Occupational health and work climate: A case study of survey data[1]

by

Klaus Mohn,[a,*]

NOVEMBER 2008

[a] *University of Stavanger, 4036 Stavanger, Norway*
and StatoilHydro, 4035 Stavanger, Norway

Abstract

Work-related health problems represent a latent threat to job motivation and organisational performance, with high potential costs both for private and public enterprises. Based on powerful survey data from an international oil company in Norway, we explore how work-related health problems are connected to characteristics at the individual level, as well as attributes of the local working environment. Estimated ordered probit models suggest that work-related health problems are aggravated by age and seniority. The estimated connection between work-related health problems and performance appraisal is weak, whereas significant gains in welfare and economic performance seem to be implied by an enhanced focus on competence and expertise, trust and confidence.

Key words: Health problems, working environment, survey data, probit models

[1] For useful comments and advise, the author would like to thank (without implying) Einar Brandsdal, Mari Ræge, and Mark Votruba.
[*] *E-mail address:* klaus.mohn@uis.no (K. Mohn).

A. Introduction

Work-related health problems have economic implications in a range of dimensions. On a macroeconomic level, unhealthy practices and working conditions may undermine the labour force, via both participation rates and exit rates from the labour market (e.g., Suhrcke et al., 2006). A range of studies have been conducted to study costs and other economic consequences of sickness absence, some of which are surveyed by Brown and Sessions (1996). On the other hand, research on the roots and determinants of sickness absence have largely been confined to medical research for specific diagnoses (Alexanderson 1998) and job types (e.g., Hansson et al. 2008), and to research in applied psychology for explanations in the psychological, organisational, and social domain (e.g., Michie and Williams 2003, Piirainen et al. 2003). Based on survey data from an international oil and gas company, this study applies rigorous econometric methods to the the latter strain of empirical literature on work-related health problems.

On the microeconomic level, a well-established result is that occupational health exerts an influence on job motivation, productivity and corporate performance (e.g., Goetzel et al. 2001, Tompa 2002). Another channel for economic consequences of work-related health problems goes via losses of effort and productivity from sickness absence, with a broad range of examples including low back pain (Ekman et al. 2005), migraine (Edmeads and Mackell 2002), and alcohol abuse (Maynard and Kennon 2006). In construction companies and other work places characterised by physical hazard, both injuries and larger accidents may also involve indirect economic costs in terms of reputational damage and threats to the social "license to operate" (e.g., Graafland 2002).

Based on previous versions of the same company survey as the one in this study, Høivik et al (2007) study associations between self-reported working conditions on the one hand, and registered health and safety results on the other. The results of this study clearly demonstrate that statistics on injuries, undesirable incidents and sickness absence to some extent can be predicted by survey results in corresponding areas.

Consequently the organisational climate, as reported through work environment surveys, does also have an economic impact.

The aim of this study is to explore empirically how self-reported work-related health problems are influenced by individual characteristics as well as general properties and characteristics of the local working environment. Based on a powerful set of survey data from Statoil's 2006 work environment and organisational study (n > 12,000), we construct three indices to describe the qualities of the local working climate around each leader and employee.[2] One of these indices measures the local focus on competition and performance. The second measures the local inclination for expertise and competence, whereas the third index is constructed to grasp the level of relational and reputational trust and confidence, as perceived by each respondee of the survey. Based on the ordered probit model, a variety of regressions are run to assess the relationship between self-reported work-related health problems on one hand, and qualities of the local work place on the other. The sample is split between leaders and employees, and the empirical models include a variety of control variables, including gender, age, and seniority.

In terms of results, both age and seniority exerts seem to aggravate the prevalence of work-related health problems, with an exception for men in managerial positions. Competition and performance appraisal has a slightly positive influence on work-related health problems, especially for women with leadership responsibilities. Occupational health is systematically better in units and jobs with an emphasis on competence and expertise, and even more so if the local working environment is characterised by a high degree of trust and confidence.

In terms of policy implications, this study may provide valuable insights on how to allocate resource in terms of both management attention and policy design. On the organisational level, work-related health problems seem to accelerate with age and

[2] Observe that Statoil's Global People Survey 2006 was designed and conducted by the company itself, without my influence or interaction. The point of departure for this study is formed by the pre-defined questionnaire and the collection of individual responses.

seniority among male employees, but not so much among female employees. On the other hand, management responsibilities seem to imply more of an occupational health hazard for women than for men, with a difference which increases in both age and seniority. Combined with the insights on how work-related health problems are related to job content and local working environment, these results may indicate how to allocate resources in terms of management attention, HR policies, as well as general measures to support occupational health and prevent sickness absence, wear and tear of the labour force and exit. Although this study is limited to a data set from a single company, the extent and diversity of the organisation may well allow generalisation in terms of policy design in a wider economic context. That being said, a full appraisal of the usefulness of the proposed modelling framework should await applications of the model on alternative data sets, with a wider reach across companies and industries.

The paper is organised as follows. Section B gives an introduction of the data set, as well as an introduction and discussion of the variables of the empirical. The econometric model is outlined and estimated in Section C, with subsequent discussion of key results. Concluding remarks are offered in Section D.

B. Data and variables

Our data source is the annual survey of the work environment and organisational issues in Statoil. This so-called Global People Survey (GPS) was undertaken in the period 15 September to 27 October 2006, and was sent out to 16,000 leaders and employees in 14 European countries.[3] With a response rate of 83 per cent, more than 13,000 forms were retrieved from the survey. Our sample is the 2006 survey, with some 12,600 responses for the variables we will study. Statoil's Global People Survey 2006 requested the evaluation of 60 questions and statements on a measurement scale ranging from 1 to 6. Subjects covered a wide range of topical

[3] Observe that Statoil's Global People Survey 2006 was designed and conducted by the company itself, without our influence or interaction. Our point of departure is formed by the questionnaire and the individual responses.

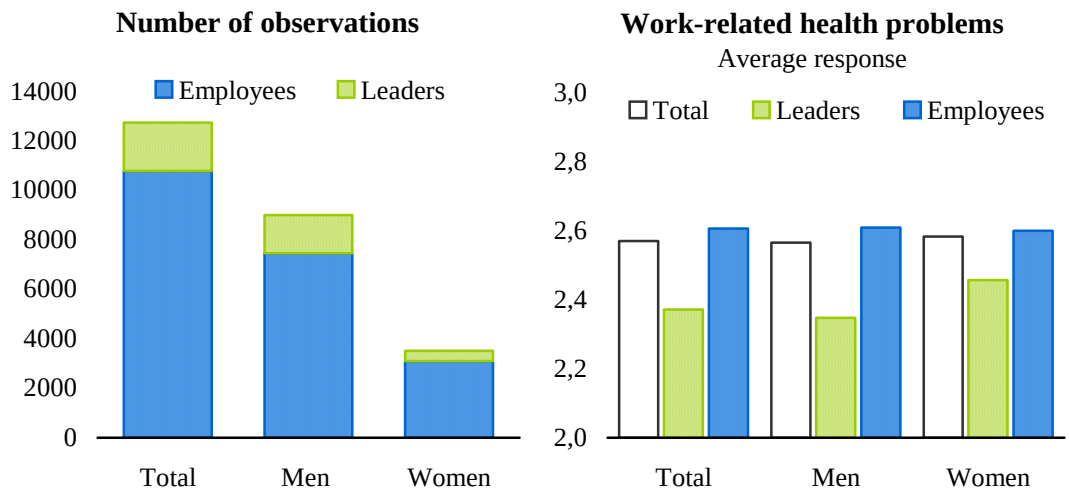
areas, including (but not limited to) performance appraisal practices, change capability, competence and expertise, trust and identity. Moreover, the response forms offer background information on gender, age, seniority, leader/non-leader position, country of work and organisational belonging, offering information for a wide range of empirical assessments.

The scope of this investigation is to study factors that may contribute to the explanation of work-related health problems. As a dependent variable for our analysis, we therefore select the response given to the following question in Statoil's GPS:

"*Do you experience health problems that could be caused by your work situation?*"

On a scale from 1 ("Not at all") to 6 ("In high extent"), respondents are asked to assess their own perception of health problems which might derive from their work. In terms of measurement, challenges arise at two levels for this question of Statoil's GPS. First, the objective definition of "health problems" may vary across individuals. Is an in-growing nail a health problem? Does passive smoking qualify? Potentially, systematic variation may also occur with respect to objective definitions, for example between men and women, across different age groups or between different types of work environments in the organisation. In principle, this kind of problems may also apply for the definition of "work situation". Second, the subjective trigger level of discomfort for reports on health problems may also vary across groups of individuals. Similarly, the connection between perceived health problems and the work situation is also subject to individual judgment. However, personal perceptions and general contentment remain important for individual attitudes and job motivation. Even with the above reservations, we feel that Statoil's GPS may reveal important information about the prevalence of work-related health problems. The objective of our statistical analysis is therefore to explore factors that may influence how individuals perceive their own situation with respect to work-related health problems.

Figure 1. Data composition and average scores



Source: Statoil's Global People Survey 2006.

Some key properties of the data set are resolved in Figure 1. 12,751 individuals have responded to the question on work-related health problems. 30 per cent of the total is represented by women, whereas 15 per cent of the total is classified as leaders with personnel responsibilities. The inclination for leadership positions is somewhat higher among men (17 per cent) than among women (12 per cent). In other words, the prevalence of women is somewhat higher among employees (29 per cent) than for the population of leaders (21 per cent). Average scores for the question on work-related health problems are reported in the right-hand panel of Figure 1. At this point, variation across categories seems moderate. However, there is a slight tendency for employees to report more work-related health problems than their leaders. Moreover, this kind of health problems also seem to be somewhat more common among women in leadership positions than among men in corresponding positions. Among employees, there is only a negligible difference between men and women when it comes to self-reported work-related health problems. More details on average scores are offered in Appendix 1.

Our scope of research involves regressions of the above indicator of work-related health problems against relevant background variables. We seek to establish robust relations between our dependent variables on the one hand, and other elements of

Statoil's Global People Survey on the other. Our data set allows a split between men and women, and we therefore test whether perceptions of performance appraisal and career opportunities vary systematically across gender. Further, respondents are asked for information on seniority. More specifically, they tick one of three boxes to indicate time of service with the firm (less than 3 years, 3-10 years, or more than 10 years). In our statistical analyses, we apply dummy variables to test for the role of seniority for perceptions of work-related health problems.

There are reasons to believe that work-related health problems are related to characteristics of the local working environment. As an example, a highly competitive and performance-oriented working environment may serve as a stimulus both to job motivation and individual health (e.g., Holman et al. 2002). On the other hand, this kind of working environment could also produce stress, disillusion, and exhaustion (e.g., Brown and Benson 2003). The net effect of these two sets of mechanisms is an empirical question.

To grasp this variation in properties and characteristics of the local working environment, we design three index variables, based on factor analysis of relevant groups of items from Statoil's GPS (see Pett, Lackey, and Sullivan, 2003). An overview of retained items, index variables and key statistics is presented in Table 1. We report eigenvalues for two potential principal components, EV_1 and EV_2. A substantial drop is observed between EV_1 and EV_2 for all index variables. With a maximum for the second eigenvalue of 0.37 (*TRID*), this suggest that our preferred index-variables represent a reliable clustering of items. The clustering of items is backed up by high factor loadings (λ_1), indicating a specific underlying dimension for all our index variables. Moreover, the reliability of our index-variables is also supported by high internal consistency, as measured by Cronbach's α (Cronbach, 1951). Finally, values above 0.45 for all communality measures (*C)* indicate a low degree of specific variance, implying that each of our index variables is quite well explained by one single factor.

Table 1. Validation of index variables
Factor analysis obtained with Stata 10.0

Items, index variables, and key statistics	λ_1 [a)]	C [b)]
Performance culture (PERF; EV_1 = 3.46; EV_2 = 0.36; Cronbach's α = 0.87)		
PERF1: "In my entity, we set ambitious goals"	0.72	0.54
PERF2: "In my entity, we deliver what we promise"	0.64	0.44
PERF3: "In my entity, we place considerable emphasis on being cost- effective"	0.67	0.49
PERF4: "In my entity, we continuously seek business opportunities and/ or operational improvements"	0.75	0.60
PERF5: "In my entity, we strive for simplification and clarity and fight activities which do not add value"	0.72	0.54
PERF6: "My superior provides me with constructive feedback on my work"	0.66	0.58
PERF7: "My superior is clear about performance standards"	0.75	0.66
Expertise (EXPT; EV_1 = 3.27; EV_2 = 0.06; Cronbach's α =0.88)		
EXPT1: "I am able to utilise my expertise and abilities in my daily work"	0.67	0.47
EXPT2: "Conditions are favourable for me to continue my personal development in a systematic manner"	0.84	0.71
EXPT3: "I receive the training required to do a good job"	0.73	0.55
EXPT4: "I take the initiative and actively seek to develop my skills"	0.65	0.45
EXPT5: "In my entity, we are good at making use of each other's expertise and experience"	0.80	0.65
EXPT6: "My leader creates favourable conditions for the development of each employee"	0.73	0.54
Trust and identity (TRID; EV_1 = 3.53; EV_2 = 0.37; Cronbach's α = 0.87)		
TRID1: "I have confidence in the management of my business unit"	0.81	0.68
TRID2: "I have confidence in the corporate executive committee"	0.75	0.63
TRID3: "I speak of Statoil to my friends as a good company to work for"	0.66	0.47
TRID4: "In my entity, we respect the individual"	0.68	0.59
TRID5: "In my entity, we may challenge accepted truths"	0.69	0.60
TRID6: "Cooperation between management and the trade unions in my business unit is good"	0.72	0.55
TRID7: "I am confident that Statoil contributes to sustainable development and displays social responsibility wherever it has operations"	0.65	0.48

[a)] Factor loadings. [b)] Communality. Data source: StatoilHydro, Global People Survey 2006.

The first index variable (*PERF*) includes items relating to ambitions, targets, deliveries, cost consciousness, and performance appraisal. The idea behind this variable is simply to assess how the conscious pursuit of a work environment based on merit and performance influences the propensity to for self-reported work-related health problems. As outlined above, theory offer support for both negative and positive effects for this variable, and an empirical investigation is required to determine its impact.

The second index variable (*EXPT*) evolves around competence and expertise, and represents a synthesis of items related to human capacity utilization, development and exchange of competence. These qualities of the local work place may be seen as a reflection of active HR management (e.g., Lado and Wilson, 1994), which is potentially important both for the job motivation of the individual employee, and for the performance of the organisation. Following this line of thought, high scores on the *EXPT* index should dampen the tendency for work-related health problems.

The third index variable represents a proxy for trust and identity (*TRID*), based on questions and items concerned with confidence in management, as well as issues of strategy, collaboration and reputation. As this variable captures trust both in the immediate leader as well as corporate management, it covers both the relationship-based as well as the character-based perspective of trust (e.g., Dirks and Ferrin, 2002). Theoretical contributions to job motivation and well-being the work place offer a robust connection between trust in the work place on the one hand, and physical and mental health on the other (e.g., Elovainio et al. 2002; Väänänen et al. 2004). Our statistical investigation will offer an empirical test of this theoretical prediction.

Table 2. Descriptive statistics for data sample

Mean (μ) and standard devation (σ)

	Full sample *(N = 12,598)*		*Leaders* *(N = 1,947)*		*Employees* *(N = 10,651)*		*Men* *(N = 9,097)*		*Women* *(N = 3,501)*	
	μ	σ	μ	σ	μ	σ	μ	σ	μ	σ
WRHP	2.57	1.42	2.37	1.37	2.61	1.43	2.57	1.42	2.58	1.42
PERF	4.47	0.78	4.79	0.67	4.42	0.78	4.46	0.78	4.51	0.75
EXPT	4.41	0.79	4.65	0.72	4.37	0.80	4.40	0.79	4.44	0.79
TRID	4.71	0.81	5.07	0.66	4.65	0.82	4.70	0.83	4.76	0.77

Data source: StatoilHydro, Global People Survey 2006.

C. Estimation and results

Our empirical model is specified to account for the special properties of our data, which is based on a set of ordinal information from Statoil's Global People Survey. Specifically, our dependent variables may take any value on an ordinal scale from 1 to 6, whereas dummy variables for gender, age, and seniority take either 0 or 1 as their value. We know that five is a better response than four, and this information should be acknowledged and exploited in our econometric estimation. However, we are not in a position to say that the difference between three and four is half the importance of the difference between one and three. On the other hand, aggregation has transformed the ordinal scale of the constituent variables to a continuous scale for the five index variables. Still, the variation of the index variables is restricted to the interval [1, 6]. Based on these special properties of our data, we apply a generalisation of the probit model for categorical choice, the so-called ordered probit model (Zavoina and McElvey, 1975; Greene, 2003). At the core of our model is an underlying linear relationship between a latent variable (y^*), and a set of explanatory variables (x, z):

$$y^* = x\beta + z\gamma + e, \qquad [1]$$

where x represents the vector of dummy variables for gender and seniority, z is the vector of index variables, β and γ represent the set of coefficients to be estimated, and e is an error term with the standard white-noise properties. What we observe, however, is not y^*, but its ordered approximation (y), with discrete values in the interval [1, 6]. With α_1, α_2, α_3, α_4, α_5 as the relevant set of threshold parameters (or cut points), the observed variable is now assumed to satisfy the following definition:

$$\begin{aligned} y &= 1 \quad if \quad y^* \le \alpha_1 \\ y &= 2 \quad if \quad \alpha_1 < y^* \le \alpha_2 \\ &\vdots \\ y &= 6 \quad if \quad y^* > \alpha_5 \end{aligned} \qquad [2]$$

The probability of observing y^* at a specific value for the response may be stated as:

$$\begin{aligned} p(y=1 \mid x,z) &= p(\ x\beta + z\gamma + e\ \leq \alpha_1 \mid x,z) \\ p(y=2 \mid x,z) &= p(\ \alpha_1 \leq x\beta + z\gamma + e\ < \alpha_2 \mid x,z) \\ &\vdots \\ p(y=6 \mid x,z) &= p(\ x\beta + z\gamma + e\ > \alpha_5 \mid x,z) \end{aligned} \qquad [3]$$

Maximum-likelihood procedures are now applied to estimate the vectors β and γ of Equation [2], along with the threshold parameters $\alpha_1, \ldots, \alpha_5$. The coefficients β and γ measure the change in the average score for the dependent variable in response to a one-unit change in dummy variables and explanatory variables, respectively.[4]

To account for variation across different groups of individuals, we define dummy variables for gender, age, and seniority. The gender dummy (*FEM*) takes 1 as its value for women, and 0 for men. Respondents of Statoil's GPS report age according to 5 age intervals (< 30 years; 30-39 years; 40-49 years; 50-59 years; > 60 years). The youngest age group serves as our point of reference, and dummy variables are defined for each of the older age groups (*Age 2*; *Age 3*; *Age 4*; *Age 5*). In terms of seniority, there are three available categories for length of service with the company (< 3 years; 3-10 years; > 10 years). Again, the newly employed (less than 3 years of experience with the company) serve as a base case, and dummy variables are defined for each of the more experienced groups (*Seniority 2*; *Seniority 3*). We would also like to test for cross-gender variation in the effects of age, seniority, and potentially also in the effects of our index variables. For example, age and/or seniority may have another effect on the propensity to report work-related health problems among women than among men. Correspondingly, the response to a highly performance-oriented culture may not be the same for men as for women. For this purpose we

[4] Observe, however, that the direction of the effect of a change in x (z) is unambiguously determined by the sign of β (γ) only for the probabilities of the worst score ($p(y = 1 \mid x, z)$) and the top score ($p(y = 6 \mid x, z)$). For intermediate scores (*2*, *3*, *4*, and *5*), the sign of partial effects is not uniquely determined by the sign of the coefficients. However, the model can be applied for prediction, whereby the role of exogenous variables is explored for each outcome by comparative analyses. Specifically, estimates of expected outcomes can be compared for various levels of the explanatory variables to obtain partial effects for each of the outcomes.

construct appropriate interaction terms between the variables (e.g., *FEM* x *Age 2*; *FEM* x *PERF*), and estimate their coefficients.

In terms of estimation strategy, we start out with a full-sample estimation with all the above dummy variables and interaction terms. This model is then gradually reduced, through a step-wise elimination of dummy variables and interaction terms. The full sample has observations both for employees and individuals with management responsibilities. To address the potential differences between these groups of people, we split the sample between leaders and employees, and re-estimate the model with and without dummy variables. To study the gender variation more explicitly, we split the sample once again, and estimate the general model without dummy variables for four sub-samples: Men in managerial positions, women in manageerial positions, male employees, and female employees. Results are presented in Tables 3a,b,c.

The full sample consists of approx. 12,600 observations. The sample split between leaders and non-leaders leave some 1,950 observations (16 per cent) for the population of leaders, and around 10,650 observations (84 per cent) for the population of employee respondents. The statistical properties of all econometric models are satisfactory. Estimated parameters take signs according to expectations, and most of them pass the tests of statistical significance.[5] Moreover, all tests for joint significance strongly indicate that our explanatory variables are highly valid. Statistical fit, in terms of pseudo R^2, suggest that our variables capture 3-4 per cent of the variation in the data set.[6]

[5] To test for the influence of intragroup correlation, preliminary estimations were run with clustered standard errors for a range of background variables. However, the significance of our estimated effects shows robustness to these alternative estimation procedures. To keep things simple, we therefore stick to the straight-forward version of standard errors in our presented calculation of p-values.

[6] This pseudo R^2 measure is computed because there is no direct equivalent of a traditional R^2 (from OLS regression) in non-linear models like the ordered probit model. Compared to standard econometric on time series data, our pseudo R^2 estimates may seem to indicate weak statistical fit. However, this level of statistical fit is not uncommon for non-linear models of discrete choice in cross-sectional data. As noted by Wooldridge (2003), goodness of fit is not as important as statistical and economic significance of the variables in this class of models.

Table 3a. Full sample estimation results

Maximum-Likelihood estimates of ordered probit model obtained with Stata 10.0

	Model 1	*Model 2*	*Model 3*	*Model 4*
Estimated coefficients [a)]				
FEM (gender dummy)	0.19 (0.25)	0.33*** (0.00)	0.29*** (0.00)	0.08*** (0.00)
Age 2	0.19*** (0.00)	0.19*** (0.00)	0.20*** (0.00)	0.11*** (0.00)
FEM x Age 2	-0.17** (0.04)	-0.17** (0.03)	-0.22*** (0.00)	..
Age 3	0.23*** (0.00)	0.23*** (0.00)	0.25*** (0.00)	0.18*** (0.00)
FEM x Age 3	-0.10 (0.24)	-0.11 (0.23)	-0.18** (0.02)	..
Age 4	0.33*** (0.00)	0.33*** (0.00)	0.36*** (0.00)	0.26*** (0.00)
FEM x Age 4	-0.21** (0.03)	-0.21** (0.03)	-0.31*** (0.00)	..
Age 5	0.25*** (0.00)	0.25*** (0.00)	0.28*** (0.00)	0.18*** (0.00)
FEM x Age 5	-0.23* (0.09)	-0.23* (0.09)	-0.32*** (0.01)	..
Seniority 2 (3 - 10 yrs)	0.38*** (0.00)	0.39*** (0.00)	0.35*** (0.00)	0.35*** (0.00)
FEM x Seniority 2	-0.09 (0.17)	-0.10 (0.14)	..	..
Seniority 3 (> 10 yrs)	0.48*** (0.00)	0.48*** (0.00)	0.44*** (0.00)	0.44*** (0.00)
FEM x Seniority 3	-0.14* (0.06)	-0.14** (0.04)	..	..
PERF	0.09*** (0.00)	0.10*** (0.00)	0.10*** (0.00)	0.10*** (0.00)
FEM x PERF	0.01 (0.80)	..	..	..
EXPT	-0.17*** (0.00)	-0.19*** (0.00)	-0.19*** (0.00)	-0.19*** (0.00)
FEM x EXPT	-0.05 (0.21)	..	..	..
TRID	-0.33*** (0.00)	-0.32*** (0.00)	-0.32*** (0.00)	-0.32*** (0.00)
FEM x TRID	-0.06 (0.11)	..	..	..
Model diagnostics				
χ^2 ( )	1703.1*** (0.00)	1699.4*** (0.00)	1695.4*** (0.00)	1680.7*** (0.00)
Pseudo R^2	0.04	0.04	0.04	0.04
Obs (#)	12,598	12,598	12,598	12,598

*) Significant at 90, **) 95 and ***) 99 per cent confidence level, respectively.

a) p-values in brackets.

Table 3a presents full sample estimates with gender-specific shift parameters, which are removed group by group as we move from left to right across the table, from Model 1 to Model 4. Observe that the vast majority of retained coefficients is quite robust to the reduction implied by this reduction. This is especially true for the index variables for work climate, which hardly show any variation at all across the four different model specifications of Table 3a. Some indications of variation across genders are found for the age and seniority variables, indicating that occupational health may have a different time path among women than among men. However, the origin of these variations may be clouted by the aggregation of the data set across leaders and employees. We therefore go on to split the data set, and estimate separate models for leaders and employees, maintaining the gender-specific shift parameters. Results for this exercise are shown in Table 3b.

Table 3b reveals significant variation in results between leaders and employees. Again, the prevalence of self-reported job-related health problems seems to increase in both age and seniority for male leaders and employees. However, this result is strongly modified by the gender dummy, especially among leaders. The pattern which emerges is that men see leadership and management responsibilities as a blessing to their health situation, especially when they mature in terms of age and seniority. Women on the other hand seem to perceive leadership as a blessing only when they are young, whereas the burden of management responsibilities weigh down their self-reported health situation as they gain age and seniority.

In table 3c, the sample has been split again, to allow separate estimations across men and women, leaders and employees, respectively. Again, this yields four different model versions, and excludes the requirement for any shift dummies. Constant terms came out as statistically insignificant in all the model versions of Table 3c, and were therefore dropped. The patterns of the previous models are now even more evident, without a significant loss in statistical model quality. The parsimonious models of Table 3 are therefore recommended as the preferred models of the study.

Table 3b. Split-sample estimation results

Maximum-Likelihood estimates of ordered probit model obtained with Stata 10.0

	Leaders		*Employees*	
	Version 1	*Version 2*	*Version 1*	*Version 2*
Estimated coefficients [a)]				
FEM (gender dummy)	-0.63 (0.32)	-0.47 (0.26)	0.25 (0.15)	0.34*** (0.00)
Age 2	-0.45* (0.06)	-0.45* (0.06)	0.22*** (0.00)	0.21*** (0.00)
FEM x Age 2	1.29*** (0.00)	1.30*** (0.00)	-0.25*** (0.00)	-0.25*** (0.00)
Age 3	-0.48** (0.05)	-0.47** (0.05)	0.28*** (0.00)	0.28*** (0.00)
FEM x Age 3	1.31*** (0.00)	1.30*** (0.00)	-0.18** (0.04)	-0.19** (0.04)
Age 4	-0.36 (0.14)	-0.36 (0.14)	0.37*** (0.00)	0.37*** (0.00)
FEM x Age 4	1.16** (0.01)	1.17** (0.01)	-0.29*** (0.01)	-0.29*** (0.01)
Age 5	-0.59** (0.03)	-0.59** (0.03)	0.31*** (0.00)	0.30*** (0.00)
FEM x Age 5	1.69*** (0.00)	1.69*** (0.00)	-0.37*** (0.00)	-0.37*** (0.00)
Seniority 2 (3 - 10 yrs)	0.41*** (0.00)	0.41*** (0.00)	0.39*** (0.00)	0.39*** (0.00)
FEM x Seniority 2	-0.48** (0.04)	-0.48** (0.04)	-0.06 (0.37)	-0.07 (0.30)
Seniority 3 (> 10 yrs)	0.55*** (0.00)	0.55*** (0.00)	0.49*** (0.00)	0.50*** (0.00)
FEM x Seniority 3	-0.87*** (0.05)	-0.87*** (0.05)	-0.06*** (0.42)	-0.07*** (0.35)
PERF	0.07 (0.28)	0.10* (0.09)	0.10*** (0.00)	0.10*** (0.00)
FEM x PERF	0.14 (0.33)	..	-0.01 (0.88)	..
EXPT	-0.29*** (0.00)	-0.29*** (0.00)	-0.15*** (0.00)	-0.17*** (0.00)
FEM x EXPT	-0.00 (0.99)	..	-0.06 (0.17)	..
TRID	-0.23*** (0.00)	-0.25*** (0.00)	-0.34*** (0.00)	-0.32*** (0.00)
FEM x TRID	-0.09 (0.49)	..	0.08** (0.06)	..
Model diagnostics				
χ^2 ( )	189.2*** (0.00)	188.14*** (0.00)	1533.3*** (0.00)	1529.1*** (0.00)
Pseudo R^2	0.03	0.03	0.04	0.04
Obs (#)	1,947	1,947	10,651	10,651

*) Significant at 90, **) 95 and ***) 99 per cent confidence level, respectively.

a) p-values in brackets.

Table 3c. Split-sample estimation results

Maximum-Likelihood estimates of ordered probit model obtained with Stata 10.0

	Leaders		*Employees*	
	Men	*Women*	*Men*	*Women*
Estimated coefficients [a)]				
Age 2	-0.46* (0.06)	0.82** (0.03)	0.22*** (0.00)	-0.03 (0.61)
Age 3	-0.48** (0.05)	0.81** (0.03)	0.28*** (0.00)	0.10 (0.19)
Age 4	-0.37 (0.14)	0.78* (0.05)	0.37*** (0.00)	0.08 (0.33)
Age 5	-0.59** (0.03)	1.09** (0.03)	0.31*** (0.00)	-0.07 (0.59)
Seniority 2 (3 - 10 yrs)	0.42*** (0.00)	-0.06 (0.75)	0.39*** (0.00)	0.33*** (0.00)
Seniority 3 (> 10 yrs)	0.55*** (0.00)	-0.32* (0.08)	0.50*** (0.00)	0.43*** (0.00)
PERF	0.07 (0.28)	0.20* (0.10)	0.10*** (0.00)	0.10** (0.02)
EXPT	-0.29*** (0.00)	-0.29*** (0.01)	-0.15*** (0.00)	-0.21*** (0.00)
TRID	-0.23*** (0.00)	-0.32*** (0.01)	-0.34*** (0.00)	-0.26*** (0.00)
Model diagnostics				
χ^2 ( )	147.4*** (0.00)	39.78*** (0.00)	1,178.6*** (0.00)	353.9*** (0.00)
Pseudo R^2	0.03	0.03	0.05	0.04
Obs (#)	1,528	419	7,569	3,082

*) Significant at 90, **) 95 and ***) 99 per cent confidence level, respectively.
a) p-values in brackets.

In most respects, the general patterns of Tables 3a and 3b are reiterated by the simpler specifications of Table 3c. However, variations and differences across gender and responsibilities are even are brought further forward. We see that both age and seniority exerts a positive influence on perceived health conditions among men in management positions. Middle-aged men with leadership responsibilities report less work-related health problems then younger men with corresponding responsibilities. Time of service with the company has the same general effect on male managers. For women on the other hand, it is the other way around. As female managers mature, the burden of leadership seems to grow, implying more reports on work-related health problems. This difference also accelerates over time and

seniority, with larger deviations for old-timers. Some of this tendency may be due to the influence of pregnancy, child-birth and uneven distribution of domestic responsibilities. However, the large divergence for the old-timers can hardly be explained by these factors. For these groups, an alternative explanation might be that women are over-represented in jobs associated with physical wear and tear, like cleaning, catering, and monotonous office work.

Age and maturity also have a slightly different influence on occupational health among employees than among their leaders. Specifically, age has a negative influence on work-related health problems among male employees, whereas age does not seem to play an important role for occupational health among women. Seniority, on the other hand, seems to cause a slight decay in health also among female employees, well in line with the results for their male colleagues. Again, the role of service time for the prevalence of work-related health problems in women employees may be due to systematic differences across genders when it comes to job content, roles and responsibilities.

Table 3 also supports our general hypothesis that job content and work environment plays a significant role for perceptions of occupational health. In terms of sign, the impact of stress seems to dominate the impact of job motivation in our indicator for competition and performance (*PERF*). However, the effect is small, and also hardly significant among managers. However, the results do indicate that female leaders perceive leadership responsibilities as more of a burden to their occupational health than is the case for men. For employees, on the other hand, the effect is exactly the same among women and men.

The estimated models are also supportive of the idea that focus and attention on competence and expertise (*EXPT*) will improve the perceptions of occupational health. This is especially true for leaders, with no differences between men and women with manager responsibilities. Focus on competence and expertise seems to play a slightly less important role among employees, but the parameter estimate is

still highly significant both for men and women. Interestingly, the results for employees also indicate that occupational health among women is influenced more by competence and expertise than the case is for men.

Finally, the idea that issues of trust and identity (*TRID*) are important for perceptions relating to occupational health finds strong support in our statistical assessment. Specifically, Table 3c suggests that an improvement in trust and identity will reduce the prevalence of self-reported work-related health problems for all groups – men and women, leaders and employees. Trust and identity seems to play a somewhat more important role among women in managerial positions than for their male companions. Among employees, it is the other way around. In total, the results for trust and identity clearly suggest that disturbances in the working environment relating to confidence in management, strategy, collaboration and reputation may have a substantial negative effect on self-reported work-related health problems, and thereby also on sickness absence. This is well in line with previous research in the field (e.g., Elovainio et al. 2002; Väänänen et al. 2004).

D. Concluding remarks

This study has explored how self-reported work-related health problems are influenced by general properties and characteristics of the local working environment, based on comprehensive survey data from an international oil and gas company. Index variables are constructed to reflect the relative strength of various qualities of the local working environment, like performance culture, expertise and competence, and trust and identity. Moreoer a range of categorical variables are also applied to control for variation across gender, time, and length of service.

In terms of results, both age and seniority exerts seem to aggravate the prevalence of work-related health problems among, with an exception for men in managerial positions. Competition and performance orientation has a slightly positive influence on

work-related health problems, especially for women with leadership responsibilities. Occupational health is systematically better in units and jobs with an emphasis on competence and expertise, and even more so if the local working environment is characterised by a high degree of trust and confidence.

In terms of policy implications, this study provides valuable insights on how to allocate resource in terms of both management attention and policy design. On the organisational level, work-related health problems seem to accelerate with age and seniority among male employees, but not so much among female employees. On the other hand, management responsibilities seem to imply more of an occupational health hazard for women than for men, with a difference which increases in both age and seniority.

Combined with the insights on how work-related health problems are related to job content and local working environment, these results may indicate how to allocate resources in terms of management attention, HR policies, as well as general measures to support occupational health and prevent sickness absence, wear of the labour force and exit.

Although this study is limited to a data set from a single company, the extent and diversity of the organisation may well allow generalisation in terms of policy design in a wider economic context. That being said, a full appraisal of the usefulness of the proposed modelling framework should await the application of the model on alternative data sets, with a wider reach across companies and industries.

Literature

Alexanderson, K. (1998), "Sickness absence: a review of performed studies with focused on levels of exposures and theories utilized", *Scandinavian Journal of Publich Health* 26 (4), 241-249.

Brown, M. and J. Benson. 2003. Rated to exhaustion? Reactions to performance appraisal processes. *Industrial Relations Journal* 34(1), 76-81.

Brown, S. and Sessions, J. G. (1996), "The economics of absence: theory and evidence", *Journal of Economic Surveys* 10 (1), 23-53.

Cronbach, L. J. (1951) "Coefficient alpha and the internal structure of tests", *Psychometrika* 16, 297-334.

Dirks, K. T. and Ferrin, D. L. (2002), "Trust in leadership: meta-analytic findings and implications for research", *Journal of Applied Psychology* 87 (4), 611-628.

Edmeads, J. and Mackell, J. A. (2002), "The Economic Impact of Migraine: An Analysis of Direct and Indirect Costs", *Headache* 42 (6), 501-509.

Ekman, M., Johnell, O. and Lidgren, L. (2007), "The economic cost of low back pain in Sweden in 2001", Acta Orthopaedica 76 (2), 275-284.

Elovainio, M., Kivimäki, M., and Vahtera, J. (2002), "Organizational Justice: Evidence of a New Psychosocial Predictor of Health", *American Journal of Public Health* 92 (1), 105-108.

Goetzel, R. Z., Guindon, A. M., Turshen, J. and Ozminkowski, R. (2001), "Health and productivity management: establishing key performance measures, benchmarks, and best practices, *Journal of Occupational & Environmental Medicine* 43(1), 10-17.

Graafland, J. J. (2002), "Modelling the trade-off between profits and principles", *De Economist* 150 (2), 129-154.

Greene, W. H. (2003), *Econometric Analysis.* 5th edition, Prentice Hall, New Jersey.

Hansson, A. S., Vingård, E., Arnetz, B. B. and Anderzén, I. (2008), "Organizational change, health, and sick leave among health care employees: A longitudinal study measuring stress markers, individual, and work site factors", *Work & Stress* 22 (1), 69-80.

Holman, D., Chissick, C., and Totterdell, P. (2002), "The effects of performance monitoring on emotional labor and well-being in call centers", *Motivation and Emotion* 26 (1), 57-81.

Høivik, D., Baste, V., Brandsdal, E. and Moen. B. E. (2007), "Associations between self-reported working conditions and registered health and safety results". *Journal of Occupational & Environmental Medicine* 49(2), 139-147.

Lado, A. A. and Wilson, M. C. (1994), "Human resource systems and sustained competitive advantage: a competency-based perspective", *Academy of Management Review* 19 (4), 699-727.

Maynard, A. and Kennan, P. (2006) , "The economics of alcohol abuse", *Addiction* 76 (4), 339-345.

Michie, S. and Williams, S. (2003), "Reducing work related psychological ill health and sickness absence: a systematic literature review", *Occupational and Environmental Medicine* 60, 3-9.

Mohn, K., Kvaløy, O. og A. Hunnes (2008), ”Performance appraisal and career opportunities: a case study”, Manuscript. University of Stavanger.
Pett. M., Lackey, N. R. and Sullivan, J. J. (2003), *Making sense of factor analysis*. Sage, Thousand Oaks (CA).
Piirainen, H., Rasanen, K. and Kivimaki, M. (2003), “Organizational climate, perceived work-related symptoms and sickness absence: a population-based survey”, *Journal of Occupational & Environmental Medicine* 45 (2), 175-184.
Suhrcke, M., McKee, M., Stuckler, D., Arce, R. S., Tsolova, S. and Mortensen, J. (2006), “The contribution of health to the economy in the European Union”, *Public Health* 120 (11), 994-1001.
Tompa, E. (2002), “The impact of health on productivity: empirical evidence and policy implications”. *Review of Economic Performance and Social Progress* 181-202.
Väänänen, A., Kalimo, R., Toppinen-Tanner, S., Mutanen, P., Peiró, J. M.,
Kivimäki, M. and Vahtera, J. (2004), “Role clarity, fairness, and organization climate as predictors of sickness absence”, *Scandinavian Journal of Public Health* 32 (6), 426-434.
Wooldridge, J. M. (2003), *Econometric Analysis of Cross Section and Panel Data*, MIT Press, Cambridge.
Zavoina, R. and McElvey, W. (1975), “A statistical model for the analysis of ordinal level dependent variables”, *Journal of Mathematical Sociology*, Summer 1975, 500-509.

Appendix 1. Average scores for dependent variables

"Do you have health problems which might derive from your work? "

	Seniority 1 *(< 3 years)*	*Seniority 2* *(3-10 years)*	*Seniority 3* *(> 10 years)*	*Total*
Full sample (N = 12,751)				
Men	1.932	2.544	2.765	2.566
Women	2.112	2.603	2.754	2.584
All	1.990	2.561	2.762	2.571
Leaders (N = 1,956)				
Men	1.826	2.275	2.418	2.348
Women	2.633	2.636	2.350	2.458
All	2.106	2.357	2.405	2.372
Employees (N = 10,795)				
Men	1.934	2.585	2.860	2.610
Women	2.078	2.599	2.827	2.601
All	1.982	2.589	2.851	2.607