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Abstract

The North Sea oil and gas industry currently faces recruitment and retention difficulties due to a shortage of skilled workers. The vital contribution of this sector to the U.K. economy means it is crucial for companies to focus on retaining existing employees. One means of doing this is to improve the job satisfaction of workers. In this paper, we investigate the determinants of job satisfaction and intentions to quit within the U.K. North Sea oil and gas industry. We analyse the effect of personal and workplace characteristics on the job satisfaction and quit intentions of offshore employees. The data used were collected using a self-completed questionnaire. Job satisfaction was analysed using an ordinal probit model and quit intentions were analysed using a binary probit model. 321 respondents completed the questionnaire. We find that respondents in good financial situations, those whose skills are closely related to their job, and those who received training reported higher levels of job satisfaction. Furthermore, we establish the importance of job satisfaction, promotion prospects and training opportunities in determining workers' intentions to quit the offshore oil and gas sector. To encourage better retention, companies should seek to adopt policies that focus not only on pay but also provide promotion and training opportunities aimed at investing in their employees' skills development.

Keywords: Job satisfaction, Quit intentions, U.K. offshore industry, Principal components analysis

1.1 Introduction

The oil and gas industry makes a vital contribution to the U.K.'s economy. In 2006, the industry provided 96% of the UK's oil needs and 92% of its gas needs. Further, the oil and gas industry plays a considerable role in the U.K.'s labour market: providing employment to 480,000 individuals. Of these individuals, around 18,000 work offshore on a regular basis. The oil and gas industry's labour market effects are stronger in local areas because oil and gas reserves are mainly located off the east coasts of Scotland and England. For instance, around 38% of all U.K. offshore oil and gas jobs are based in the Grampian area in the North East of Scotland.

The U.K. oil and gas industry has recruitment problems because there is a shortage of skilled workers (BBC, 2005). This constrains the industry's ability to react to favourable economic conditions (such as increased oil and gas prices) because companies are simultaneously recruiting from the same (limited) pool of skilled workers (Department of Trade and Industry, 2001). This shortage of skilled workers is likely to persist in future years because, in the U.K., the industry has an ageing workforce and there are too few qualified new entrants into the labour market (Department of Trade Industry, 2003).

In response to the problems of recruitment and retention of skilled workers within this sector, the aim of this paper is to investigate the determinants of job satisfaction and intentions to quit within the U.K. North Sea oil and gas industry. For the purpose of the analysis, job satisfaction is modelled as a function of individual, household and workplace characteristics and the equation is estimated using an ordered probit estimator. The impact of job satisfaction is then examined using a probit model, where individuals' intentions to quit are represented as a function of the level of perceived job satisfaction along individual and household characteristics and workplace attributes. Understanding what factors influence workers' job satisfaction and their intentions to quit their job will help companies to recruit workers and to retain existing employees by lowering the probability of employees leaving the company. While this study focuses on employees within the North Sea oil and gas industry, its findings add to the wider literature on job satisfaction and quit intentions, and are useful for understanding worker behaviour in all sectors.

1.2 Determinants and effects of job satisfaction

Within the industrial psychology literature, job satisfaction is defined as a "positive emotional state resulting from the appraisal of one's job" (Locke, 1976, p.1300). Thus, an individual's job satisfaction reflects both objective and subjective factors, e.g. the circumstances the individual finds himself in, and his psychological state (Freeman, 1978). Hamermesh (2001) viewed job satisfaction as the worker's mental mapping of all the objective and subjective characteristics of the job into an index of satisfaction.

Previous research shows that understanding how workers' perceive their work is important because job satisfaction affects economic outcomes. In one of the earliest studies of job satisfaction within the economics literature, Freeman (1978) concluded that subjective expressions of job satisfaction are significantly related to future objective economic behaviour and in particular the probability of an individual quitting their job. The hypothesis that job satisfaction affects economic outcomes and behaviour is further supported by studies in Europe and the United States of America, which suggest that individual job satisfaction has a positive effect on job performance and productivity (Freeman, 1978, Patterson, Warr and West, 2004), a negative effect on voluntary turnover or quit behaviour (Freeman, 1978; Akerlof, Rose and Yellen, 1988; Gordon and Denisi, 1995; Clark, Georgellis and Sanfey, 1998; Hamermesh, 2001), and is quantitatively more important than wages in determining an individual's decision to quit their job (Freeman, 1978). Akerlof et al (1988) and Clark et al (1998) robustly established that the causality runs from job satisfaction to quitting outcomes. Job satisfaction is also negatively related to absenteeism (Drago and Wooden, 1992). Furthermore, job satisfaction affects an individual's investment in their human capital (i.e. their level of skills and knowledge acquired through formal education and on-the-job training). Specifically, a more satisfied worker will be more likely to invest in firm-specific human capital that will increase his/her investment to the employer (Hamermesh, 2001).

Previous research, across all sectors in the economy, has found that individuals' job satisfaction is determined by their personal and job characteristics[1] (Freeman, 1978; Hamermesh, 1977). Job satisfaction is positively related to pay and the relationships between job satisfaction and both age and job tenure is U-shaped (Clark, Oswald and Warr, 1996); Gardner and Oswald, 2001; Theodossiou and Zangelidis, 2009). Job security influences job satisfaction: job insecurity leads to a deterioration of the employer-employee relationship and the expectation of job losses has a negative effect on individuals' job satisfaction (Brockner, Grover and Blonder, 1988; Blanchflower and Oswald, 1999). Surprisingly, higher levels of education are associated with less satisfied workers (Clark, 1997). While it is widely accepted that more highly educated workers have better jobs, education also raises expectations, which may lead to dissatisfaction and disappointment (Hagenaar, 1986; Ross and Reskin, 1992). Furthermore, highly educated workers are more likely to suffer from educational mismatch (Sloane, Battu and Seaman, 1995).

There is a well documented gender differential in job satisfaction (Clark, 1997). Despite extensive evidence that women's jobs are worse than men's jobs with respect to pay, hiring and firing, job content, and promotion opportunities, women consistently report higher job satisfaction scores than men do (Blanchflower and Oswald, 1992). Clark (1997) found that men are more concerned with the extrinsic aspects of work, e.g. pay and promotion, whereas women are more likely to value the intrinsic returns to work, and thus are more likely to highlight good relations with managers, the actual work itself, and the hours of work. Clark proposed that the higher levels of job satisfaction for women may be due to the role of expectations, i.e. that women will be more satisfied than a man with the same objective characteristics and work values if women expect less than men from their job.

[1] A vast part of the job satisfaction literature focuses on psychological determinants of job satisfaction. For extensive reviews see Locke (1976), Steel and Ovale (1984), and Warr (1999).

1.3 Job satisfaction in the oil and gas industry

Studies of job satisfaction within the oil and gas industry have focused on the psychosocial determinants of job satisfaction, such as the lifestyle of the offshore environment and the combination of physical and psychosocial stressors that this environment imposes upon offshore workers (French, Caplan and Harrison, 1982; Parkes, 1996; Ulleberg and Rundmo, 1997; Parkes, 2002). French, Caplan and Harrison(1982) found that job satisfaction was a predictor of offshore oil workers' mental and physical health. Similarly, Ulleberg and Rundmo (1997) found that job dissatisfaction is related to strain, and job dissatisfaction is partly caused by job stress. Parkes (2002) investigated offshore workers psychological well-being including their job satisfaction and found unfavourable workloads, job insecurity, and perceived high risks were associated with lower levels of well-being.

The significant determinants of job satisfaction found by previous studies include the worker's age, with the usual U shaped relationship (Parkes, 2002) and promotion or a move to a new employer, which increases in job satisfaction (Parkes, 2002). Ulleberg and Rundmo (1997) identified three underlying factors contributing to overall job satisfaction: satisfaction with employee relations (including workload, safety measures, participation and communication); intrinsic job satisfaction (satisfaction with personal achievement in one's job); and extrinsic satisfaction with the working conditions. Extrinsic satisfaction is affected by the perceived risk of disasters and major accidents but not by perceived risk of ordinary occupational injuries.

2.1 Methods

To investigate the determinants of job satisfaction and intentions to quit within the North Sea oil and gas industry, we used a purposefully designed questionnaire to collect information on offshore workers' demographic and job/workplace characteristics, including their satisfaction with eight facets of the job (work environment, workload, job stress, working hours, physical risk, wages, job security, and career prospects) and overall job satisfaction. The

facets of the job were determined by the general job satisfaction literature and previous research on job satisfaction in the offshore oil and gas industry.

We compose the profile of an average respondent, examine several aspects of their offshore employment, and use regression analysis to model how personal and job characteristics affect job satisfaction and quit intentions in the offshore oil and gas industry. This is the first study to explore these issues.

2.2 Sample

Participants in the study were employed on offshore oil and gas installations in the UK sector of the North Sea. The questionnaires were distributed to a random sample of 760 offshore workers in January 2007 by the managers of U.K. North Sea offshore installations. Specifically, five questionnaires were sent to 152 offshore installation managers (OIMs), this represents almost all U.K. North Sea offshore installations. The OIMs were asked to distribute these questionnaires to five employees on their installation[2]. The questionnaires were completed anonymously, and were then returned to the researchers by post. Accompanying the questionnaires was a letter to the OIM, this detailed who the researchers were, and the primary aims of the research project ("to increase our knowledge of the working practices in the North Sea oil and gas sector, and to gather information on demographic and workplace characteristics of employees within the industry"). The OIMs were also informed that this was an independent study, not commissioned by any company or government body.

[2] As with all survey research, the data may have a sample selection problem: where respondents differ from non-respondents in either their observable or unobservable characteristics. Unfortunately, we were unable to investigate this as no official data are available that describe the characteristics of offshore workers in the oil and gas industry. However, from the perspective of the type of occupations and companies the data appear to cover the full range of offshore jobs.

2.3 Questionnaire

A self-completed questionnaire was used to collect the data. Each questionnaire contained 41 questions, these included questions about the offshore workers' individual and household characteristics, their job characteristics and working arrangements, their level of job satisfaction and their future expectations (including their intention to quit).

With respect to respondents' individual and household characteristics: Respondents were asked their gender, age, marital status, financial status, and their health[3]. Household income may not take into account the different financial responsibilities that individuals and their household have. To assess respondents' financial status we asked respondents how they felt they were managing financially: responses were gathered on a five-point scale (living comfortably, doing alright, just about getting by, finding it difficult, and finding it very difficult). Respondents' health was measured using the following self assessed health (SAH) question 'Please think back over the last 12 months about how your health has been. Compared to people of your own age, would you say that your health has on the whole been excellent/good/fair/poor/very poor?'

With respect to respondents' job characteristics and working arrangements: Respondents were asked their occupation, the type of company they worked for within the sector, their job security, job match, training experiences and expectations. Closed ended questions were used to collect the respondents' occupation and type of company they worked for. The categories presented to respondents are shown in Table 1. These lists were comprehensive and complied with advice from experts within the industry. This information allow us to assess if, given our sampling strategy we have a fair coverage of all types of offshore worker.

[3] In general, the questions on individual, household, and job characteristics followed the question and answering format of numerous large, national household surveys such as the British Household Panel Survey (BHPS) in the U.K.

Furthermore, in order to assess respondents' job security we asked respondents about their employment status using three categorisations of contract (permanent, fixed term or temporary[4]). We also explore respondents' expectations on their career prospects by asking if they expect to "get a better job with their current employer/promotion" in the following 12 months.

To assess how well respondents' skills match to their job we asked respondents if their current job was 'closely related', 'somewhat related' or 'not related' to their qualifications/skills. Finally, in order to examine respondents' past and future training opportunities we asked individuals if they had received training in the past 12 months and also if they expect to receive work-related training in the following 12 months.

2.3.1 Job satisfaction

Respondents' subjective job satisfaction was measured on a six-point scale where a value of one corresponded to "Very dissatisfied" and a value of six corresponded to "Very satisfied". First, respondents were asked their job satisfaction for eight facets of their job: work environment; workload; job stress; working hours; physical risk; wages; job security; and career prospects. Second, respondents were asked their overall job satisfaction. The exact question in the survey read as follows: "All things considered how satisfied or dissatisfied are you with your present job, using the 1-6 scale (1 is very dissatisfied and 6 is very satisfied)?"

This approach is similar to other measures of job satisfaction reported in the literature and included in major surveys. The six-point response scale used in this study is the same as that used in the European Household Panel Survey (ECHP). While job satisfaction is measured in similar ways in most studies, there are many different scales used to measure job satisfaction. For example, the BHPS asked respondents' their level of job satisfaction with eight facets of their job, and measures job satisfaction on a scale of one to seven, with one

[4] A permanent contract has no fixed period of time for ending, a fixed term contract lasts between 1 and 3 years, and a temporary contract lasts less than 12 months.

representing “Not satisfied at all” and seven representing “Completely satisfied”. The Workplace Employee Relations Survey (WERS) specifies its job satisfaction variable on a scale of one to five, with one representing “Very dissatisfied” and five representing “Very satisfied”. In the U.S. the National Longitudinal Survey (NLS) adopts a scale of four categories when asking respondents how they feel about their current job, from “Dislike it very much” to “Like it very much”, while the Michigan Panel Survey of Income Dynamics (PSID) ranks job satisfaction on a scale of one to five (“Not enjoyable at all” to “Very enjoyable”). Many job satisfaction scales measure satisfaction with many facets of the job. In this study, we were concerned with job satisfaction in the UK offshore oil and gas industry. We do not use the generic facets of job satisfaction in existing scales because we wish to capture satisfaction with the particular working practices and potentially serious health and safety concerns in offshore work.

We ask respondents to state their overall job satisfaction and their satisfaction with eight facets of the job. To investigate if these eight facets are capturing different aspects of the job we measure the correlation between reported satisfaction with each facet. Further, respondents’ reported satisfaction with different facets of the job are ranked. To examine the statistical significance of the observed differences in reported job satisfaction across facets we calculate a mean job satisfaction score and use pair-wise t-tests.

Early theoretical models defined job satisfaction as a function of the money wage and the monetary equivalent of non pecuniary aspects of job (Hamermesh, 1977; and Borjas, 1979). Since the latter are generally difficult to observe and measure, they are commonly proxied by a vector of job attributes. Therefore, taking into account a vector of personal and household characteristics, we model job satisfaction *s* as a function of respondents’ personal characteristics *z*, household characteristics *h,* income *y*, job characteristics *j* and working conditions *w*:

$$s=f(z,h,y,j,w) \qquad (1)$$

When job satisfaction is defined as the dependent variable in a regression equation, the multinomial probability model can be used to predict the influence of various factors on the probability of giving a certain response. Given that *s* is measured as an ordinal variable, an

ordered probit model is estimated. The regressions control for a number of personal, household and job characteristics that have been identified by previous literature as important predictors of job satisfaction. The explanatory variables specified in the job satisfaction model included standard measures of the objective position of the offshore worker, including age, gender, marital status, health, household financial situation, type of contract, as well as variables relating to the individual's expectations of the future with respect to training and promotion.

2.3.2 Quit intentions

A utility maximisation model of separation can provide the theoretical framework for developing a simple expression for the propensity to quit. Individuals, while employed, may explore the labour market in order to find more attractive employment opportunities. In this framework, people compare the utility they receive from their current employment to the utility they expect to experience in another job. Quit, as an outcome of this search activity, occurs when the present value of the expected utility stream from an alternative job is higher than that in the current employment, after allowing for any mobility costs. Considering V as a value function representing the utility stream from the current job i, an individual will quit to job j if $V_i<V_j-C$, where C is any mobility cost incurred. The value of the utility stream can be defined as $V=V(z,h,y,j,w,s)$, a function of personal and household characteristics, income, job characteristics, work conditions and job satisfaction.

One approach to investigate the relationship between job satisfaction and quitting behaviour has been to use the responses from cross sectional survey questions in which respondents are asked about their future employment expectations or intentions, i.e. latent turnover (Shields and Ward, 2001). This is the approach that we use. In order to gather information on individual's intentions to quit their job, we asked respondents whether they expect to start new job with a new employer in the following 12 months or if they expected to start up their own business in the following 12 months (possible responses to each question were "Yes" or "No"). If respondents answered "Yes" to either starting a new job with a new

employer or starting up their own business, they are considered to be a “quitter”; otherwise they are a “stayer”.

The impact of job satisfaction and other determinants on quit intentions is studied using a probit model, linking the probability of an individual quitting his/her job to the characteristics of the individual and his/her job, including job satisfaction. Considering the dichotomous nature of our quitting variable (i.e. Stayer = 0 and Quitter = 1), we estimated a binary probit model in order to calculate the probability of offshore workers intending to quit their jobs in the next twelve months. We assume that intentions to quit are a function of current job satisfaction, along with personal and job characteristics.

We elicited job satisfaction for eight facets of respondents’ jobs. Given that the constructs underlying these eight facets may overlap, one might expect respondents’ satisfaction with these eight job characteristics to be correlated, in this case we cannot include all facets in our model of quit intention. Thus, we use principal component analysis to summarise satisfaction with the eight facets into composite factors which are included as explanatory variables in model 3. The objective of principal component analysis is to create a small number of new component variables, which summarise the information contained in the larger set of variables. This is done by identifying the linear combinations of the original variables with the greatest variance (i.e. that contains most of the information in those variables).

We consider the quit intention to be a function of respondents’ job satisfaction, their individual and household characteristics, and their working conditions. This approach implicitly assumes that the error terms in the job satisfaction and quit intentions models are not correlated (i.e. there is no unobservable individual heterogeneity which simultaneously determines job satisfaction and quit intentions). This issue is addressed in a number of studies (Clark et al, 1998; and Shields and Ward, 2001). Shields and Ward (2001) conclude that “the relationship between job satisfaction and quitting, identified in cross-sectional studies, is robust to concerns about unobserved individual heterogeneity” (pp.693).

We estimated three models: model 1 which has a similar specification as the job satisfaction equation (with the omission of occupational control variables); model 2 is the same as model 1 with the addition of the overall job satisfaction variable; and model 3 is the same as model 1 with the inclusion of two composite job satisfaction variables determined using a principal components analysis.

3.1 Results

A total of three hundred and thirty complete questionnaires were returned, giving a response rate of 43%. Due to missing values in some of the questions[5] the empirical analysis was carried out on a sample of three hundred and twenty-one individuals. **Table 1** presents the descriptive statistics of the individual and household characteristics and workplace features used in this study. The average respondent is a married male, aged 44 years, in good health, whose household manages well financially. Of the total sample, 96% were males, 82% were married or co-habitating, 78% reported they have good health, and 86% reported that their household manages well financially.

All the main offshore jobs/occupations were adequately represented in the sample: 21% of respondents were maintenance personnel and technicians, 14% were production/process operators, 15% were either drillers or supporting staff, and 11% were administrators. Respondents were primarily employed by operating (40%) and drilling companies (29%), followed by service companies (12%) and engineering contractors (11%). The majority of the respondents have permanent contracts (88%). Approximately 30% of the respondents expect to get a better job/promoted with their current employer.

[Insert **Table 1** here]

[5] There is one missing observation in each of the following variables: overall job satisfaction; satisfaction with work environment, job stress, working hours, physical risk, wages and job security; and type of company. Also, there are two further missing observations in the variable satisfaction with job security.

More than half (55%) of respondents stated that their job was 'closely related' to their skills/qualifications. Ninety one percent of respondents had received training in the past 12 months and 48% of respondents expected to receive some kind of training in the following 12 months. Respondents were asked about their preferences over the days spent offshore and the majority (70%) stated that they would prefer shorter offshore periods.

3.2 Job satisfaction estimates

A summary of respondents' job satisfaction with the eight facets of their job and their overall job satisfaction is presented in **Table 2**. While responses varied over respondents, on average respondents appear to be fairly satisfied with their employment. The correlations between reported satisfaction for the eight facets are presented in **Table 3.** While there is some correlation between each of the facets in most cases this is low, this indicates that these facets are capturing different aspects of the job and respondents are distinguishing between the facets. For three facets, work environment, workload and job stress, the correlations are higher between 0.6 and 0.7. This may indicate that these facets are measuring the same underlying construct. The ranking of respondents' job satisfaction with the eight facets of their job, from most satisfaction to least satisfaction, is physical risk, work environment, job security, workload, career prospects, wages, working hours, and job stress. The statistical significance of the observed differences in the reported mean job satisfaction are presented in **Table 4**. Overall, there appears to be significant variation on the job satisfaction scores across the 8 different job domains and the overall perceived level of satisfaction.

[Insert **Tables 2**, **3** and **4** here]

From the ordinal probit analysis of overall job satisfaction, gender and age are not significant determinants of job satisfaction (although the former can probably be attributed to the fact that 96% of the sample is male). Respondents who are married or living with a partner are less satisfied with their jobs. As expected, respondents in households that are financially managing well or very well report higher levels of job satisfaction. Individuals who were in good health in the previous 12 months are more likely to be satisfied with their jobs. Job

satisfaction is higher among individuals who report that their skills are well matched to their current job. In addition, individuals' preferences over the length of the offshore period are an important determinant of job satisfaction. Workers who prefer to spend fewer days offshore appear to be less satisfied with their jobs, compared to those who prefer to work the same or more days offshore.

[Insert **Table 5** here]

Interestingly, we find that individuals are found to respond more to their past experiences than to anticipated future prospects. Specifically, people who received training in the previous 12 months have higher job satisfaction than those who did not receive training. However, future prospects reflected in their expectations of receiving training, or getting promoted in the next 12 months do not appear to affect current levels of job satisfaction.

3.3 Quit intentions estimates

In our sample 15% of respondents expected to start a new job with a new employer or start their own business in the next 12 months. In model 1, respondents' demographic characteristics do not have a significant effect on their intention to quit. Similarly, the type of contract, individuals' preference over working days offshore, skill match quality and training received have no effect on an individual's intention to quit. Only respondents' expectations of future promotion or training are significant. Specifically, individuals who expect to either get promoted or receive training in the coming 12 months are less likely to quit their current job.

[Insert **Table 6** here]

In model 2, job satisfaction is estimated to be a significant determinant of quitting intention, with respondents reporting higher levels of job satisfaction being less likely to state an intention to quit. As before, expecting promotion or training in the next 12 months reduces the probability of indicating an intention to quit. In this specification training received in the past 12 months is found to increase the probability of quitting.

The results from the principal component analysis are presented in the **Appendix**. The eight components along with the corresponding scoring coefficients are presented in **Tables A1** and **A2**. As a rule of thumb, only the components with eigen values above unity are kept. In this case, two components are formed, which together capture 64% of the variance in the responses to the eight job satisfaction variables. The rotated matrix of the scoring coefficients, obtained from a two-component solution, is provided in **Table A2**. The scoring coefficients take values between -1 and 1, and the significant factors in each component are highlighted in the table[6].

Component 1 is mainly constructed based on individuals' perceived level of satisfaction from the work environment, physical risk, wages, job security and career prospects. The three remaining domains of job satisfaction, satisfaction with the workload, job stress and working hours are the primary factors of the second component. These two components are then included in the quit intention equation along the other demographic and workplace characteristics. The results obtained from this specification are similar to those based on overall job satisfaction (second column). Satisfaction with either the job overall or on specific facets of the job is found to reduce significantly the probability of quit intention. Furthermore, future prospects reflected in promotion or training opportunities make individuals less likely to want to quit their current job.

4. Discussion

When considering the impact of personal and household characteristics on individual's overall job satisfaction, we found that several of the characteristics commonly found to be important in the job satisfaction literature had a significant effect for offshore workers, while others did not. Gender and age are not important determinants of job satisfaction for offshore

[6] The authors would like to thank an anonymous reviewer for the helpful suggestions on the principal component analysis.

workers, whereas health and marital status do influence their levels of job satisfaction. Respondents who are married or living with a partner are less satisfied with their jobs, perhaps reflecting the nature of offshore work, where workers are offshore for fifteen days consecutively and are away from their families for this time.

The significant positive effect of health on job satisfaction supports previous empirical studies such as Clark (1997), who found that good health has a consistent, large and well-defined positive effect on job satisfaction. However, the causality of the relationship between poor health and low job satisfaction is not clear. Are respondents dissatisfied because they are in poor health or they are in poor health because they are dissatisfied? In general, studies have suggested that job satisfaction affects individuals' health, through stress, anxiety and depression (see Faragher, Cass and Cooper, 2005 for a literature review on the issue). This relationship between health and job satisfaction also concurs with the findings of French *et al.* (1982) for offshore workers.

With respect to job characteristics, longer hours of work are associated with lower overall job satisfaction. Those workers who would prefer to work fewer hours in their offshore job appear to be less satisfied with their jobs. This result is in line with previous studies such as Clark (1997). With respect to income, individuals who reported that their household manages well financially exhibit higher levels of job satisfaction. If we use this household income variable as a proxy of pay, this finding supports the hypothesis that job satisfaction is positively correlated with pay.

Having undertaken training in the previous twelve months has a positive effect on overall job satisfaction. Shields and Ward (2001) reported a similar result for nurses working in the National Health Service in England, where they found that the largest effect on job satisfaction originated from being in a workplace where training and other forms of human capital development are encouraged. One potential explanation for the positive relationship between training and job satisfaction is that training signals the employer's commitment to its employees' skills development, and within the oil and gas industry, improving health and safety standards. A further possible explanation may be that workers who have received training in the previous twelve months may link this investment by their employer to their job security:

Blanchflower and Oswald (1999) found job security to be the most important determinant of job satisfaction. In line with the literature (Allen and van der Velden, 2001; Vieira, 2005) skills mismatches are a good predictor of job satisfaction, with individuals in jobs with good skills match, experiencing higher levels of job satisfaction.

With respect to the eight specific facets of job satisfaction, we found that respondents were most satisfied with the physical risk of offshore jobs. This is contrary to the concerns raised by the Health and Safety Executive (HSE) (Key Programme 3: Asset Integrity Programme) about safety in the UK oil and gas industry (HSE, 2007)[7]. However, respondents' reported satisfaction with their job's physical risk is based on their perceptions of risk and the incidences or accidents they have experienced. These perceptions and experiences may be quite different to the actual safety conditions present in their offshore installation[8]. Respondents were least satisfied with their job stress and their working hours. This may be driven by the offshore work environment. The working time arrangements for the majority of offshore workers consist of working twelve hour shifts for fifteen consecutive days: 69.5% of respondents stated that they would prefer to work fewer days offshore.

We find that job satisfaction is estimated to be a significant determinant of quit intensions in the next 12 months, this is consistent with both the theoretical literature and previous empirical studies. Respondents who report higher levels of job satisfaction are less likely to state an intention to quit their job. Freeman (1978) and Shields and Ward (2001) reported that job satisfaction is a significant determinant of the probability of quitting. Freeman (1978) concluded that satisfaction is a major determinant of labour mobility, and that this statistical link between job satisfaction and quit intentions suggests that non-pecuniary factors are important in workers mobility between jobs. As pointed out by Shields and Ward (2001) our results represent a lower bound estimate of the impact of job satisfaction on

[7] This investigation involved inspections of nearly 100 offshore installations concerning their safety and integrity and the equipment on installations.

[8] Studies have found that individuals are often too optimistic about their risk of injury or illness compared to their assessment of the risks that others face (Weinstein, 1984).

quitting because the most dissatisfied workers are likely to have already left their job, resulting to downward-biased estimated job satisfaction effects.

Having undertaken training increases respondents' expectation of quitting their job in the next 12 months, this can be explained when training increases workers' human capital and employability. Receiving training acts as a signal of the individual's ability and skills to outsiders. Consequently, individuals who received training may attract more outside offers, or alternatively, start their own business using the skills and experience they have acquired.

The expectation of receiving training and promotion in the next twelve months reduces offshore workers intentions to quit their jobs. If respondents are in a work environment where they expect to receive training or promotion, these may signal to the respondent their employers' commitment to developing their skills and career. Approximately 30% of the respondents expect to get a better job/promoted with their current employer, and this suggests that career development opportunities exist in the oil and gas industry. Over half of respondents (48%) expect to receive some kind of training in the following 12 months.

However, with respect to staff retention, 15% of the individuals expect to either change employer or start their own business. While this result is important from an individual company's perspective, it may be less so for the sector as whole if respondents move to other oil and gas companies or set up their own business within the sector.

There are three main limitations in this study. First, the paper focuses on employees within a very particular industry sector, the UK sector of the North Sea oil and gas industry. Therefore, one may question how the findings add to the wider literature on job satisfaction and quit intentions. We believe that the results found in the study overall are useful for understanding worker behaviour in all sectors, and that they may reflect job satisfaction and job mobility patterns observed in other industry sectors who share similar characteristics in terms of their industry structure, workforce composition and market features. Second, as with all survey research, the respondents may have a different profile of observable and unobservable characteristics from the non-respondents. Unfortunately, due to the lack of official data on the overall characteristics of the offshore workforce we were unable to

investigate the representativeness of our survey sample. Nevertheless, from the perspective of the type of occupations and companies the data appear to have adequate representation of the full range of offshore jobs. Third, this study focuses on individuals' intention to quit in the following 12 months. Given that there is no follow up in our questionnaire, we do not know how many of those who intended to quit, actually did. There are two possible reasons why an individual who intended to quit in the coming 12 months would not do this. First, switchers may be more informed or more engaged in the job market, which allows them to identify job opportunities, or they could be more aggressive in their job search. Second, moving to a new job is the outcome of a two-step process: an individual queues for a job, and the employer hires the individual from a pool of applicants. This implies that switchers and stayers may also differ in their attractiveness to employers. By focusing to individuals' intentions to quit, we avoid these caveats and we able to examine what makes individuals to want to quit their job.

5. Conclusion

Oil and gas companies operating in the U.K. report that there is a shortage of skilled workers and that consequently they are facing recruitment and retention difficulties. In response, this paper analysed job satisfaction and quit intentions of employees in the U.K. North Sea oil and gas industry. The data were collected through the purpose-designed questionnaire that provides valuable and unique information on the demographic and socioeconomic characteristics of the respondents and their households, and the respondents' views about their current employment.

In this study, we focus on factors that influence the retention of existing staff such as job satisfaction and quit intentions. We find that, on the whole, workers are satisfied with their offshore job and with specific aspects of their employment. Respondents report that they are most satisfied with the level of physical risk they face in their offshore jobs, followed by their work environment and job security. In line with other studies of job satisfaction in the oil and gas industry, we find a positive relationship between respondents health and job satisfaction. We find that individuals in good financial condition, those whose skills are closely

related to their offshore job, and those who received training in the previous 12 months are estimated to report higher levels of perceived job satisfaction. With respect to financial condition (which is a proxy for income), our results are consistent with the findings of Clark *et al*. (1996) and Gardner and Oswald (2001). However, in contrast to these studies we do not find a significant relationship between age and job satisfaction.

Although there is a shortage of skilled labour, we find a low percentage of respondents' indicating that they intend to quit their job in the next 12 months. Job satisfaction, promotion prospects and training opportunities appear to reduce significantly the probability of intentions to quit, in contrast to Krueger and Rouse (1998) who find no relationship between training and employees quitting. Interestingly, providing training could be regarded as a double edged sword for employers, since the workers who had training in the previous 12 months report higher levels of job satisfaction, but are also more likely to intend to quit. Nevertheless, this finding is consistent with the relatively recent training literature based on the assumption of imperfectly competitive labour markets that identifies the conditions under which firms may finance general training (Acemoglu and Pischke, 1999; Booth and Bryan, 2002; Booth and Zoega, 1999; Katz and Ziderman, 1990; Loewenstein and Spletzer, 1998;Stevens, 1994, 1996).

Overall these findings establish the importance of job satisfaction, and promotion and training opportunities in determining workers' intentions to quit within the U.K. North Sea oil and gas industry, and further suggest that policies that focus only on improving pay will only have limited success unless they are accompanied by promotion and training opportunities aimed at investing in worker's skills and career development. Giving consideration to the match between an individual's skills/qualifications and the job at the time of recruitment may help to promote higher levels of job satisfaction once employees have been hired, and providing ongoing investment in employees' skills, along with opportunities to gain promotion, will reduce the probability of workers' leaving their employers.

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Table 1: Descriptive Statistics

Variable	Mean	SD
Personal and household characteristics		
Male (1: male; 0: otherwise)	0.960	
Age (Age of individual)	43.913	9.129
Married (1: married/cohabitating; 0: otherwise)	0.819	
Good health (1: has good health; 0: otherwise)	0.782	
Managewell (1: household manages well financially; 0: otherwise)	0.860	
Job characteristics		
Permanent contract (1: permanent contract; 0: otherwise)	0.882	
Fewer hours (1: prefers to work fewer hours; 0: otherwise)	0.695	
Had training (1: had training in the past 12 months; 0: otherwise)	0.907	
Good job match (1: good skill match; 0: otherwise)	0.551	
Promotion in next 12 months (1: expects promotion in next 12 months; 0: otherwise)	0.296	
Training in next 12 months (1: expects training in next 12 months; 0: otherwise)	0.477	
Quit (1: expects to quit job in next 12 months; 0: otherwise)	0.153	
Occupations		
Drilling (1: drilling occupation; 0: otherwise)	0.125	
Drilling service support (1: drilling service support occupation; 0: otherwise)	0.028	
Production/process operator (1: production/process operator; 0: otherwise)	0.137	
Maintenance personnel and technicians (1: maintenance personnel and technicians; 0: otherwise)	0.212	
Geologist/geophysicist (1: geologist/geophysicist; 0: otherwise)	0.003	
Engineer (1: engineer; 0: otherwise)	0.059	
Engineering support (1: engineering support occupation; 0: otherwise)	0.028	
Administrative (1: administrative occupation; 0: otherwise)	0.109	
Catering staff (1: catering staff; 0: otherwise)	0.040	
Other (1: other occupation; 0: otherwise)	0.252	
Type of company		
Operating company (1: operating company; 0: otherwise)	0.402	
Drilling company (1: drilling company; 0: otherwise)	0.287	
Engineering contractor (1: engineering company; 0: otherwise)	0.109	
Catering company (1: catering company; 0: otherwise)	0.056	
Service company (1: service company; 0: otherwise)	0.121	
Other company (1: other company; 0: otherwise)	0.025	
Number of observations	321	

Table 2: Distribution of job satisfaction

Job satisfaction	Frequency of scores (%)						Mean	S.D.
Score:	**1**	**2**	**3**	**4**	**5**	**6**		
Overall	1.56	5.3	13.08	38.94	33.96	7.17	4.20	1.04
Work environment	1.87	5.61	13.4	36.76	35.2	7.17	4.19	1.06
Workload	2.18	14.33	16.51	31.15	29.91	5.92	3.90	1.21
Job stress	3.74	10.9	21.18	35.2	23.68	5.3	3.80	1.18
Working hours	3.43	12.77	20.56	32.09	25.86	5.3	3.80	1.21
Physical risk	2.8	4.36	12.77	30.22	36.45	13.4	4.33	1.16
Wages	4.98	10.59	21.81	26.48	28.97	7.17	3.85	1.28
Job security	3.43	7.17	17.76	28.04	38.63	4.98	4.06	1.17
Career prospects	6.23	9.97	18.38	26.48	33.02	5.92	3.88	1.30

Note: Table 2 shows respondents reported satisfaction with their overall job, and eight aspects of their job. The columns correspond to the scale used to rank job satisfaction, with one representing “Very dissatisfied” and six representing “Very satisfied”. The numbers in the table report the percentage of respondents who reported that level of satisfaction, e.g. 7.17% of respondents reported that they were very satisfied with their present job.

Table 3: Correlation matrix of job satisfaction domains

	Overall	Work en/ment	Workload	Job stress	Working hours	Physical risk	Wages	Job security	Career prospects
Overall	1	0.6146	0.4771	0.4945	0.5288	0.4202	0.5246	0.567	0.6149
Work environment		1	0.5369	0.4209	0.4945	0.4639	0.4027	0.5398	0.4157
Workload			1	0.6478	0.6658	0.2728	0.3121	0.3101	0.2833
Job stress				1	0.6021	0.3286	0.275	0.3197	0.3288
Working hours					1	0.3571	0.4119	0.3905	0.3792
Physical risk						1	0.3408	0.4349	0.3942
Wages							1	0.4736	0.493
Job security								1	0.5374
Career prospects									1

Note: Pair-wise correlations coefficients. All correlation coefficients are significant at p<0.01.

Table 4: Equality of scores in different domains of job satisfaction

	Overall	Work en/ment	Workload	Job stress	Working hours	Physical risk	Wages	Job security	Career prospects
Overall			***	***	***	**	***	**	***
Work environment			***	***	***	**	***	**	***
Workload				*	*	***		**	
Job stress						***		***	
Working hours						***		***	
Physical risk							***	***	***
Wages								***	
Job security									***
Career prospects									

Note: Pair-wise comparisons of mean score of job satisfaction in different job facets. *** p<0.01, ** p<0.05, * p<0.1

Table 5: The determinants of overall job satisfaction

Variable	Coefficient (SD)
Male	-0.218
	(0.37)
Age	-0.001
	(0.01)
Married	-0.337*
	(0.18)
Goodhealth	0.491***
	(0.15)
Managewell	0.490***
	(0.16)
Permanent	0.042
	(0.21)
Fewer hours	-0.658***
	(0.15)
Hadtraining	0.481**
	(0.23)
Goodjobmatch	0.251*
	(0.13)
Promotion in next 12 months	-0.082
	(0.13)
Training in next 12 months	-0.150
	(0.15)
Male	-0.060
	(0.13)
Occupational dummies	YES
Type of company dummies	YES
Threshold 1	-2.346
Threshold 2	-1.583
Threshold 3	-0.854
Threshold 4	0.391
Threshold 5	1.889
Log likelihood	-405.89
Wald $\chi^2(26)$	130.31

Note: Coefficients with standard errors in parentheses, based on ordered probit estimates. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Determinants of quit intentions in current job

Variable	dy/dx (sd)	dy/dx (sd)	dy/dx (sd)
Job satisfaction (overall)		-0.082*** (0.020)	
Job satisfaction (comp1)			-0.044** (0.014)
Job satisfaction (comp2)			-0.007 (0.015)
Male	-0.029 (0.090)	-0.076 (0.095)	-0.067 (0.100)
Age	-0.002 (0.002)	-0.001 (0.002)	-0.002 (0.002)
Married	-0.009 (0.051)	-0.024 (0.051)	-0.026 (0.053)
Goodhealth	-0.072 (0.053)	-0.016 (0.044)	-0.041 (0.049)
Managewell	-0.049 (0.061)	-0.023 (0.054)	-0.019 (0.052)
Permanent	0.011 (0.052)	0.023 (0.045)	0.046 (0.040)
Fewer hours	0.004 (0.044)	-0.024 (0.045)	-0.014 (0.046)
Hadtraining	0.063 (0.048)	0.076** (0.034)	0.073* (0.036)
Goodjobmatch	0.017 (0.038)	0.025 (0.035)	0.020 (0.037)
Promotion in next 12 months	-0.124*** (0.037)	-0.128*** (0.031)	-0.116*** (0.033)
Training in next 12 months	-0.126** (0.039)	-0.120*** (0.036)	-0.117** (0.037)
Type of company dummies	YES	YES	YES

Note: Marginal effects with standard errors in parentheses, based on probit estimates.*** p<0.01, ** p<0.05, * p<0.1

Appendix

Table A1: Principal components/correlation

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.97499	2.79415	0.4969	0.4969
Comp2	1.18084	0.478683	0.1476	0.6445
Comp3	0.702159	0.14413	0.0878	0.7322
Comp4	0.558029	0.0298881	0.0698	0.802
Comp5	0.528141	0.118315	0.066	0.868
Comp6	0.409826	0.0420777	0.0512	0.9192
Comp7	0.367748	0.0894858	0.046	0.9652
Comp8	0.278262	.	0.0348	1

Table A2: Scoring coefficients

Variable	Comp1	Comp2
Work environment	**0.3031**	0.2386
Workload	-0.0596	**0.6075**
Job stress	-0.0359	**0.5629**
Working hours	0.0696	**0.5013**
Physical risk	**0.4028**	0.0225
Wages	**0.4601**	-0.0224
Job security	**0.5165**	-0.0395
Career prospects	**0.5077**	-0.0574

Note: Rotated factor matrix calculated from a two-component solution.