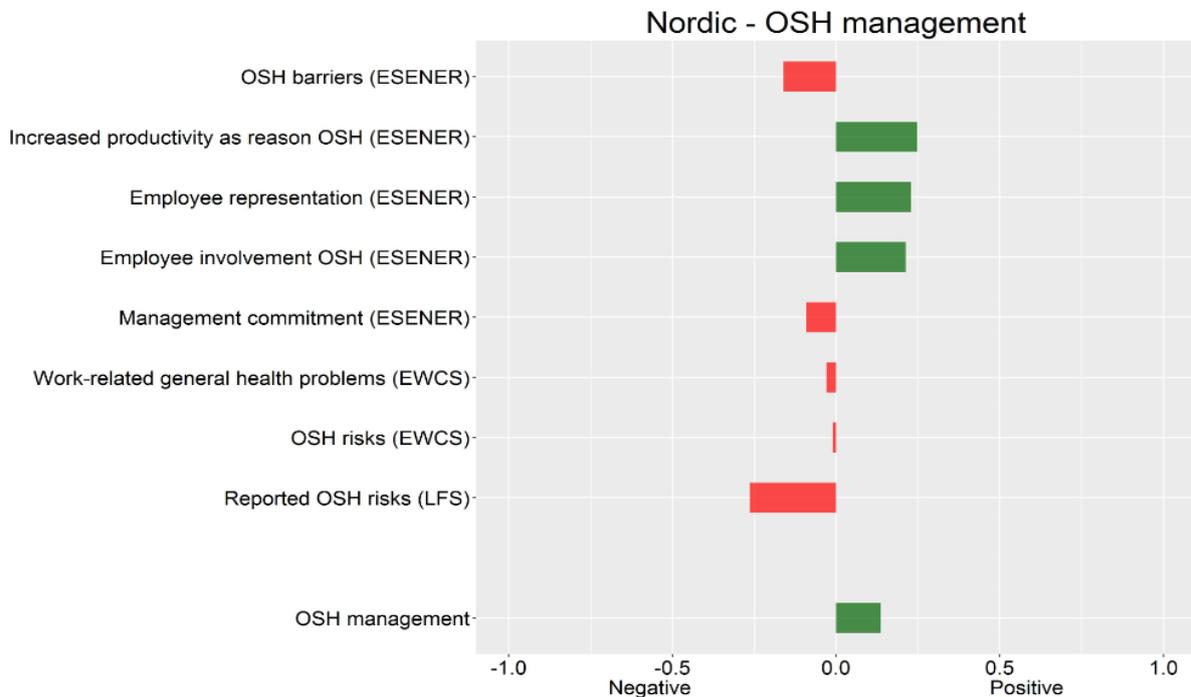


Figure 11: The typology of OSH risk management for the Nordic countries



For PSR management a different typology is provided, as the explanatory variables for PSR management are quite different from those for OSH (and MSD) risk management.

When considering PSR management in the same country clusters as discussed above, the typology of the Baltic states shows more room for improvement (Figure 12) than the typology of the Nordic countries

(Figure 13). PSR management in the Baltic states is relatively poor: risk exposure to general PSR is relatively high; employee involvement in the management of PSRs and the opportunities to discuss these risks are quite low. In the Nordic countries, the typology for PSRs management is much more positive, in terms of risk management and the most important drivers of PSR management (Figure 13).

Figure 12: The typology of PSR management in the Baltic states

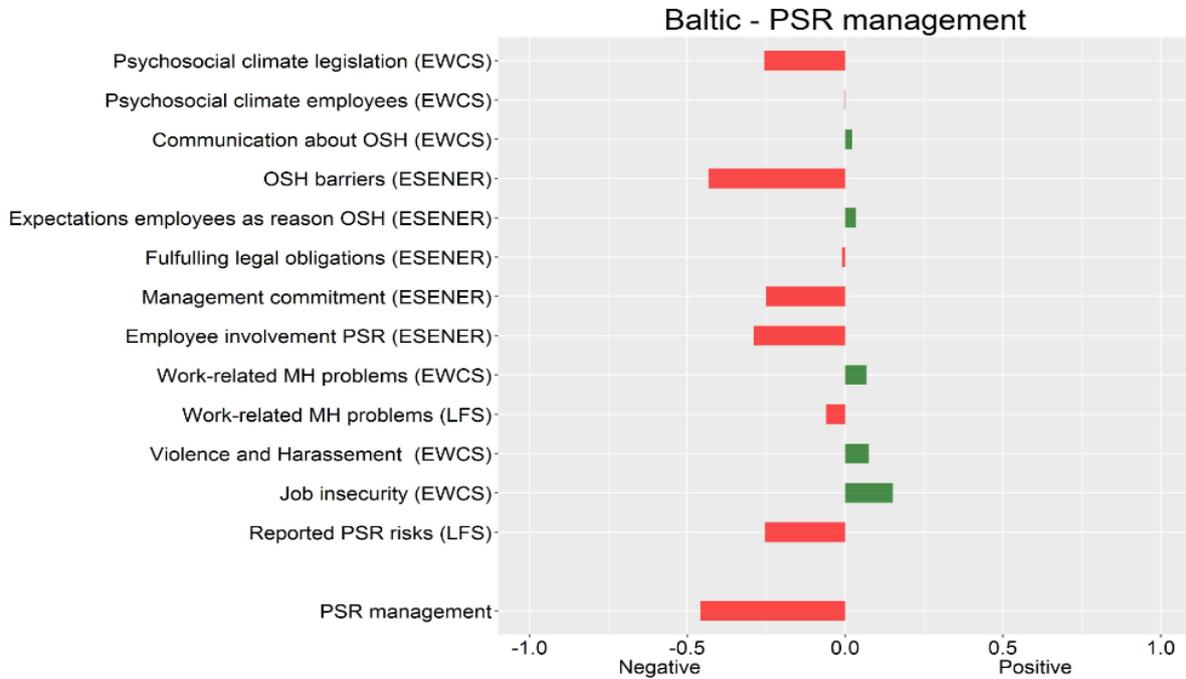
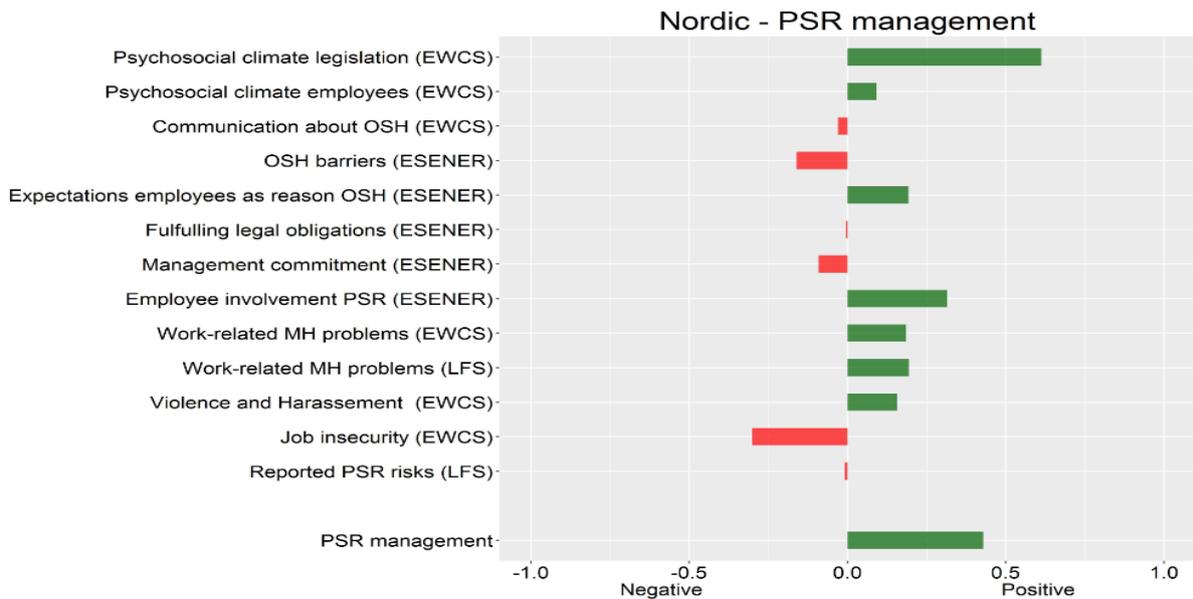


Figure 13: The typology of PSR management in the Nordic countries



Some sample sector profiles are presented for the agriculture, forestry and fishing sector and for the health care and social work sector. In the first sector, greater exposure to OSH risks is typically reported by employees, whereas, in the health care and social work sector, exposure to some specific OSH risks (exposure to dangerous substances such as chemicals and bacteria) is usually reported, but also many

PSRs are reported. From these data, we might expect PSRs to play a more minor role in the agriculture sector. PSRs may be hidden based in the data used here, since a large proportion of agricultural workers are self-employed rather than employees. Figure 14 indeed shows that the exposure to environmental OSH risks (EWCS) in the agriculture, forestry and fishing sector is reported by employees to be high, much higher than the environmental risk exposure reported by employees in the health care and social work sector (Figure 15). However, OSH risk management, as well as drivers of OSH risk management, is in general higher and, relative to the average sector, more positive in the health care and social work sector than in the agriculture, forestry and fishing sector.

Figure 14: The typology of OSH risk management in the agriculture, forestry and fishing sector

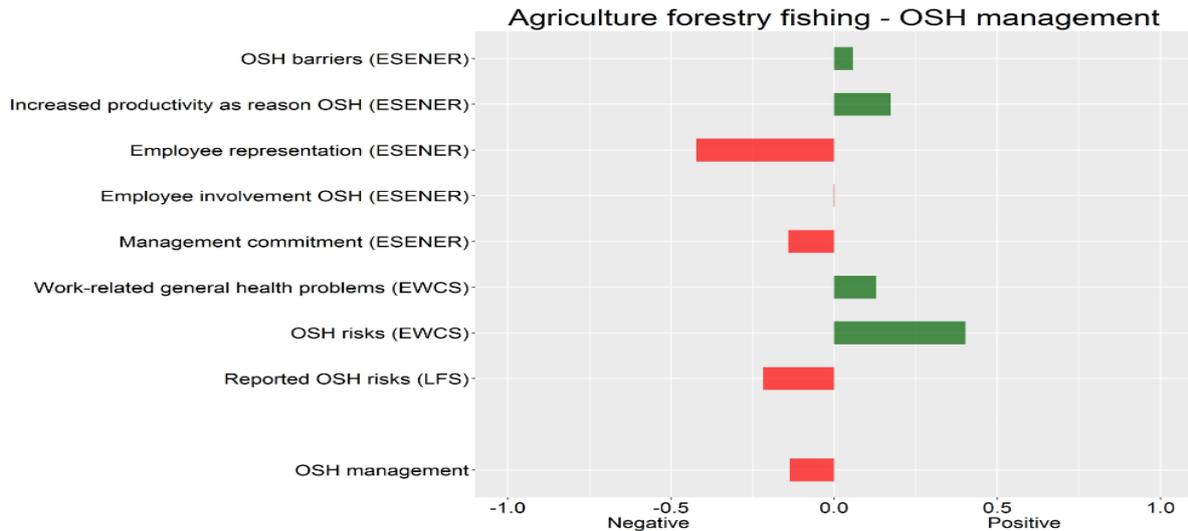


Figure 16 shows that, as expected, PSR management in the agriculture, forestry and fishing sector is relatively poor, as are most indicators of good PSR management. The main specific indicator that is positive in the agriculture sector is the fair and respectful workplace.

PSR management and most indicators or drivers of PSR management in the health care and social work sector are relatively positive, although there still appears to be room for improvement in, for example, drivers such as management commitment and communication (Figure 17).

Figure 15: The typology of OSH risk management in the health care and social work sector

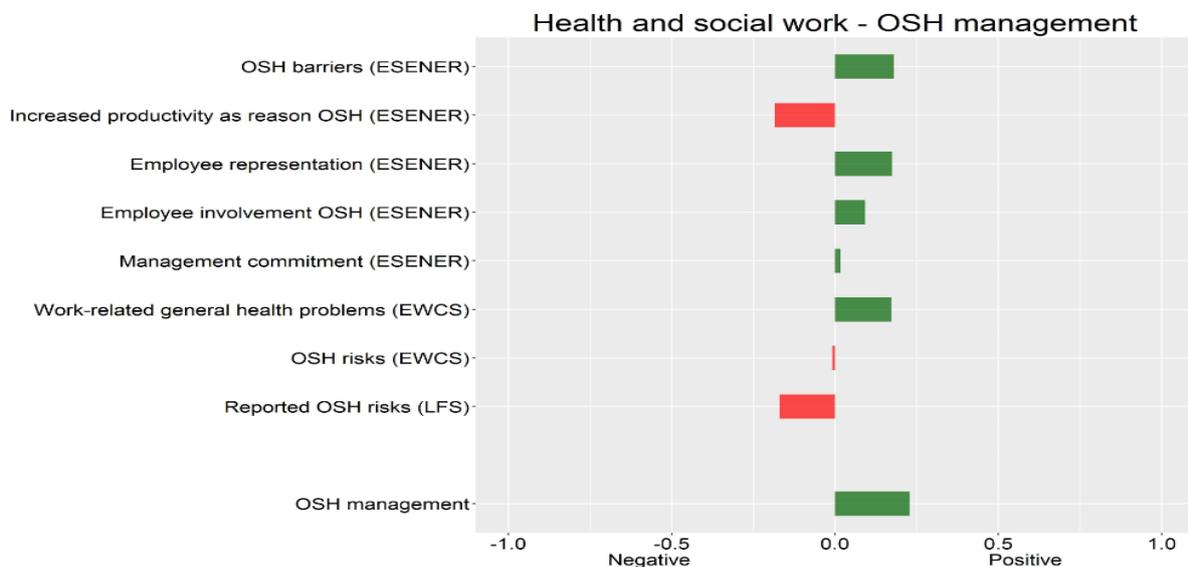


Figure 16: The typology of PSR management in the agriculture, forestry and fishing sector

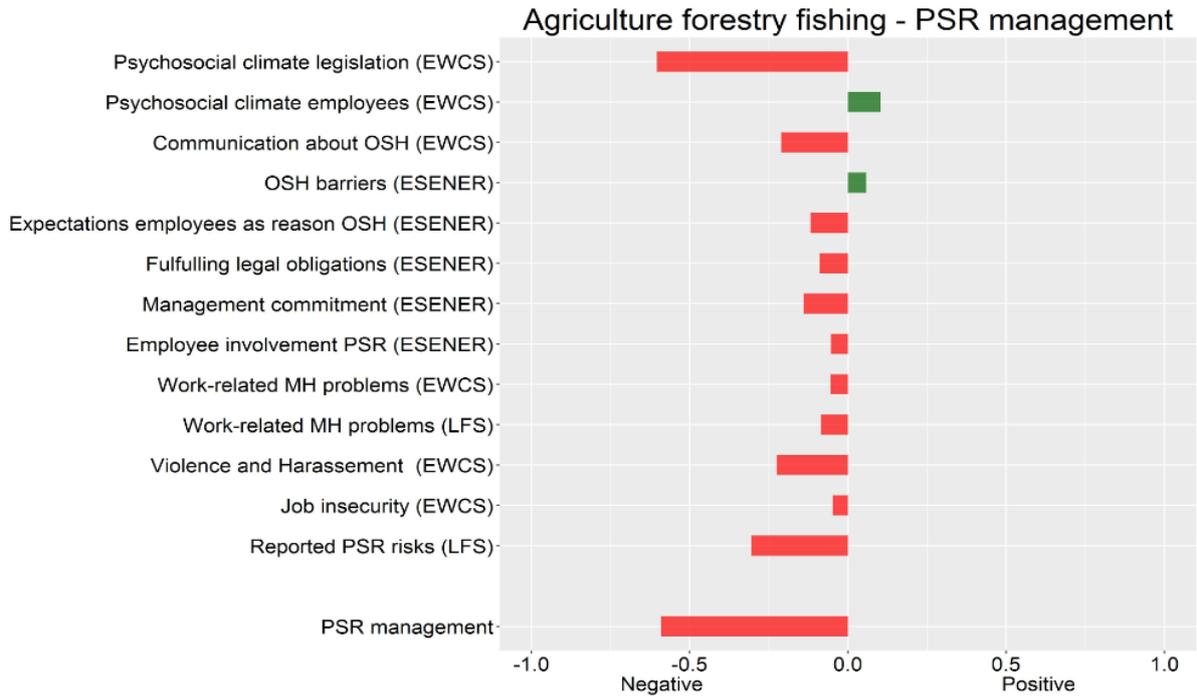
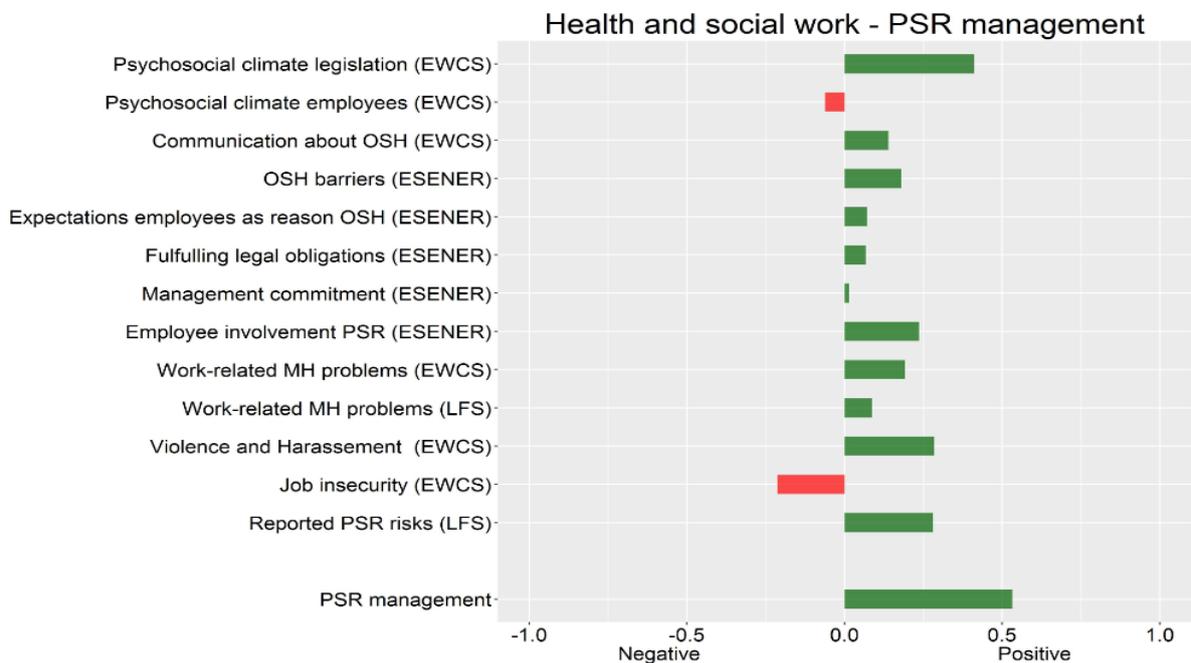
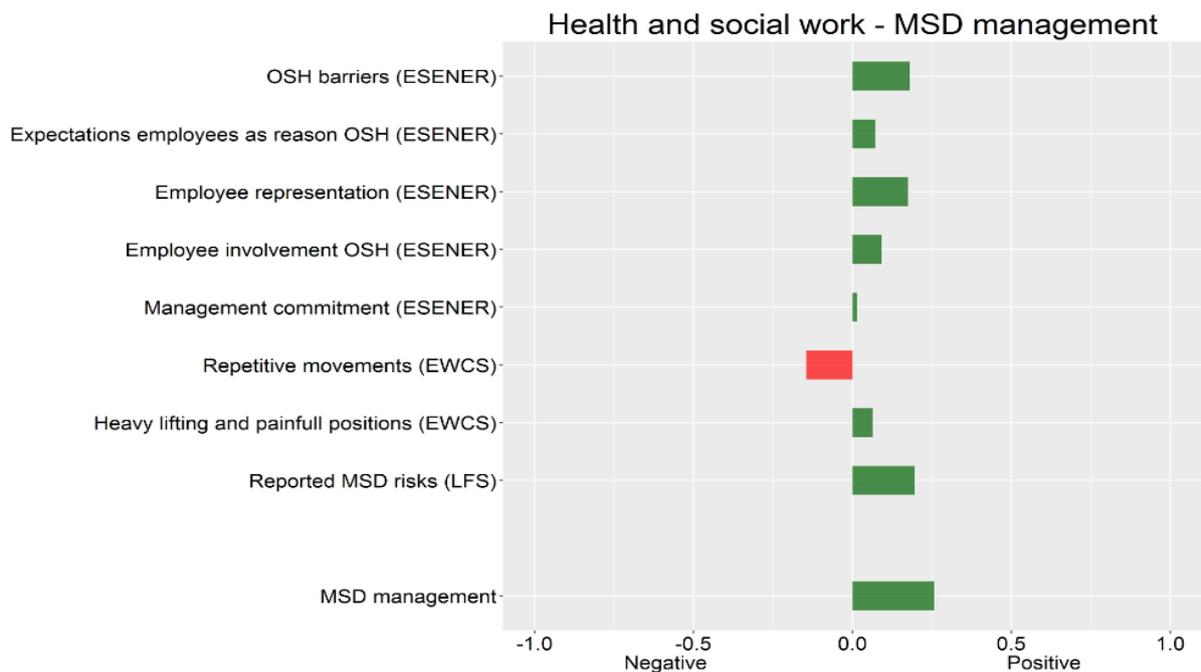


Figure 17: The typology of PSR management in the health care and social work sector



Although the indicators of the typologies of OSH risk management and MSD risk management are the same, the typologies themselves may be different. Figure 18 shows the typology for MSD risk management in the health care and social work sector. It is clearly shown that MSD risk management and exposure to MSD risks is somewhat higher in this sector than OSH risk management. However, the relevant drivers and barriers are the same, as there is a lack of MSD risk-specific drivers and barriers in the surveys used for the joint analysis.

Figure 18: The typology of MSD risk management in the health care and social work sector



▪ **Summary**

Typologies for countries, country clusters and sectors based on the main determinants of risk management summarise the findings of the joint analyses. These typologies present the relative status of the drivers for general or specific risk management, and indicate where there is room for improvement in risk management in a specific country, country cluster or sector.

4 Conclusions, discussion and recommendations from the joint analysis

The aim of this study was to provide answers to relevant questions on OSH risk management, such as ‘When OSH risks are managed at the enterprise level, do employees perceive that their exposure to OSH risks is reduced or just lower?’ and ‘What about their work-related health outcomes?’. To encourage OSH risk management it is important to understand what influences it, whether or not risk management is influenced by exposure of employees to work-related risks, both general and specific, whether or not health problems add to the decision to manage OSH risks and whether or not drivers and barriers of OSH risk management — such as management commitment, employee participation or a lack of resources — are important explanatory factors. This knowledge may be relevant to policy-makers, employer and employee representatives and OSH professionals in order to further stimulate risk management.

In this study, it was possible to combine data from three major European surveys — ESENER-2, the LFS ad hoc module and the 6th EWCS — to provide answers to relevant questions on OSH risk management that could not be answered by analysing any one of these datasets in isolation.

The following research questions were addressed:

1. Is exposure to OSH risks, both in general and more specifically in relation to environmental risks, risks of MSDs and PSRs, as reported by employees, related to risk awareness and risk management in enterprises?
2. Are work-related health outcomes and well-being, as reported by employees, related to risk awareness and risk management in enterprises?
3. How well is risk management explained by exposure to work-related risks, both general and specific, and by work-related health outcomes as reported by employees?
4. Do success factors, such as management commitment and employee participation, or barriers, such as lack of resources or expertise, explain the relationship between risk management at the enterprise level and risk perception by employees? If so, what impact do these factors have?
5. Can a typology of enterprises be defined according to either the background of the enterprise (such as country or sector) or the main features of its OSH risk management, including its drivers and barriers?

The ESENER dataset provided information on OSH risk awareness, OSH risk management, and drivers of and barriers to risk management in enterprises. The LFS ad hoc module provided data on exposure to general OSH risks, as well as on general risks of MSDs and PSRs, and general work-related health outcomes, as reported by employees. The EWCS provided data on the exposure to specific environmental risks, as well as specific risks of MSDs and PSRs, and specific work-related health outcomes, as reported by employees.

As these datasets were not linked at the employee or enterprise level, common background variables of country and sector were used to combine datasets. The intention was to also include ‘size’ as a third variable to combine datasets, but this could not be achieved robustly because this variable was not harmonised between surveys. As it is widely known that OSH risk management is related to enterprise size (see also EU-OSHA, 2010, 2014), we tested the impact of excluding ‘size’ as a level variable on the combined dataset of ESENER and the LFS ad hoc module. It was concluded that the relationships between OSH risk awareness and OSH risk management in enterprises and exposure to general OSH risks, as reported by employees, were unaffected when considered at the highest level, the country level ⁽²⁴⁾.

⁽²⁴⁾ In addition, these relationships were not affected in a meaningful way when the ‘relevance criterion’ — a factor that ensured that only robust findings (correlations larger than 0.30) were considered — was included in the analysis.

4.1 Exposure to risks, work-related health outcomes and risk management in enterprises (research questions 1, 2 and 3): principal conclusions

The general relationship found in this study was that greater exposure to OSH risks, as reported by employees, was related to increased OSH risk management in enterprises. The likelihood of greater risk management in enterprises increased with exposure to more *specific* risks, as reported by employees, and varied by country and sector. This finding was supported for the management of general occupational risks, musculoskeletal risks and PSRs. Information on specific risks contributed to the explained variance between general (information) on risks and risk management. The specific risks were environmental risks (OSH risk management), heavy lifting and tiring positions, and repetitive movements (MSD risk management), and violence and harassment and job insecurity (PSR management). These relationships cannot be interpreted as causal, as the combination of the datasets does not allow us to draw a conclusion on the direction of the relationships studied. However, it can be inferred that risk management may be a response to greater levels of risk exposure and high incidence of occupational diseases or work-related health problems.

The relationship between exposure to environmental risks, as reported by employees, and risk awareness is stronger than the relationship between exposure and risk management. This means that the fact that (in smaller enterprises) the owner or director or (in larger enterprises) their safety and health experts are aware of environmental risks does not necessarily imply that they are able to do anything to manage these risks. In larger organisations, the individual with most knowledge regarding OSH is often an expert, but may not necessarily have the power and resources to intervene in certain types of risks. There may be a number of different reasons given by employers or their representatives to explain why risks are not tackled despite having been acknowledged as a risk by enterprise-level interviewees.

As for exposure to PSRs, risks are mainly related to risk awareness and risk management in enterprises at the country level, and the relationships are weaker at the sector level. Differences in specific PSRs, such as high job demands, low autonomy and job insecurity, are explained to a greater extent by country-specific differences. Only exposure to violence and harassment is positively and relevantly related to risk awareness and risk management in enterprises at both the sector and country levels. Exposure to issues such as violence and harassment, and external violence in particular, can largely be considered different from the other PSRs, as it can clearly be observed, both by employees and management. On the other hand, exposure to high job demands, low autonomy and, to a lesser extent, job insecurity may be more implicit. Employers and their representatives regularly differ from employees in the way they report on PSRs at work, and these differences are larger than those in reporting on OSH and MSD risks (e.g. Houtman et al., 1998; Iavicoli et al., 2011). These findings suggest that national-level factors such as policies and culture play a larger role in PSR management.

The presence of health problems reported by employees only marginally increases the likelihood that enterprises will manage OSH risks and MSD risks. Only when employees report work-related mental health problems does the likelihood of greater PSR management in enterprises increase.

It can thus be concluded that:

1. Risks reported by employees are positively related to risk management for all three types of risks studied here (OSH risk, MSD risk and PSR): greater risk exposure, as reported by employees, is related to increased risk management in enterprises.
2. The availability of specific information on risks, as reported by employees, such as environmental risks, heavy lifting and tiring positions, repetitive movements, violence and harassment, and job insecurity, strongly increases the likelihood that risk management will take place in enterprises.
3. Information on health problems reported by employees only marginally increases the likelihood that management of OSH risks and MSD risks in enterprises will take place. However, when employees report work-related mental health problems, the likelihood of increased PSR management in enterprises increases.

4.2 The impact of drivers and barriers in the explanation of risk management (research question 4): principal conclusions

The impact of drivers and barriers on risk management can be considered in two different ways. First, they may have a direct effect on risk management, thus adding to the degree to which risk management can be explained. Second, they may act as moderators of the relationship between risk factors and risk management, meaning that the relationship between the risk factor and risk management is altered depending on the presence or absence of the driver or barrier.

When considering the first type of impact, drivers that affect both OSH and MSD management in a robust way are the presence of an employee representative, management commitment and employee involvement in OSH management. By comparison, other drivers and barriers investigated add significantly less or nothing to the explanation of OSH and MSD management. PSR management is not explained by these three general drivers, or by the barriers. However, employee involvement specifically in the management of PSRs does explain PSR management to a considerable extent.

When considering the moderating effects of barriers to or drivers of risk management, the general finding is that when drivers are absent or in short supply, there is no relationship between the exposure to risks, as reported by employees, and the risk management, as reported by the establishment. When these drivers are present, in general, a positive relationship is found between the risk exposure reported by employees and risk management in enterprises. Drivers that have a robust moderating effect are as follows:

- Formal employee representation influences the relationship between exposure to OSH and MSD risks and OSH risk management and MSD risk management, respectively.
- Employee expectations influence the relationship between exposure to MSD risk and MSD risk management.
- Legal expectations influence the relationship between exposure to job insecurity and PSR management.
- OSH communication influences the relationship between exposure to job insecurity and PSR management.
- PSR-specific drivers, such as employee involvement specifically in managing PSRs, experience of a fair and respectful workplace, the presence of worker representation and the ability to discuss organisational issues, influence the relationship between exposure to PSRs in general and PSR management.

The relationship between job insecurity and PSR management is somewhat different. This relationship is found to be negative, which we interpret as meaning that, if job insecurity is high, PSR management is not a priority. For PSR management some specific drivers are found to moderate the relationship between PSRs and PSR management.

Barriers to risk management, such as lack of resources, do not have a profound effect on risk management, but do have a strong, moderating effect on OSH management and minor effects on MSD and PSR management. When barriers are minor, there is no relationship between the risk, as reported by employees, and risk management, as reported by the establishments. However, when barriers are present, *greater* exposure to risks such as violence and harassment is associated with *increased* risk management.

4.3 Typologies of enterprises (research question 5): principal conclusions

The last research question aimed to investigate the possibility of defining typologies of enterprises according to either the background of the enterprise, such as country and sector, or the main features of its OSH risk management, including its drivers and barriers. The results of the analyses show that typologies can be made for countries, country clusters and sectors based on the main determinants of risk management. These typologies present the relative status of the drivers for general or specific risk management, and indicate room for improvement in risk management in a given country, country

cluster or sector; several examples building on the characteristics that are found to be related to increased risk management were discussed in Chapter 3 and in the technical report (Eekhout et al., 2016).

4.4 Summary policy-focused findings of the joint analysis

Based on the results of this joint analysis of the three major European surveys on OSH, the following summary conclusions can be drawn that will be of interest to policy-makers and other stakeholders:

- Exposure to risks, as perceived by employees, and particularly to specific environmental and specific MSD risks and PSRs, appears to be an important driver of the management of OSH risks, risks of MSDs and PSRs.
- Additionally, information on mental health problems, as reported by employees, significantly and relevantly adds to the management of PSRs by the enterprises, as does information on exposure to general and specific PSRs.
- Drivers and barriers may influence how policy-makers and other stakeholders — employers, employees and their representatives, and OSH professionals — manage general OSH risks in enterprises, particularly MSD risks and PSRs.

4.5 Recommendations for policy-makers, national and sectoral stakeholders

- It is important to support moves to *strengthen management commitment* to OSH in general, as well as to the specific management of OSH and MSD risks. Although this driver was not found to be related to PSR management, the literature suggests that it is relevant to PSR management. It may well be that specific support for PSR management is necessary to fully develop PSR management.
- It is also recommended that employer and employee representatives and other relevant stakeholders, such as representatives of sector-level organisations and OSH professionals, *encourage employee participation to facilitate the management of OSH in general, as well as more specific management of MSD risks and PSRs*. This is because:
 - Improving *formal employee representation* is strongly associated with OSH and MSD risk management. Again, no association with PSR management is found. In MSEs this task may be more relevant to employer and employee representatives who cover the MSE, as well as to sector organisations that feel responsible for encouraging healthy and productive workplaces.
 - Improving *informal employee participation* can also improve OSH management.
 - *Involvement in the design and set-up of measures to manage PSRs* is strongly associated with greater PSR management.

National and sectoral stakeholders could also:

- *Support the development of risk assessment tools*. Examples of such tools are often already available at EU and national levels for general, as well as specific, risks.
- *Aim to improve formal employee representation in companies* to support OSH management.
- *Encourage formal employee representation* as an important driver of both gathering information on exposure to OSH and MSD risks and their respective risk management. With regard to PSRs, the main factor determining risk management appears to be employee involvement in the specific PSR management process.
- *Encourage management commitment to OSH and MSD risk management*. It may be that management commitment specifically directed at psychosocial issues is important for PSR management, but information on this type of management commitment is not yet available in ESENER.

- *Promote fair and respectful workplace environments and the presence of employee representation in the workplace* to effectively manage PSRs. These, together with the opportunity to formally discuss organisational issues, are particularly important drivers of PSR management.
- *Aim to increase resources for risk management in enterprises.* In general, limited resources in enterprises mean that there is no relationship between the risks reported and the risk management. The findings indicate that only in the case of exposure to very specific risks, such as violence and harassment, are sparse resources allocated to these risks.

4.6 Limitations of the joint analysis

The method used to combine data in this study has limitations. It is clear that combining three datasets is quite complex, particularly because there is no option to link the data at the individual worker or enterprise level. The workers surveyed in the LFS and EWCS did not belong to the same companies and could not be linked directly to the companies in ESENER. Had this been possible, the number of observations could have increased, and with it the variance, resulting in a further increase in the validity of the analyses. We were restricted to analyses at the higher cluster levels (i.e. country and sector). The variable 'size' could not be taken into account as a level for the linkage of the datasets when the EWCS was included. However, the impact of not including the size level was analysed using ESENER-2 and the LFS 2013 ad hoc module in combination, and was found not to have a major impact when considering only robust and relevant findings. As our analyses were therefore restricted to analyses at country and sector level, we considered only the highly significant and relevant findings, restricting ourselves to the most robust and clear findings.

While the data were taken from three different surveys collected around the same time and we could analyse correlations and associations between all variables, it was not possible to indicate any causal direction in these relationships. In addition, the questions on specific drivers for PSR management and on PSR management itself in ESENER-2 were asked only of enterprises with 20 or more employees, excluding the smaller MSEs.

4.7 Strengths of the joint analysis

Combining datasets like this helps to produce relevant, interpretable results that go further than what would be possible through separate analyses of these datasets. The analysis of combined datasets, as was done in this study, is a cost-effective way to obtain results from several sources that could otherwise be obtained only through costly and time-consuming field work. It also allows us to make more use of existing data than was foreseen.

However, harmonisation of common variables for linking databases (e.g. by country, sector and size) as done in this study is a prerequisite for the successful combination of different datasets. The more levels of information that can be linked, the more reliably and validly the results can be interpreted.

The joint analyses link important steering information (drivers and barriers) to OSH risk management in general, as well as to the management of two important specific OSH risks: PSRs and MSD risks. For PSR management, part of the information on drivers came from ESENER-2 and part came from EWCS. Both sources were equally able to provide useful information that can be used to promote PSR management. The drivers are particularly important components of a typology that provides an overview of the conditions in countries, country clusters or sectors, and indicates where there is room for improvement of these conditions to actively promote risk management.

4.8 Future work

Joint analyses may become one type of analysis that will merit more use in the future. When datasets collecting information on OSH are better harmonised, including the levels at which the data can be combined, the usefulness of these type of analyses may increase further.

In future, with further adaptation to these surveys, we may also be able to consider other relevant drivers and barriers, particularly for specific types of OSH risks. For now, no specific information on drivers and barriers was available for MSD risk management. There are some specific drivers of PSR management, but, to better grasp the conditions for specific drivers, one may additionally need specific information about management support specifically for PSRs and MSD risks, and communication about these specific types of risks as well. The analyses performed in this study show that relevant information on drivers (and probably barriers too) can be collected from both employees and enterprises.

Although some of the future work proposed here is aspirational, these joint analyses already provide findings relevant both to general OSH risk management and more specifically to MSD risk management and PSR management, and help indicate which drivers could further promote general and specific OSH risk management in enterprises within countries and sectors.

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