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High involvement management practices, technology uses, work motivation and job search behaviour¹

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Abstract - Nowadays, employers face the mobility of the most productive employees and large costs induced by labour turnover. This paper examines the impact of two management policies on employees' motivation on one hand and their quitting behaviour on the other hand. These two policies are i) the participation in High Involvement Management (HIM) practices and ii) the use of Information and Communication Technologies (ICT). Employees' motivation, which is at the heart of this question, has different facets. Some employees exert effort because their job is in line with their values, gives opportunities for personal growth and pleasure in performing tasks. Alternatively, employees may simply be driven by rewards or compulsion. Using recent survey-based data of employees, the results show that the HIM and ICT strategies are positively related to the two types of work motivation (personal growth and rewards/compulsion). However, these strategies affect differently the likelihood of staff to remain or leave their current employer by type of motivation. While the HIM strategy reduces the risk that employees motivated by personal growth search for another job, it encourages on the contrary those who are motivated by rewards or compulsion to leave. ICT appear to play no role in employee retention.

Résumé - De nos jours, les entreprises font face à la mobilité des travailleurs les plus productifs et à d'importants coûts inhérents à la rotation de la main-d'œuvre. Cet article porte sur l'impact de deux politiques de management sur la motivation des employés d'une part, et leur tendance à chercher (ou non) un autre emploi d'autre part. Ces deux politiques sont i) l'implication active des employés dans le management de l'entreprise (High Involvement Management - HIM) et ii) l'usage des technologies de l'information et de la communication (TIC). La motivation des employés, qui est au cœur de cette question, revêt différentes facettes. Certains employés sont attachés à leur emploi si celui-ci est en accord avec leurs valeurs, leur permet de se développer sur le plan personnel, et s'ils trouvent de l'intérêt aux tâches qu'ils effectuent. D'autres sont davantage incités par des récompenses ou par un sentiment de contrainte. Les récentes données d'enquête utilisées montrent que les stratégies 'HIM' et 'TIC' sont efficaces pour accroître les deux types de motivation précités (développement personnel et récompense/contrainte). En revanche, ces stratégies affectent différemment la volonté de quitter l'entreprise en fonction du type de motivation dont font preuve les employés. Alors que la stratégie HIM réduit le risque que les employés motivés par le développement personnel recherchent un autre emploi, elle incite au contraire au départ ceux qui sont motivés par les récompenses ou la contrainte. La stratégie TIC ne joue quant à elle aucun rôle dans la volonté de recherche d'un autre emploi.

Keywords: on-the-job search, work motivation, high involvement management practices, information and communication technologies

JEL classification: J81, J28, M54

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1 Introduction

Firms dedicate resources to increase firm-specific skills, enhance employees' commitment, and stimulate their efforts with the goal of raising firm performance. The mobility of employees and especially of the most productive ones is costly for firms (Huselid, 1995; Morrow and McElroy, 2007). Employees' turnover also incurs costs due to attracting, selecting, recruiting and training new productive employees (Oi, 1962).

There is a considerable interest in the literature on the role played by firms investment in management practices and associated technologies in firm performance (*e.g.* Bresnahan *et al.*, 2002; Brynjolfsson and Hitt, 2000; Combs *et al.*, 2006; Ichniowski *et al.*, 1996; MacDuffie 1995). However, the literature does not pay detailed attention to the underlying process inside firms through which High Involvement Management (HIM) practices and Information and Communication Technologies (ICT) result in better firm performance.

Some recent studies support positive relationships between management practices, ICT and employees' positive attitudes such as job satisfaction, organisational commitment, citizenship or pride (*e.g.* Böckerman *et al.*, 2012; Brown *et al.*, 2008; Gallie *et al.*, 2012; Godard, 2001; Guest, 1999; Kalmi and Kauhanen, 2008; Martin and Omrani, 2015; Mohr and Zoghi, 2008; White and Bryson, 2013). The underlying assumption of these studies is that employees' have a positive motivational response to management practices and ICT but employees' motivations per se are not directly tested.

Since the work of Deci and Ryan (1985) two main types of motivations are at the centre of theories of motivation: autonomous motivation and controlled motivation. On one hand, autonomous motivation is a desired attribute of employees for managers as they exert effort because of values, identification and intrinsic reasons and have positive behaviours at work such as cooperation, information sharing, commitment, intra- and extra-role performance (Akerlof and Kranton, 2005; Gagné and Deci, 2005). On the other hand, controlled motivation is not highly valuable for manager as they exert effort because of rewards and out of feelings of compulsion and are unrelated to positive behaviours at work except continuance commitment.

To increase the quality and quantity of work effort and boost productivity, employers need to strengthen above all the autonomous motivation of the staff and to retain the autonomously motivated employees. However, the relationships between employees' participation in HIM,

use of ICT and quit intentions of employees remain unexplored. When the quitting intention of employees is studied, authors only focus on specific human resources management practices like team work and associated ICT are largely ignored (Delfgaauw, 2007; Garcia-Serrano, 2004; Green *et al.*, 2000). Furthermore, these researches do not pay attention to the type of employee that is more prone to quitting their current job except papers on the quitting behaviour of dissatisfied employees (*e.g.* Antecol and Cobb-Clark, 2009; Böckerman and Ilmakunnas, 2009).

The objective of this paper is to provide new evidence on quit intentions of motivated employees analysing the role of participating in High Involvement Management (HIM) practices and associated ICT. This paper adds to the existing empirical literature on quitting behaviour by looking at two related research questions: first, what are the relations between participation in HIM, ICT use and employees' motivations? Second, do autonomously motivated employees want to stay in their current job?

My data are uniquely suited to examine these questions. They are based on an original and recent survey collected in 2013 in a European country characterized by the predominance of its service sector. The data constitute a representative sample of employees working across organisations of at least 15 employees in private sector firms from Luxembourg. Thus, this paper gives results on continental European employees, including, besides Luxembourgish, French, Belgian and German citizens and some other nationalities. Unlike existing data on the work environment and quitting intentions used by prior research, my data provide, first, detailed information about participation in management practices, ICT use at the employee level and working conditions and, second, capture the work motivations as defined by self-determination theory (Deci and Ryan, 1985; 2000; Gagné and Deci, 2005; Gagné *et al.*, 2010).

The results provide an insight into how the workplace environment enhances employees' motivations. Intensive participations to HIM practices and ICT are, indeed, positively related with work motivations. The results give support to the use of motivations in the analysis of intentions to quit. They underline that employees that are autonomously motivated (by intrinsic and value reasons) are those that have the highest likelihood to stay. Conversely, employees mainly motivated by rewards and compulsion are those that are more likely to search for another job. Moreover, with their HIM strategy employers find a way to retain autonomously motivated and push towards the exit the others.

The paper proceeds as follows. Section 2 discusses the existing empirical evidence. Section 3 presents the data and the estimation strategy. The results are shown in section 4. Section 5 discusses the results and concludes.

2 Related literature

The key dimensions of a high performance work system that enhance firm performance are High Involvement Management practices. Employers build their HIM strategy to stimulate employees' effort. They invest in the skills of their workforce through training. They favour employee participation and provide channels for an employee's voice through information-sharing activities. They give more autonomy, responsibilities and discretion via autonomous teamwork. They incentivize employees through monetary gains. As these practices are complementary and overlap each other Böckerman *et al.* (2012), Bowen and Ostroff (2004), Ichniowski *et al.* (1997) and White and Bryson (2013) underline that to be effective the HIM strategy need to be implemented through single system or bundle. In the tradition of mutual gains, the HIM strategy is a way of redistributing firm-level productivity gains and convincing employees that their work values and contribution are recognized (Batt, 2004; Kalmi and Kauhanen, 2008; Osterman, 2000). The overall influence on employee behaviours will therefore depend on how intensively firms invest in their HIM strategy.

Moreover, the HIM system is not designed independently from ICT diffusion inside the organisation. ICT are positively associated with management practices such as the autonomous team or people management (Askenazy *et al.*, 2006; Bloom *et al.*, 2012). Adopted together HIM practices and ICT make the organisation more adaptive and increase firm performance (Askenazy *et al.*, 2006; Bloom *et al.*, 2014; Bresnahan *et al.*, 2002; Brynjolfsson and Hitt, 2000; Caroli and Van Reenen, 2001; Dessein and Santos, 2006; Milgrom and Roberts, 1990). As underlined by Bloom *et al.* (2014), the technologies that are implemented by employers to optimize their workplace environment are those that facilitate information access inside the firm (such as ERP – Enterprise Resource Planning) and those that reduce internal communication costs (such as Intranet).

The positive links of new work practices and/or ICT on firm performance is broadly established (see, for instance, Brynjolfsson and Hitt, 2000; Combs *et al.*, 2006; Ichniowski *et al.*, 1996; Ichniowski and Shaw, 2013; MacDuffie, 1995). However, research on the mechanisms through which the work environment results in better firm performance remains scarce. The positive effects of HIM and/or ICT are often explained by assuming positive effects on employees'

motivations and effort but most of the time only related concepts of employees' attitudes (such as job satisfaction, organisational commitment, involvement, citizenship or pride) are analysed. Empirical evidence on high involvement management practices underlines positive links with attitudes (Bauer, 2004; Böckerman *et al.*, 2012; Brown *et al.*, 2008; Gallie *et al.*, 2001; 2012; Godard, 2001; Guest, 1999; Kalmi and Kauhanen, 2008; Macky and Boxall, 2007; Martin and Omrani, 2015; Mohr and Zoghi, 2008; Ramsay *et al.*, 2000; White and Bryson, 2013). Only a part of the technologies used at work are examined in the literature. Computer use is most of the time non-significant (Gallie *et al.*, 2001; Mohr and Zoghi, 2008; Martin and Omrani, 2015) whereas Internet use appears to be positively linked with employees' attitudes (Martin and Omrani, 2015).

In addition, the relationships between employees' participation in HIM, use of ICT and their quit intentions is rarely examined. The existing empirical evidence at the firm level reveals that management practices do lead to lower firm-level quit rates (Batt *et al.*, 2002; Haines *et al.*, 2010; Huselid, 1995) and encourage non-performers to leave the firm (Jones and Wright, 1992). In spite of these previous results, empirical evidence for the relationships between participation in management practices, especially HIM, use of ICT and employees' quitting behaviours only focuses on some human resources management practices. Cottini *et al.* (2011) underline that granting voice to employees decreases their probability of voluntary turnover. Green *et al.* (2000) show that training provided by employers decreases the employee's job search. Garcia-Serrano (2004) shows that autonomy, participation in firm life, including training and knowledge about the objectives of the firm diminish intentions to quit. Delfgaauw (2007) points out that dissatisfaction in relation to autonomy, responsibility, financial prospects, training and organisational management increases the job search of public sector employees.

Another strand of literature pays attention to the type of employee that is more prone to quitting their current job but only by the means of job dissatisfaction. Since the seminal work of Freeman (1978) and Akerlof *et al.* (1988), the economic literature on quitting behaviours puts a large amount of emphasis on the quitting behaviour of dissatisfied employees. They underline that job dissatisfaction is a good predictor of quit intentions, job searching and/or actual separation (Clark *et al.*, 1998; Clark, 2001; Delfgaauw, 2007; Green, 2010; Kristensen and Westergaard-Nielsen, 2006; Lévy-Garboua *et al.*, 2007; Pissarides and Wadsworth, 1994; Sousa-Poza and Henneberg, 2004). From these previous researches, we know that dissatisfied employees are those that want to quit their current employer.

This stream of empirical research does not pay detailed attention to motivated employees, and especially to those that provide a high degree of effort that for a large part drives firm performance. Social psychology research, grounded on self-determination theory (Deci and Ryan, 2000), distinguishes two main types of work motivation: controlled motivation and autonomous motivation. They reveal that autonomous motivation (based on intrinsic motivation, personal values and identification) is associated with employees' positive behavioural outcomes such as commitment, intra and extra-role performance compared to controlled motivation (see Gagné and Deci, 2005 for a review). They suggest that “autonomous motivation [...] is superior in situations that include both complex tasks that are interesting and less complex tasks that require discipline. When a job involves only mundane tasks, however, there appears to be no performance advantage to autonomous motivation” (Gagné and Deci, 2005, p. 347). Thus, for all tasks except mundane tasks, autonomous motivation dominates controlled motivation in term of performance. In a principal-agent model, Gómez-Miñambres (2012) shows that intrinsic motivation leads individuals to achieve their highest productivity. Minkler (2004) underlines that autonomous forms of motivation increases the likelihood of keeping to the contract of best effort. Moreover, as underlined by Gagné and Deci (2005) and Gagné *et al.* (2010), the behaviours of employees motivated by reward and compulsion (controlled motivation), even if it is not necessarily bad, are not desired attributes for the employer, as they are unrelated to positive employee behaviours except continuance commitment. Therefore, it is fundamental for employers to stimulate work motivation and preferably autonomous forms of motivation through the investments in their technological and organisational structure.

Although their quitting behaviour is largely neglected in the economic literature, social psychologists such as Gagné and Deci (2005) and Karasek and Theorell (1990) argue that motivated employees have lower turnover intentions, especially those that are autonomously motivated. They also provide evidence for the negative links between a concept related to motivations (organisational commitment) and turnover behaviours (Meyer *et al.*, 2002; Mowday *et al.*, 1982).

This paper provides new evidence on quitting intentions of motivated employees by studying the relationships with the workplace environment. Even the existing empirical evidence on the quitting behaviours of dissatisfied employees neglects the technological and organisational environment to concentrate on adverse working conditions such as discrimination, poor job amenities or low social support (Antecol *et al.*, 2009; Antecol and Cobb-Clark, 2009;

Böckerman and Ilmakunnas, 2009; Scott *et al.*, 2006; Shields and Wheatley Price, 2002). In short, adverse working conditions have negative consequences for job satisfaction and that dissatisfied employees are those that want to quit their current employer. However, this paper is the first to propose and test the relationships between the workplace environment and employee motivation, on one hand, and the quitting intentions of motivated employees on the other hand.

3 Empirical strategy

3.1 Data

The original cross-sectional dataset used in this paper comes from the ‘Survey on working conditions and quality of work life’ collected in 2013 in Luxembourg by LISER on behalf of the National Social Security Ministry. The sample was drawn in September 2012 from the exhaustive administrative data of the social security of Luxembourg. A stratified sampling strategy, on employees aged at least 15 years, was used in order to ask at least one employee for all organisations in the private sector with at least 15 employees. The non-compulsory survey was conducted online between March and June 2013. Because of job switching between the time of the sample drawing and the conduct of the survey, missing information on a large part of survey items for some respondents, and the exclusion of employees with less than twelve months of tenure in the current organisation, the final sample size came to 14,248 employees. Many items used in this study have some missing values, but these are few, which is a good indicator of data quality. The few missing values on each item were imputed using the median value of non-missing data on the same item in the sampling strata of the missing respondent. The non-response, together with the survey design probabilities, was used to generate appropriate weights used in the paper. The weights ensure that the distributions by country of residence, nationality, gender, age, white and blue collars, economic activity and size class of the organisation in which the employee works, are representative of people at work in the private sector. The dataset is thus representative of employees in the private sector of Luxembourg, whether they are resident (about 47% of the working population) or cross-border employees (about 53% of the working population). Thus, the results do not concern only Luxembourgish employees but also employees from mainly other European countries. Thus, 31% of the studied population are French employees, 18% Luxembourgish ones, 15% Belgian ones, 14% Portuguese ones, 13% German ones and 9% have another nationality. As the data

are cross sectional I am only able to test the strength of conditional correlations not causal relationships.

3.2 Measuring motivations

The data include the Motivation at Work Scale (MAWS) developed and validated by Gagné *et al.* (2010) based on the Self-Determination Theory (SDT) (Deci and Ryan, 1985; 2000). It covers the spectrum of work motivation. Employees exert effort because the tasks are interesting and enjoyable (intrinsic motivation), because the job corresponds to their values and goals (identified regulation) or because of guilt or to maintain their self-esteem (introjected regulation) and, in addition, to obtain rewards (external regulation). Eleven separate items covering this spectrum of work motivation are summarized in Table 1. Factor analysis is used to create a measure of employee work motivation based on the number of meaningful common factors. As shown in Figure 1, the factor analysis indicates that the first factor describes the average employee position on the spectrum of motivation because it affects the responses to all items positively. The second factor separates autonomous motivations (identified regulation and intrinsic motivation) from controlled motivations (external and introjected regulation), which is consistent with the research in conceptualizing motivations (Deci and Ryan, 2000; Gagné *et al.*, 2010). The variable ‘External_1’ is not well explained by the two factors (uniqueness above 0.7) and his discarded.

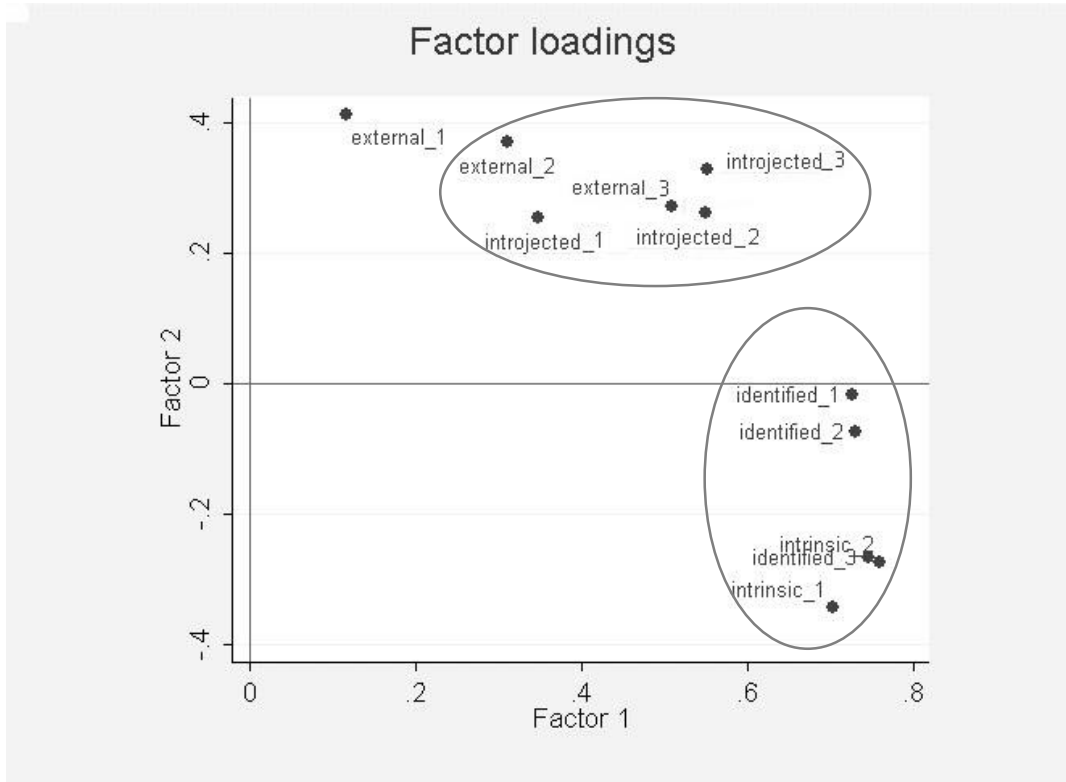
Table 1. Components of work motivations

Variable name	Measurement	Mean	Std. dev.	Median
External_1	Because of sanctions (being fired because of low effort)	5.06	3.39	5
External_2	Because of the pay-check	6.54	2.89	7
External_3	Because it allows me to get rewards (bonuses or promotion)	3.87	3.40	4
Introjected_1	Because otherwise I feel bad about myself	6.91	3.15	8
Introjected_2	Because I have to prove to myself that I can do it	5.86	3.35	7
Introjected_3	Because my reputation depends on it	5.21	3.39	6
Identified_1	Because this job fulfils my career plans	4.59	3.17	5
Identified_2	Because it allows me to reach my personal goals	4.83	3.32	5
Identified_3	Because this job fits my personal values	5.37	3.19	6
Intrinsic_1	Because I have fun doing my job	6.63	2.89	7
Intrinsic_2	Because my job is stimulating	5.11	3.07	5
Observations		14,248		

Source: Survey on working conditions and quality of work life - Luxembourg - 2013.

Notes: Weighted statistics. Descriptive statistics are prior to standardization. The related question in the survey is “Using a scale from 0 to 10, please indicate from the following statements to what extent they apply to you. I dedicate myself to my work...”.

Figure 1. Factor loading of the work motivation items



Source: Survey on working conditions and quality of work life - Luxembourg - 2013.

First, this factor analysis is used to create an overall work motivation index based on the first factor. For each employee I defined the overall work motivation index for all of the ten items retained formulated as follows: $M(i) = \sum_{j=1}^{10} c1_j x_j(i)$; where $c1_j$ gives the coordinates of the ten retained items on the first factor and $x_j(i)$ the values taken by the responses given by each employee (i) to the work motivation items. Thus, this index will be large if the employee is highly motivated. This index is standardized via z-score (i.e. the index is standardized by subtracting the mean and dividing by standard deviation). Second, based on the distinction between controlled and autonomous work motivation revealed by the second factor, I construct two separate indexes for controlled and autonomous work motivation based on a similar formula as the one used for the overall work motivation index.

Appendix Table A1 provides some descriptive statistics for employees and compares the characteristics of those with low work motivation and those with high work motivation, based on the indices of overall work motivation, controlled motivation and autonomous motivation. Males, Luxembourgish, Belgian, employees with a high level of education, professionals and managers, associate professionals and those working in finance are significantly more likely

than others to be highly motivated whatever the index retained. Conversely, French, Portuguese, employees with a low level of education, part-time employees, sales and services personnel, non-qualified operatives and those working in trade, accommodation and food services or in other services are significantly more likely than others to be weekly motivated whatever the index observed. These differences imply the importance of carefully controlling for individuals, job and organisation characteristics.

In the robustness check estimate, I also analyse an overall measure of job satisfaction that is close to that used in the literature (e.g. Clark *et al.*, 1998; Clark, 2001). The variable is based on the question: “*How satisfied are you with your work?*” with responses ranging on a scale from 0 (“*completely dissatisfied*”) to 10 (“*completely satisfied*”). Like the work motivation indices, the overall measure of job satisfaction is standardized via z-score. The average value of this measure of job satisfaction before standardization is 6.25 and is highly correlated with the measure of autonomous motivation (correlation coefficient of 0.6155 which is significant at the 1% level) and not significantly correlated with controlled motivation.

3.3 *Work motivation and on-the-job search behaviour*

Considering that all tasks undertaken by employees (except mundane ones), autonomous forms of motivation are associated with positive attitudes and better performance compared with controlled motivation, it is fundamental for employers, from a managerial point of view, to retain autonomously motivated employees while encouraging non-motivated employees and those motivated by external pressure to leave. Empirical evidence revealed by social psychology research based on Self-Determination Theory (Deci and Ryan, 1985; 2000) underlines that autonomous motivations are negatively related to quit intentions while for controlled motivation the pattern is reversed (see Gagné and Deci, 2005 for a review).

The database gives no information on actual separation but it has been shown that on-the-job search is a good predictor of actual separation (Böckerman and Ilmakunnas, 2009; Kristensen and Westergaard-Nielsen, 2006). My on-the-job search behaviour measure is close to those of Delfgaauw (2007): ‘*Have you tried to leave your current job in the last 12 months?*’, with three possible answers ‘*No, not at all*’, ‘*Yes, I have been looking around*’, ‘*Yes, I have intensively searched*’. As only less than 6% of the weighted sample answered ‘*Yes, I have intensively searched*’, a dummy variable of on-the-job search was constructed and grouped together ‘*Yes, I have been looking around*’ and ‘*Yes, I have intensively searched*’: 32.6% of the weighted sample.

Table 2 compares on-the-job search behaviour of employees by their level of work motivation. It appears that weekly motivated employees are significantly more likely (41%) than highly motivated employees (24%) to search for another job. The same pattern is observed if we compare employees based on controlled and autonomous motivation indexes. But these descriptive statistics do not take into account the correlation between controlled and autonomous motivation indexes (correlation coefficient of 0.5427 which is significant at the 1% level) and the characteristics of employees, job and organisation.

Table 2. On-the-job search behaviour by work motivation indexes

	All sample	Overall work motivation			Controlled motivation			Autonomous motivation		
		Low	High	t-test p-value high vs. low	Low	High	t-test p-value high vs. low	Low	High	t-test p-value high vs. low
On-the-job search	0.33	0.41	0.24	0.00	0.36	0.29	0.00	0.42	0.23	0.00
Observations	14,248	7,127	7,121		7,125	7,123		7,127	7,121	

Source: Survey on working conditions and quality of work life - Luxembourg - 2013.

Notes: Weighted statistics.

3.4 Participation in management practices and use of ICT

The studied organisational environment of the employee is in line with papers that analysed how management practices, and especially High Involvement Management (HIM) ones, permits to enhance employees behaviours such as job satisfaction, organisational commitment, citizenship or pride but in which quit intentions are largely ignored (*e.g.* Bauer, 2004; Böckerman *et al.*, 2012; Brown *et al.*, 2008; Gallie *et al.*, 2012; Godard, 2001; Guest, 1999; Kalmi and Kauhanen, 2008; Martin and Omrani, 2015; Mohr and Zoghi, 2008; White and Bryson, 2013).

Based on the bundle view supporting synergistic benefits between HIM practices, the participation of the employee in management practices is captured by a score for the core High Involvement Management (HIM) practices. The practices summed in the HIM bundle are the same as in Böckerman *et al.* (2012) and Kalmi and Kauhanen (2008): a proxy of self-managed team; incentive pay; training; and information-sharing between managers and employees. Moreover, in robustness check estimates, a HRM bundle covering a larger range of Human Resource Management practices is also studied. Appendix Table A2 gives the descriptive statistics of the practices included in the HIM and HRM bundle and the distribution of the bundle variables.

The technologies used by employees studied are the very ones that have been shown to be implemented by employers to optimize their workplace environment (Bloom *et al.*, 2014): technologies that facilitate internal information access (ERP – Enterprise Resource Planning, workflow) and technologies that reduce internal communication costs (groupware, Intranet). They are measured at the employee level and summed up to calculate the ICT bundle. Moreover, in robustness check estimates, two more common ICT (Internet and e-mail use for professional purposes) are included in a second ICT score (ICT 2). Appendix Table A3 gives the descriptive statistics of the ICT included and the distribution of the ICT bundles.

An interaction term between the HIM bundle and the ICT bundle is also included in the analyses to allow for the parallel diffusion of management practices and ICT in organisations so as to have an additional link with employees' motivations and job search behaviour.

3.5 Other explanatory variables

In line with existing research on job dissatisfaction and quit intentions, adverse working conditions that can influence employee motivations are also included (Antecol *et al.*, 2009; Antecol and Cobb-Clark, 2009; Böckerman and Ilmakunnas, 2009; Garcia-Serrano, 2004; Scott *et al.*, 2006, Shields and Weathley Price, 2002). The following variables are introduced: (i) harmful working conditions, (ii) scheduling hazards (shift), (iii) accident risks, (iv) the feeling of being neglected by the hierarchy, and (v) discrimination (Appendix Table A4 gives details on the definition of the variables and descriptive statistics).

In line with existing evidence that underlines the role played by outside opportunities in employees' utility in the current job and quit intentions, measures of outside opportunities are also included (Antecol and Cobb-Clark, 2009; Böckerman and Ilmakunnas, 2009; Clark and Oswald, 1996; Green, 2010 or Theodossiou and Zangelidis, 2009). The local unemployment rate, which most of the time is the only measure for external opportunities, is included. Moreover, three variables that may influence employees motivations and quit intentions are introduced: (i) the ratio between the median wage in the current business sector and those in the current organisation, (i) growth of employment in the business sector (Nace 2-digit) during the year before the survey, and (ii) the fact that the current organisation employment growth was in the upper third of those observed in the business sector during the year before the survey (Appendix Table A4 gives details on the variables definition and descriptive statistics).

The quality of the match between the employee and the current job can also influence employees attitudes and search decisions (Boxall, 2013; Van Ophem, 1991). Indicators of the

matching quality are thus included in the analyses. These indicators cover (i) the fact that the employee attends a course he or she paid for him/herself, (ii) the fact that the employee thinks that the job he or she is occupying requires a lower educational level than his or her personal level, (iii) the fact that the employee needs more skills to better perform in the current job, (iv) the fact that the employee has too low or (v) too high competence in ICT² (Appendix Table A4 gives details on the variables definition and descriptive statistics).

The choice of control variables is determined by the empirical literature on employees' attitudes and quit intentions. Information about the variables is provided in Appendix Table A1. Thus, to account for individual characteristics the following variables are included: gender, age (3 categories: less than 30 years, 30-49, 50 and more), nationality (6 classes: Luxembourgish; French; German; Belgian; Portuguese; other nationalities), family situation (with partner (yes/no), child (yes/no)), education (3 categories: less than secondary, secondary, higher than secondary), commuting time (an ordered variable for 8 categories from less than 10 minutes to 1 hour and more). The included job characteristics are: permanent contract (yes/no), part-time (yes/no), tenure (in months), work experience (in years), union member (yes/no), occupations (7 categories: Professionals and managers; Associate professionals; Administrative and Clerical; Sales and service personnel; Craft; Plant operatives; Non-qualified operatives) and quintile of hourly wage. The variables that capture organisation characteristics are: size (4 categories: 15-49 employees; 50-99 employees; 100-249 employees; 250 employees and more) and sector (7 categories: Manufacturing; Construction; Trade, accommodation and food services; Transportation and storage; IT and communication; Finance; Other services).

3.6 Estimation strategy

I investigate the relationships between, on one hand, employees' participation in the HIM strategy of the employer and use of ICT and work motivation, and, on the other hand, quit intentions of motivated employees.

A model inspired by Antecol and Cobb-Clark (2009) and Böckerman and Ilmakunnas (2009) is estimated. This model is recursive in the sense that work motivation(s) explains on-the-job search but on-the-job search does not explain work motivation(s). In a first model, only one equation for the overall work motivation index is introduced (M). In a second model that

² It has been shown in the literature that work organisational practices are complementary to skills and that technological changes are skill-biased (Bauer and Bender, 2004; Bresnahan *et al.*, 2002; Caroli and Van Reenen, 2001; Chennels and Van Reenen, 2002). Measures of matching quality concerning skills; educational level and occupations are included to control for skills in the estimates.

disentangles controlled motivation (CM) and autonomous motivation (AM) two equations are introduced.

A model written as follows is estimated (for Model 2 - specification 2):

$$\begin{cases} S_i^* = & \alpha_1 CM_i + \beta_1 AM_i + \gamma_1 H_i * CM_i + \varphi_1 H_i * AM_i + & \delta_1 H_i + \pi_1 I_i + \omega_1 H_i * I_i + \tau_1 X_i & + \varepsilon_{1i}^S \\ CM_i = & & \delta_2 H_i + \pi_2 I_i + \omega_2 H_i * I_i + \tau_2 X_i & + \vartheta_2 Z_i & + \varepsilon_{2i}^{CM} \\ AM_i = & & \delta_3 H_i + \pi_3 I_i + \omega_3 H_i * I_i + \tau_3 X_i & + \vartheta_3 Z_i & + \varepsilon_{3i}^{AM} \end{cases}$$

where i indexes the employee, S_i^* is the unobserved (latent) measure of search behaviour, CM_i and AM_i measures controlled motivation and autonomous motivation, respectively. H_i , I_i are respectively the HIM bundle and ICT bundle observed at the employee level and $H_i * I_i$ the interaction term between the two bundles. In specification 2, interaction variable(s) between work motivation measure(s) and HIM bundle ($H_i * CM_i + H_i * AM_i$) are added. Further, X_i includes adverse working conditions variables, outside opportunities proxies, matching quality indicators and other control variables about employee, job and organisation characteristics (and a constant) included in all models and Z_i are the instruments, which are only included in the motivation equation(s) as the exclusion restriction. ε_i^{CM} , ε_i^{AM} , ε_i^S are random errors normally distributed.

The two or three equations (depending on the model) form a system of continuous (motivation indexes) and binary (on-the-job search) dependent variables with potentially endogenous explanatory variables (motivations). It is assumed that all equations include unobserved heterogeneity and therefore the error terms of the two (or three) equations are allowed to be correlated. Because of the recursive structure and assuming normally distributed errors, the model is estimated using the conditional recursive mixed process estimator based on the Geweke-Hajivassiliou-Keane (GHK) simulated maximum likelihood estimator implemented in Stata by Roodman (2011). Moreover, the model is estimated with robust standard errors that are clustered at the organisation level to correct for the fact that some employees are employed by the same organisation and therefore the observations may not be entirely independent.

Because of the potential behavioural correlations between being motivated and searching for another job, an instrumenting strategy is implemented. Identification and consistent estimation of the above model depend on the lack of correlation between, on the one hand, potentially endogenous motivations and, on the other hand, the error term of the on-the-job search equation, or on the availability of instruments correlated with potentially endogenous motivations and

uncorrelated with the error terms of the on-the-job search equation. Short of instruments like the motivations observed in the past, due to the use of cross-sectional data, only imperfect instruments are proposed. However, the choice of these instruments has empirical and theoretical appeals. Based on the self-determination theory and empirical results on it, task discretion, feedback from the superior, work dependence with colleagues and group financial compensation (Z_i) are sources of the three basic psychological needs of autonomy, competence and identification with the group that must be fulfilled to support motivation and not related to the error term of the on-the-job search equation (Deci and Ryan, 1985; Gagné and Deci, 2005; Gagné *et al.*, 2010). Following Antecol and Cobb-Clark (2009), the validity of this exclusion restriction is explored by using 2SLS that estimate independently a linear probability specification of on-the-job search using sources of basic needs as excluded instruments and motivation indexes as endogenous. Appendix Table A5 provides indicative tests for Model 2 - Specification 2 (disentangling controlled and autonomous motivations). The F -statistics from the first-stage regressions exceed 10 and are thus indicative that weak instruments are not a particular concern (Staiger and Stock, 1997). The over-identification tests reveal that the excluded instruments are not incorrectly omitted from the estimation equation of on-the-job search (Baum *et al.*, 2007). In robustness check estimates, the reduced-form of the model is estimated including these variables in on-the-job search equation.

4 Results

4.1 Main results

The main results are summarized in Table 3. Two models are estimated and vary only at the level of motivation measures: (i) the first model includes the overall work motivation index, (ii) the second model disentangles controlled motivations from autonomous motivations. For each model, Table 3 reports two specifications, specification 1 including work motivation measures, HIM bundle, ICT bundle and an interaction variables between the two, and in specification 2 interaction variable(s) between work motivation measure(s) and HIM bundle are added to deepen the analysis of how the HIM strategy permits to retain or push towards the exit employees. The average marginal effects are reported for on-the-job search (which is estimated with a probit model in the system of equations presented above) in columns (2), (4), (7) and (10) while other columns report coefficients (which are estimated with continuous maximum

likelihood estimators). Appendix Table A6 reports the results of all variables included in Model 2 - Specification 2.

Correlation coefficients between the error terms of all equations are given at the bottom of Table 3. Significant correlation terms between errors terms of the equations suggest that unobserved heterogeneity across equations lead to bias results obtained with independent regressions. In particular, there is a positive and significant correlation between the error terms of autonomous motivation and on-the-job search equations while the correlation is significant and negative between controlled motivation and on-the-job search equations.

Table 3. HIM, ICT, work motivation and on-the-job search

	Model 1				Model 2					
	Specification 1		Specification 2		Specification 1			Specification 2		
	Overall work motivation	On-the-job search	Overall work motivation	On-the-job search	Controlled motivation	Autonomous motivation	On-the-job search	Controlled motivation	Autonomous motivation	On-the-job search
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Overall work motivation (M)		-0.122*** (0.013)		-0.116*** (0.015)						
Controlled motivation (CM)							0.207*** (0.051)			0.195*** (0.052)
Autonomous motivation (AM)							-0.22*** (0.0212)			-0.21*** (0.024)
HIM bundle (H)	0.186*** (0.015)	-0.0126* (0.007)	0.186*** (0.015)	-0.0141* (0.007)	0.145*** (0.015)	0.174*** (0.015)	-0.02*** (0.006)	0.145*** (0.015)	0.174*** (0.015)	-0.02*** (0.006)
H*M				-0.005 (0.004)						
H*CM										0.009** (0.004)
H*AM										-0.01*** (0.004)
ICT bundle (I)	0.052*** (0.016)	0.028*** (0.007)	0.052*** (0.016)	0.026*** (0.007)	0.055*** (0.016)	0.041*** (0.016)	0.014* (0.008)	0.055*** (0.016)	0.041*** (0.016)	0.012 (0.008)
H * I	-0.008 (0.008)	-0.002 (0.004)	-0.008 (0.008)	-0.001 (0.004)	-0.014* (0.008)	-0.003 (0.008)	0.001 (0.003)	-0.014* (0.008)	-0.003 (0.008)	0.003 (0.003)
Instruments	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	No
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rho M-job search		0.160*** (0.0449)		0.159*** (0.0448)						
Rho CM-job search						-0.441*** (0.168)			-0.442*** (0.168)	
Rho AM-job search						0.134*** (0.0396)			0.132*** (0.0395)	
Rho CM - AM						0.528*** (0.0111)			0.528*** (0.0111)	
Log L	-26257.836		-26257.01		-43620.743			-43613.954		
Wald Chi 2	7117.92***		7122.22***		11573.87***			11490.48***		
Pseudo R2	0.11		0.11		0.08			0.08		
Observations	14,248		14,248		14,248			14,248		

Source: Survey on working conditions and quality of work life - Luxembourg - 2013.

Notes: Each column of the table reports the key variables of interest in the model. The unreported results are presented in the Appendix Table A6 for Model 2 – Specification 2. Robust standard errors clustered at the level of working in the same organisation in parentheses. Weighted estimations. Columns (2), (4), (7) and (10) report average marginal effects; other columns report coefficients. Rho are correlations parameters between error terms of equations. * significant at 10%; ** significant at 5%; *** significant at 1%.

In Model 1, the reported results underline that both the HIM and the ICT bundles are positively related to the overall work motivation index, while the combined intensity of both bundles is not significant. When the distinction between the controlled and the autonomous part of employees' motivations is made in Model 2, the same results about the HIM and ICT bundles are observed. A negative and significant link between the interaction term ($H*I$) and controlled motivation appears.

Moving on to the job search behaviour of employees, the results of Model 1 show a direct negative relationship between the HIM bundle and on-the-job search and a positive relationship between the ICT bundles and on-the-job search. In Model 2, the distinction between controlled and autonomous motivations provides similar results. It seems that the HIM strategy permits employers to retain employees in their current job. This result is in line with the empirical evidence underlining negative associations between some HIM practices and quit intention (*e.g.* Cottini *et al.*, 2011; Green *et al.*, 2000). Conversely, it seems that using more ICT pushes employees to search for a new job.³ This result can be deepened by the observation of other variables included in the model, and especially the matching quality variables about ICT skills (Appendix Table A6). They underline that being over-skilled in ICT increases the probability of searching for another job. This result reflects higher employment opportunities on the market of employees over-skilled in ICT. On the contrary, and in line with the skill-biased technological changes literature, being under-skilled in ICT increases the probability of searching for another job.

Moving on to the type of employees that search for another job, it appears that the highly motivated are less likely to search. When the two facets of work motivation are disentangled, the results presented in columns (7) and (10) stress that autonomously motivated employees are more likely to stay. On the contrary, the less valuable employees for employers, that is to say those motivated by reward and obligation reasons, have a higher likelihood to search for another job. Specifications 2 that include interaction variables between the HIM bundle and motivation measures show interesting additional results. While the results in column (4) is non-significant, the distinction between controlled and autonomous motivations is needed to reveal the underlying process. The results in column (10) emphasise that HIM practices reinforce the desire to remain with the employer of autonomously motivated employees. Conversely, even if

³ In Model 2 - Specification 2 the marginal effect of the ICT bundle is non-significant but with a p-value=0.109.

the HIM bundle increases controlled motivations, the HIM strategy has a turnover-increasing effect on those employees that are not highly valuable for employers.

Appendix Table A6 provides some other interesting results in line with existing empirical evidence about job satisfaction and quit intentions of dissatisfied employees. Adverse working conditions, when significant, present most of the time negative coefficients in the motivation equation(s). Voluntary turnover appears to be a rational response for employees exposed to adverse working conditions. This result is in line with existing evidence on the fact that employees with bad working conditions take the exit option (*e.g.* Cottini *et al.*, 2011). The estimated marginal effect of tenure is negative and significant in line with the prediction of the standard human capital theory (Becker, 1964). Moreover, it appears that better wages outside are, not surprisingly, positively associated with searching for another job.

The potential endogeneity of HIM due to reverse causality is a standard issue for any analysis with such variables as independent variables. This analysis is not immune to this issue, nevertheless as underlined by Batt *et al.* (2002) the negative effect of HIM on quit rate remains significant after taking into account the potential presence of reverse causality. Moreover, as stated by Cottini *et al.* (2011) “it is not obvious that [HIM practices (called HIWPs in their paper)] are adopted by those firms with already low employee turnover” (p. 877). A comment is also required about the issue of the potential self-selection into jobs of autonomously motivated employees based on the public available information on the management practices of the firm. HIM practices of the firm could attract autonomously motivated employees, strengthen their motivation and retain them. The available data do not permit to solve perfectly this issue, but as this effect goes in the same direction as the mechanism studied here this issue may not be fatally serious.

4.2 Robustness check

To measure the impact of accounting for motivations potential endogeneity and the control for the unobserved heterogeneity across equations, I estimate the reduced-form results of models presented in Table 3. These results are presented in Table 4.

The main results about HIM, ICT bundles and on-the-job search behaviour of motivated employees are not modified. Given the significant correlations in the error terms across equations are not zero, it is not surprising that single equation estimates of motivation(s) are smaller than those resulting from the econometric model presented above. The HIM bundle remains negative and statistically significant, the ICT bundle positive and significant. In column

(3), autonomously motivated employees remains those that want to stay in their current job while controlled motivated employees want to quit their current job. In column (4), the turnover-increasing effect of HIM on controlled motivated employees and the turnover-reducing effect of HIM on autonomously motivated employees remains. Nevertheless, in column (4) the average marginal effect associated with controlled motivation disappears suggesting the need of taking into account the correlations between the two types of motivations to disentangle the search behaviour of those mainly motivated by internal reasons from those mainly motivated by external reasons.

Table 4. Reduced-form of the model

	Model 1 – specification 1	Model 1 – specification 2	Model 2 – specification 1	Model 2 – specification 2
	On-the-job search	On-the-job search	On-the-job search	On-the-job search
	(1)	(2)	(3)	(4)
Overall work motivation (M)	-0.0712*** (0.0044)	-0.0651*** (0.0077)		
Controlled motivation (CM)			0.0228*** (0.0048)	0.00821 (0.0079)
Autonomous motivation (AM)			-0.0988*** (0.0051)	-0.0788*** (0.008)
HIM bundle (H)	-0.0242*** (0.0067)	-0.0257*** (0.0067)	-0.0237*** (0.0067)	-0.0267*** (0.0066)
H*M		-0.00481 (0.0046)		
H*CM				0.0113** (0.0040)
H*AM				-0.0160*** (0.005)
ICT bundle (I)	0.0234*** (0.0069)	0.0222*** (0.007)	0.0226*** (0.0069)	0.0206*** (0.0069)
H * I	-0.0015 (0.0037)	-0.0006 (0.0037)	-0.001 (0.0036)	0.0005 (0.0036)
Instruments	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Log L	-7682.48	-7681.67	-7598.49	-7591.71
Wald Chi 2	1841.20***	1889.11***	2032.54***	2066.44
Pseudo R2	0.146	0.146	0.155	0.156
Observations	14,248	14,248	14,248	14,248

Source: Survey on working conditions and quality of work life - Luxembourg - 2013.

Notes: Each column of the table reports the key variables of interest in the model. The unreported results are available on request. Robust standard errors clustered at the level of working in the same organisation in parentheses. Weighted estimations. Average marginal effects are reported. * significant at 10%; ** significant at 5%; *** significant at 1%.

In a second robustness check, I introduce the overall measure of job satisfaction instead of work motivation(s). As the overall job satisfaction measure is highly correlated with the autonomous motivation measure (correlation coefficient of 0.6452 which is significant at the 1% level), it is not surprising to see the same pattern of results between the participation in HIM and the use of ICT and the measure of autonomous motivation. Nevertheless, the average marginal effect of job satisfaction in on-the-job search equation is smaller than that of autonomous motivation shown in column (7) or (10) in Table 3.

Table 5. HIM and ICT bundles, job satisfaction and on-the-job search – average marginal effects

	Job satisfaction	On-the-job search	Job satisfaction	On-the-job search
	(1)	(2)	(3)	(4)
Job satisfaction (JS)		-0.144*** (0.0141)		-0.127*** (0.016)
HIM bundle (H)	0.161*** (0.0142)	-0.0125* (0.0071)	0.161*** (0.0142)	-0.0164** (0.007)
H * JS				-0.0130*** (0.0046)
ICT bundle (I)	-0.0087 (0.0149)	0.0203*** (0.00657)	-0.0087 (0.0149)	0.0178*** (0.0065)
H * I	0.0006 (0.0073)	-0.001 (0.0035)	0.0006 (0.0073)	0.00085 (0.0035)
Instruments	Yes	No	Yes	No
Controls	Yes	Yes	Yes	Yes
Rho JS - job search		-0.0110 (0.0491)		-0.0152 (0.0493)
Log L		-25258.13		-25252.33
Wald Chi 2		6635.55***		6695.90***
Pseudo R2		0.115		0.115
Observations		14,248		14,248

Source: Survey on working conditions and quality of work life - Luxembourg - 2013.

Notes: Each column of the table reports the key variables of interest in the model. The unreported results are available on request. The same controls and instruments as in Table 3 are included. Robust standard errors clustered at the level of working in the same organisation in parentheses. Weighted estimations. Columns (2) and (4) reports average marginal effects; columns (1) and (3) reports coefficients. Rho are correlations parameters between error terms of equations. * significant at 10%; ** significant at 5%; *** significant at 1%.

In a third robustness check, other bundles are created to introduce more Human Resource Management (HRM) practices (quality norms, quality circle, job rotation, formal appraisal, flexible work time, telework allowed are added to the HIM practices – HRM bundle) and more ICT (Internet use and email use for professional purpose are added – ICT 2 bundle). Introducing more practices and more technologies do not modify the main results about management practices, ICT bundles and on-the-job search behaviour of motivated employees.

Table 6. HRM, ICT 2, work motivation and on-the-job search

Model 1					Model 2				
Specification 1		Specification 2			Specification 1		Specification 2		
Overall work motivation	On-the-job search	Overall work motivation	On-the-job search		Controlled motivation	Autonomous motivation	On-the-job search	Controlled motivation	Autonomous motivation
(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)	(9)
Overall work motivation (M)	-0.123*** (0.014)		-0.105*** (0.017)						
Controlled motivation (CM)							0.205*** (0.049)		0.195*** (0.05)
Autonomous motivation (AM)							-0.22*** (0.021)		-0.20*** (0.024)
HRM bundle (HRM)	0.127*** (0.011)	-0.010** (0.005)	0.127*** (0.011)	-0.012** (0.005)	0.090*** (0.011)	0.124*** (0.01)	-0.01*** (0.004)	0.090*** (0.011)	0.124*** (0.0103)
HRM*AM			-0.005** (0.002)						
HRM*CM									0.003 (0.002)
HRM*AM									-0.01*** (0.002)
ICT 2 bundle (ICT 2)	0.064*** (0.015)	0.026*** (0.007)	0.064*** (0.015)	0.0233*** (0.007)	0.058*** (0.015)	0.055*** (0.015)	0.015** (0.007)	0.058*** (0.015)	0.055*** (0.015)
HRM*ICT 2	-0.01*** (0.003)	-0.001 (0.002)	-0.01*** (0.003)	0.001 (0.002)	-0.01*** (0.003)	-0.008** (0.003)	0.001 (0.001)	-0.01*** (0.003)	-0.008** (0.003)
									0.011 (0.007)
									0.002 (0.001)

Instruments	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	No
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rho HRM-job search	0.164*** (0.047)		0.164*** (0.047)							
Rho CM-job search					-0.439*** (0.163)			-0.441*** (0.161)		
Rho AM-job search					0.133*** (0.041)			0.130*** (0.041)		
Rho CM - AM					0.530*** (0.011)			0.530*** (0.011)		
Log L	-26243.661		-26240.892		-43598.63			-43591.955		
Wald Chi 2	7019.41***		7032.70***		11682.92***			11582.55***		
Pseudo R2	0.11		0.11		0.08			0.08		
Observations	14,248		14,248		14,248			14,248		

Source: Survey on working conditions and quality of work life - Luxembourg - 2013.

Notes: Each column of the table reports the key variables of interest in the model. The unreported results are available on request. The same controls and instruments as in Table 3 are included. Robust standard errors clustered at the level of working in the same organisation in parentheses. Weighted estimations. Columns (2), (4), (7) and (10) report average marginal effects; other columns report coefficients. Rho are correlations parameters between error terms of equations. * significant at 10%; ** significant at 5%; *** significant at 1%.

5 Conclusion

Analysis of the job search behaviour of employees is important as labour turnover is costly for employers, especially if the motivated employees choose to quit their current job. Motivated employees, and especially the autonomously motivated ones who are, indeed, the ones assumed to provide the highest level of work effort, are a valuable resource for firms. In recent decades, the job search behaviour of employees has gained the attention of labour and personnel economic and human resource management. The main result underlined by the literature is that satisfied employees are those who have no intention of leaving their current employer. But being satisfied does not necessarily mean that the employee is motivated and exerts a high degree of effort. To motivate its workforce and retain the motivated employees, employers could invest in a motivational organisational environment but with what outcome?

This article adds to the literature on two major ways. Firstly, while the working environment of employees has been captured by previous research mostly through adverse working conditions or at best a narrow range of management practices and of technologies, this paper analyses the role played by participation in the High Involvement Management strategy of the employer and the use of technologies taking into account adverse working conditions and control for a large set of employee, job and current employer characteristics. Secondly, conversely to previous researches that focus their attention on job satisfaction in the analyses of intentions to quit, I introduce work motivations which are the key drivers of employees' productivity efforts. The insertion of the Self-Determination Theory (Deci and Ryan, 1985; 2000; Gagné and Deci, 2005; Gagné *et al.*, 2010) in labor market analysis provides new ways of characterizing employees: on the one hand, there are employees who exert effort because of autonomous motivation based

on values, identification and intrinsic reasons, and, on the other hand, there are employees who exert effort because of controlled motivations based on rewards and out of feelings of compulsion. Autonomous motivation is a desired attribute of employees for managers as those employees exert positive behaviours at work (such as cooperation, information sharing, commitment and high intra and extra-role performance). Conversely, employees mainly driven by their controlled motivated are not highly valuable for the employer in terms of positive behaviours except continuance commitment (Gagné and Deci, 2005; Gagné *et al.*, 2010).

I took advantage of a recent original survey collected in 2013 in Luxembourg to analyse the relationships between the participation in high involvement management practices, the use of ICT, motivations and intentions to quit from employees working in the private sector of a European service economy. The results do not concern only Luxembourgish employees but also employees from other European countries, and especially French, Belgian, German and Portuguese ones.

The main results of the paper provide, first, insight into how the participation of employees in the organisational and technological strategy of their workplace enhances their work motivations. The HIM bundle and the ICT bundle are, indeed, positively related with all facets of work motivations. Second, the results also confirm what previous papers have said on the role of adverse working conditions on employee outcomes. Third, the results support the use of motivations in the analysis of intentions to quit. Employees motivated by values, identification and intrinsic reasons are those that do not want to leave. Conversely, employees motivated by reward and feeling of obligation are those that want to quit in order to find a more suitable workplace elsewhere. The participation in HIM is negatively related to the quit intention of autonomously motivated employees and, conversely, is positively related to the exit intention of controlled motivated ones.

My findings also have practical managerial implications for employers. They posit that a motivational work environment supposes the recourse to management practices that include team work, targeted incentive pay, training and information-sharing between management and staff. The participation in a bundle of these high involvement practices is fruitful for increasing the work motivations of employees. Using technologies that decrease the access cost of information and the cost of communication participate together in the providing of a motivational environment. Moreover, knowledge about the type of employees that intend to leave can help employers to improve retention of highly valuable employees and reduce the costs associated with turnover. Autonomous motivation is a desired attribute for firms. Thus, it

is reassuring for managers to know that autonomously motivated employees are the ones that want to stay in their current position. Furthermore, with the choice of their HIM strategy employers find a way to retain these valuable employees. Conversely, employees who want to quit their current job are those motivated by external reasons: reward and/or compulsion. These latter are not highly valuable for the employer. Moreover, the HIM strategy defined by managers has a turnover-increasing effect on these employees.

A potential shortcoming is that the dataset is cross-sectional. The fact that they could only be measured over one period of time, i.e. 2013, introduces some caution in the interpretation of the findings. Analyses that use panel data that permit to correct for unobservable time-invariant heterogeneity could further investigate the effect of HIM and ICT on work motivations and quit intentions of motivated employees.

References

- Akerlof, G. A., and R. E. Kranton (2005) 'Identity and the economics of organizations.' *The Journal of Economic Perspectives* 19(1), 9–32
- Akerlof, G. A., Rose, A. K., Yellen, J. L., Ball, L., and R. E. Hall (1988) 'Job switching and job satisfaction in the U.S. labor market.' *Brookings Papers on Economic Activity* 1988(2), 495–594
- Antecol, H., and D. Cobb-Clark (2009) 'Racial harassment, job satisfaction, and intentions to remain in the military.' *Journal of Population Economics* 22(3), 713–738
- Antecol, H., Barcus, V.E., and D. Cobb-Clark (2009) 'Gender-biased behavior at work: Exploring the relationship between sexual harassment and sex discrimination.' *Journal of Economic Psychology* 30(5), 782–792
- Askenazy, P., Thesmar, D., and M. Thoenig (2006) 'On the relation between organizational practices and new technologies: the role of (time based) competition.' *The Economic Journal* 116(508), 128–154
- Batt, R. (2004) 'Who benefits from teams? Comparing the outcomes for managers, supervisors, and workers.' *Industrial Relations* 43(1), 183–213
- Batt, R., Colvin, A.J.S., and J. Keefe (2002) 'Employee voice, human resource practices, and quit rates: Evidence from the telecommunications industry.' *Industrial and Labor Relations Review* 55(4), 573–594
- Bauer, T. K. (2004) 'High performance workplace practices and job satisfaction: Evidence from Europe.' Discussion Papers Series IZA DP No. 1265, *Institute for the Study of Labor*
- Bauer, T. K., and S. Bender (2004) 'Technological change, organizational change, and job turnover.' *Labour Economics* 11(3), 265–291
- Baum, C.F., Schaffer, M.E., and S. Stillman (2007) 'Enhanced routines for instrumental variables / generalized method of moment estimation and testing.' *The Stata Journal* 7(4), 465–506
- Becker, G. (1964) *Human capital: A theoretical and empirical analysis, with special reference to education* (Chicago, IL: University of Chicago Press)

- Bloom, N., Garicano, L., Sadun, R., and J. Van Reenen (2014) 'The distinct effects of information technology and communication technology on firm organization.' *Management Science* 60(12), 2859–2885
- Bloom, N., Sadun, R., and J. Van Reenen (2012) 'Americans do IT better: US multinational and the productivity miracle.' *The American Economic Review* 102(1), 167–201
- Böckerman, P., and P. Ilmakunnas (2009) 'Job disamenities, job satisfaction, quit intentions, and actual separations: Putting the pieces together.' *Industrial Relations* 48(1), 73–96
- Böckerman, P., Bryson, A. and P. Ilmakunnas (2012) 'Does high involvement management improve worker wellbeing?' *Journal of Economic Behavior & Organization* 84(2), 660–680
- Bowen, D.E., and C. Ostroff (2004) 'Understanding HRM-performance linkages: The role of the 'strength' of the HRM system.' *Academy of Management Review* 29(2), 203–221
- Boxall, P. (2013) 'Mutuality in the management of human resources: assessing the quality of alignment in employment relationships.' *Human Resource Management Journal* 23(1), 3–17
- Bresnahan, T. F., Brynjolfsson, E., and L. M. Hitt (2002) 'Information technology, workplace organization, and the demand for skilled labor: Firm-level evidence.' *The Quarterly Journal of Economics* 117(1), 339–376
- Brown, A., Forde, C., Spencer, D. and A. Charlwood (2008) 'Changes in HRM and job satisfaction, 1998-2004: evidence from the Workplace Employment Relations Survey.' *Human Resource Management Journal* 18(3), 237–256
- Brynjolfsson, E., and L. M. Hitt (2000) 'Beyond computation: Information technology, organizational transformation and business performance.' *The Journal of Economic Perspectives* 14(4), 23–48
- Caroli, E., and J. Van Reenen (2001) 'Skill-biased organizational change? Evidence from a panel of British and French establishments.' *The Quarterly Journal of Economics* 116(4), 1449–1492
- Chennels, L., and J. Van Reenen (2002) 'Technical change and the structure of employment and wages: a survey of microeconomic evidence.' In *Productivity, Inequality and the Digital Economy. A Transatlantic Perspective*, ed. N. Greenan, Y. L'Horty, and J. Mairesse (Cambridge, MA: MIT Press) chapter 5, 175–223

- Clark, A.E. (2001) 'What really matters in a job? hedonic measurement using quit data.' *Labour Economics* 8(2), 223–242
- Clark, A.E., and A. Oswald (1996) 'Satisfaction and comparison income.' *Journal of Public Economics* 61(3), 359–381
- Clark, A.E., Georgellis, Y., and P. Sanfey (1998) 'Job satisfaction, wage changes, and quits: Evidence from Germany.' *Research in Labor Economics* 17, 95–121
- Combs, J., Yongmei, L., Hall, A., and D. Ketchen (2006) 'How much do high-performance work practices matter? A meta-analysis of their effects on organizational performance.' *Personnel Psychology* 59 (3), 501–528
- Cottini, E., Kato, T., and Westergaard-Nielsen, N. (2011) 'Adverse workplace conditions, high-involvement work practices and labor turnover: Evidence from Danish linked employer-employee data', *Labour Economics* 18 (6), 872–880
- Deci, E.L., and R.M. Ryan (1985) *Intrinsic motivation and self-determination in human behaviour* (New York, NY: Plenum)
- Deci, E.L., and R.M. Ryan (2000) 'The "What" and "Why" of goal pursuits: Human needs and the self-determination of behavior.' *Psychological Inquiry* 11(4), 227–268
- Delfgaauw, J. (2007) 'The effect of job satisfaction on job search: Not just whether, but also where', *Labour Economics* 14(3), 299–317
- Dessein, W., and T. Santos (2006) 'Adaptive organizations.' *Journal of Political Economy* 114(5), 956–995
- Freeman, R.B. (1978) 'Job satisfaction as an economic variable.' *The American Economic Review* 68(2), 135–141
- Gagné, M., and E.L. Deci (2005) 'Self-determination theory and work motivation.' *Journal of Organizational Behavior* 26(4), 331–362
- Gagné, M., Forest, J., Gilbert, M.H., Aubé, C., Morin, E., and A. Malorni (2010) 'The motivation at work scale: validation evidence in two languages.' *Educational and Psychological Measurement* 70(4), 628–646
- Gallie, D., Felstead, A., and F. Green (2001) 'Employer policies and organizational commitment in Britain 1992-97.' *Journal of Management Studies* 38(8), 1081–1101

- Gallie, D., Zhou, Y., Felstead, A. and F. Green (2012) 'Teamwork, skill development and employee welfare.' *British Journal of Industrial Relations* 50(1), 23–46
- Garcia-Serrano, C. (2004) 'Temporary employment, working conditions and expected exits from firms.' *Labour* 18(2), 293–316
- Godard, J. (2001) 'High performance and the transformation of work? The implications of alternative work practices for the experience and outcomes of work.' *Industrial and Labor Relations Review* 54(4), 776–805
- Gómez-Miñambres, J. (2012) 'Motivation through goal setting.' *Journal of Economic Psychology* 33(6), 1223–1239
- Green, F. (2010) 'Well-being, job satisfaction and labour mobility.' *Labour Economics* 17(6), 897–903
- Green, F., Felstead, A., Mayhew, K., and A. Pack (2000) 'The impact of training on labour mobility: Individual and firm-level evidence from Britain.' *British Journal of Industrial Relations* 38(2), 261–275
- Guest, D.E. (1999) 'Human resource management – The workers verdict.' *Human Resource Management Journal* 9(3), 5–25
- Haines, V.Y., Jalette, P., and K. Larose (2010) 'The influence of human resource management practices on employee voluntary turnover rates in the Canadian non governmental sector.' *Industrial and Labor Relations Review* 63(2), 228–246
- Huselid, M.A. (1995) 'The impact of human resource management practices on turnover, productivity, and corporate financial performance.' *The Academy of Management Journal* 38(3), 635–672
- Ichniowski, C., Kochan, T.A., Levine, D., Olson, C., and G. Strauss (1996) 'What works at work: Overview and assessment.' *Industrial Relations* 35(3), 299–333
- Ichniowski, C., and K. Shaw (2013) 'Insider econometrics: Empirical studies of how management matters.' in *Handbook of Organizational Economics*, eds. Gibbons, R. and J. Roberts (Princeton, NJ: Princeton University Press) Chapter 7, 263–311
- Ichniowski, C., Shaw, K., and G. Prennushi (1997) 'The effects of human resource management practices on productivity: A study of steel finishing lines.' *The American Economic Review* 87(3), 291–313

- Jones, G.R., and P.M. Wright (1992) 'An economic approach to conceptualizing the utility of human resource management practices.' In *Research in personnel and human resources management*, eds. Rowland, K. and Ferris, G. (Greenwich, CT: JAI Press) Vol. 10, 271–299
- Kalmi, P., and A. Kauhanen (2008) 'Workplace innovations and employee outcomes: Evidence from Finland.' *Industrial Relations* 47(3), 430–459
- Karasek, R. A., and T. Theorell (1990) *Healthy work. Stress, productivity, and the reconstruction of working life* (Basic Book: New York)
- Kristensen, N., and N. Westergaard-Nielsen (2006) 'Job satisfaction and quits - which job characteristics matters most?' *Danish Economic Journal* 144(2), 230–249
- Lévy-Garboua, L., Montmarquette, C., and V. Simonnet (2007) 'Job satisfaction and quits.' *Labour Economics* 14(2), 251–268
- MacDuffie, J.P. (1995) 'Human resource bundles and manufacturing performance: Organizational logic and flexible production systems in the world auto industry.' *Industrial and Labor Relations Review* 48(2), 197–221
- Macky, K., and P. Boxall (2007) 'The relationship between 'high-performance work practices' and employee attitudes: an investigation of additive and interaction effects.' *International Journal of Human Resource Management* 18(4), 537–567
- Martin, L., and N. Omrani (2015) 'An assessment of trends in technology use, innovative work practices and employees' attitudes in Europe.' *Applied Economics* 47(6), 623–638
- Meyer, J., Stanley, D., Herscovitch, L., and L. Topolnytsky (2002) 'Affective, continuance, and normative commitment to the organization: a meta-analysis of antecedents, and consequences.' *Journal of Vocational Behavior* 61(1), 20–52
- Milgrom, P., and J. Roberts (1990) 'The economics of modern manufacturing: Technology, strategy, and organization.' *The American Economic Review* 80(3), 511–528
- Minkler, L. (2004) 'Shirking and motivations in firms: Survey evidence on workers attitudes.' *International Journal of Industrial Organization* 22(6), 863–884
- Mohr, R. D., and C. Zoghi (2008) 'High-involvement work design and job satisfaction.' *Industrial and Labor Relations Review* 61(3), 275–296

- Morrow, P. and J. McElroy (2007) 'Efficiency as a mediator in turnover-organizational performance relations.' *Human Relations* 60(6), 827–849
- Mowday, R. T., Porter, L. W., and R. M. Steers (1982) *Employee-organization linkages: The psychology of commitment, absenteeism, and turnover* (New York: Academic Press)
- Oi, W. (1962) 'Labor as a quasi-fixed factor.' *Journal of Political Economy* 70(6), 538–555
- Osterman, P. (2000) 'Work reorganization in an era of restructuring: Trends in diffusion and effects on employee welfare.' *Industrial and Labor Relations Review* 53(2), 179–196
- Pissarides, C.A., and J. Wadsworth (1994) 'On-the-job search: Some empirical evidence from Britain.' *European Economic Review* 38(2), 213–415
- Ramsay, H., D. Scholarios, and B. Harley (2000) 'Employees and high-performance work systems: Testing inside the black box.' *British Journal of Industrial Relations* 38(4), 501–531
- Roodman, D. (2011) 'Fitting fully observed recursive mixed-process models with CMP.' *Stata Journal* 11(2), 159–206
- Scott, A., Gravelle, H., Simoens, S., Bojke, C., and B. Sibbald (2006) 'Job satisfaction and quitting intentions: A structural model of British general practitioners.' *British Journal of Industrial Relations* 44(3), 519–540
- Shields, M.A., and S. Wheatley Price (2002) 'Racial harassment, job satisfaction and intentions to quit: Evidence from the British nursing profession.' *Economica* 69(274), 295–326
- Sousa-Poza, A., and F. Henneberg (2004) 'Analysing job mobility with job turnover intentions: An international comparative study.' *Journal of Economic Issues* 38(1), 113–137
- Staiger, D., and J.H. Stock (1997) 'Instrumental variables regression with weak instruments.' *Econometrica* 65(3), 557–586
- Theodossiou, I., and A. Zangelidis (2009) 'Should I stay or should I go? The effect of gender, education and unemployment on labour market transitions.' *Labour Economics* 16(5), 566–577
- Van Ophem, H. (1991) 'Wages, nonwage job characteristics and the search behavior of employees.' *The Review of Economics and Statistics* 73(1), 145–151
- White, M., and A. Bryson (2013) 'Positive employee attitudes: How much human resource management do you need?' *Human Relations* 66(3), 385–406

Appendix

Table A1. Descriptive statistics of control variables

All sample		Overall work motivation			Controlled motivation			Autonomous motivation		
		Low	High	t-test p-val. high vs. low	Low	High	t-test p-val. high vs. low	Low	High	t-test p-val. high vs. low
Individual characteristics										
Male	0.68	0.64	0.71	0.00	0.66	0.70	0.00	0.64	0.71	0.00
Age < 30 years	0.16	0.16	0.16	0.54	0.15	0.17	0.00	0.16	0.16	0.43
Age 30-49 years	0.64	0.63	0.65	0.11	0.63	0.64	0.74	0.64	0.64	0.69
50 years and more	0.20	0.21	0.19	0.01	0.22	0.19	0.00	0.20	0.20	0.81
Luxembourgish	0.18	0.17	0.19	0.00	0.17	0.19	0.00	0.17	0.19	0.01
German	0.13	0.13	0.13	0.18	0.13	0.13	0.30	0.13	0.13	0.98
Belgian	0.15	0.13	0.17	0.00	0.14	0.16	0.00	0.13	0.17	0.00
French	0.32	0.33	0.30	0.00	0.32	0.31	0.13	0.32	0.30	0.01
Portuguese	0.14	0.16	0.12	0.00	0.16	0.13	0.00	0.17	0.12	0.00
Other nationality	0.08	0.08	0.09	0.33	0.08	0.08	0.35	0.08	0.09	0.07
Living with partner	0.80	0.78	0.81	0.00	0.79	0.80	0.05	0.78	0.82	0.00
Child	0.59	0.59	0.60	0.21	0.59	0.59	0.86	0.58	0.60	0.01
Education less than secondary	0.18	0.20	0.17	0.00	0.19	0.18	0.06	0.20	0.16	0.00
Secondary	0.45	0.48	0.42	0.00	0.46	0.43	0.00	0.48	0.42	0.00
Higher than Secondary	0.37	0.32	0.41	0.00	0.35	0.39	0.00	0.32	0.42	0.00
Commuting time (1-8)	4.13 (1.96)	4.14 (1.95)	4.11 (1.96)	0.41	4.11 (1.95)	4.14 (1.97)	0.28	4.14 (1.94)	4.11 (1.97)	0.28
Job characteristics										
Permanent contract	0.94	0.94	0.94	0.45	0.93	0.94	0.05	0.94	0.93	0.18
Part-time	0.12	0.15	0.08	0.00	0.14	0.10	0.00	0.15	0.09	0.00
Tenure (in months) (12-590)	123.4 (99)	121.2 (97)	125.5 (101)	0.01	120.7 (98)	126 (101)	0.00	121 (96.9)	125.7 (101)	0.00
Experience (in years) (0-50)	19.53 (10.5)	19.58 (10.6)	19.48 (10.5)	0.56	19.75 (10.5)	19.31 (10.6)	0.01	19.38 (10.5)	19.69 (10.6)	0.08
Union	0.32	0.34	0.30	0.00	0.32	0.31	0.14	0.34	0.30	0.00
Professionals and managers	0.20	0.15	0.27	0.00	0.18	0.23	0.00	0.14	0.27	0.00
Associate professionals	0.20	0.18	0.22	0.00	0.18	0.21	0.00	0.17	0.22	0.00
Administrative and clerical	0.15	0.15	0.14	0.03	0.15	0.15	0.90	0.16	0.14	0.00
Sales and service personnel	0.11	0.13	0.08	0.00	0.12	0.09	0.00	0.13	0.09	0.00
Craft	0.15	0.15	0.15	0.88	0.15	0.16	0.82	0.15	0.15	0.91
Plant operatives	0.09	0.09	0.09	0.09	0.09	0.09	0.24	0.10	0.08	0.01
Non-qualified operatives	0.10	0.15	0.05	0.00	0.13	0.07	0.00	0.15	0.05	0.00

Quintile of hourly wage (1-5)	3.02 (1.40)	2.75 (1.42)	3.26 (1.34)	0.00	2.85 (1.43)	3.19 (1.35)	0.00	2.74 (1.41)	3.30 (1.34)	0.00
Organisation charact.										
<i>15-49 employees</i>	0.25	0.25	0.24	0.22	0.26	0.23	0.00	0.24	0.25	0.13
<i>50-99 employees</i>	0.14	0.15	0.14	0.18	0.15	0.14	0.06	0.14	0.14	0.38
<i>100-249 employees</i>	0.20	0.19	0.21	0.02	0.20	0.21	0.04	0.20	0.21	0.05
<i>250 employees and more</i>	0.41	0.41	0.41	0.88	0.39	0.42	0.00	0.42	0.40	0.02
<i>Manufacturing</i>	0.15	0.16	0.15	0.01	0.16	0.15	0.16	0.16	0.15	0.00
<i>Construction</i>	0.15	0.14	0.16	0.00	0.14	0.16	0.05	0.14	0.16	0.00
<i>Trade, accommodation and food services</i>	0.19	0.20	0.18	0.00	0.20	0.17	0.00	0.20	0.18	0.00
<i>Transportation and storage</i>	0.09	0.09	0.08	0.08	0.09	0.08	0.00	0.09	0.09	0.51
<i>IT and communication</i>	0.06	0.06	0.06	0.24	0.06	0.06	0.25	0.05	0.06	0.10
<i>Finance</i>	0.19	0.17	0.21	0.00	0.16	0.23	0.00	0.18	0.20	0.00
<i>Other services</i>	0.17	0.18	0.16	0.00	0.19	0.15	0.00	0.18	0.16	0.00
Observations	14,248	7,127	7,121		7,125	7,123		7,127	7,121	

Source: Survey on working conditions and quality of work life - Luxembourg - 2013.

Notes: Weighted statistics. Standard deviations are shown in parentheses for non-binary variables. p-value refers to a two-sided t-test of mean equality between both groups. Employees are coded as being motivated if their score is above the median value of each work motivation index. Variables omitted in the estimations are in italic.

Table A2. Management practices introduced in the HIM and HRM bundles (in %)

	<i>Measurement</i>	<i>Mean</i>	<i>HIM</i>	<i>HRM</i>
Team work	The employee works in a team of at least 5 individuals with the control of work quality done by team members = 1; otherwise = 0	25.31	Yes	Yes
Incentive pay	Part of the employee's salary is based on performance = 1; otherwise = 0	33.14	Yes	Yes
Training	The employee received a training paid by the employer during the past 12 months = 1; otherwise = 0	41.60	Yes	Yes
Information sharing between managers and the staff	The employee finds useful at least one of the downward communication tools used by management to share knowledge about the business with the staff: meetings between the management board and the staff and/or emails between the management board and the staff and/or internal surveys organized by the management board = 1; otherwise = 0	26.74	Yes	Yes
Quality norms	The employee must comply with quality standards (ISO standards, ...) = 1; otherwise = 0	58.85	No	Yes
Quality circle	The employee is involved in a group which meets regularly to identify and resolve problems related to his or her work (quality groups or quality circles) and participates in decisions concerning major changes within the company when consulted = 1; otherwise = 0	22.45	No	Yes
Job rotation	When absent for one week, the employee must catch up less than half of his or her tasks when he or she returns = 1; otherwise = 0	52.15	No	Yes
Formal appraisal	The employee has at least one appraisal interview during the past 12 months = 1; otherwise = 0	57.76	No	Yes
Flexible work time	Has flexible working hours (i.e. decides him (her)self when he or she starts and stops work, taking into account certain daily fixed time slots) = 1; otherwise = 0	38.24	No	Yes

Telework allowed	The company permits the employee to do teleworking from home = 1; otherwise = 0	10.00	No	Yes
HIM bundle				
0		21.27		
1		35.95		
2		29.37		
3 or 4		13.40		
HRM bundle				
0 or 1		8.95		
2		15.24		
3		21.03		
4		22.19		
5		16.75		
6		9.94		
7 or more		5.91		
Observations			14,248	

Source: Survey on working conditions and quality of work life - Luxembourg - 2013.

Notes: Weighted statistics. All management practices included in the HIM and HRM bundles are binary variables.

Table A3. ICT use introduced in the ICT bundles (in %)

	<i>Measurement</i>	<i>Mean</i>	<i>ICT</i>	<i>ICT2</i>
ERP	The employee uses Enterprise Resources Planning that is a tool for coordinating employees around the information system = 1; otherwise = 0	14.80	Yes	Yes
Workflow	The employee uses a Workflow that is a tool for coordinating employees around a business process = 1; otherwise = 0	15.11	Yes	Yes
Groupware	The employee uses a Groupware that is an information exchange tool = 1; otherwise = 0	24.37	Yes	Yes
Intranet	The employee uses Intranet = 1; otherwise = 0	50.18	Yes	Yes
Internet use	The employee uses Internet for work purposes at least 25% of working time = 1; otherwise = 0	0.17	No	Yes
Email use	The employee uses email for work purposes = 1; otherwise = 0	0.55	No	Yes
ICT bundle				
0		44.37		
1		23.94		
2		18.29		
3 or 4		13.4		
ICT2 bundle				
0		38.12		
1		8.79		
2		17.65		
3		17.24		
4		11.40		
5 or 6		6.79		
Observations			14,248	

Source: Survey on working conditions and quality of work life - Luxembourg - 2013.

Notes: Weighted statistics. All ICT uses are binary variables.

Table A4. Descriptive statistics and definition of adverse working conditions, outside opportunities, matching quality and instruments

	<i>Measurement</i>	<i>Mean</i>
Adverse working conditions		
Harmful working conditions	At least one adverse factor that affects the employee for a large part of the work time (noise, vibrations, extreme temperatures; radiation, rays or chemical or biological agents; lifting or moving heavy loads; performing rapid, repetitive, monotonous movements; uncomfortable working position) = 1; otherwise = 0	0.33
Shift	At least one scheduling hazard (shift work, evening shift, night shift, week end shift) = 1; otherwise = 0	0.29
Accident risk	The employee agrees or strongly agrees about the fact that the risk of accident is high = 1; otherwise = 0	0.37
Neglected by the hierarchy	At least one item “never” experienced at work (includes support to complete tasks from the superior; suggestions most often taken into account by the superior; recognition of the true value of the work by the superior) = 1; otherwise = 0	0.16
Discrimination	Has been subject of discrimination (regarding gender, age, nationality etc.) in current workplace during the past 12 months = 1; otherwise = 0	0.13
Outside opportunities		
Local unemployment	Unemployment rate in the city of the current job (source: STATEC)	7.55 (2.56)
Better wage outside	Ratio between the median wage in the current business sector (NACE 2-Digit) and those of the current organisation (source: IGSS administrative data)	1 (0.16)
Growth of employment in the sector	Growing employment in the business sector (NACE 2-Digit) in the past 12 months (source: IGSS administrative data)	0.29 (2.91)
Upper third of employment growth	Employment growth of the current organisation is in the upper third of employment growth at the business sector (NACE 2-Digit) level in the past 12 months (source: IGSS administrative data)	0.30
Matching quality		
Course	The employee attends a course paid by him/herself during the past 12 months = 1; otherwise = 0	0.06
Too high educational level	The employee thinks that that the present job requires a lower educational level = 1; otherwise = 0	0.27
Too low skills	The employee thinks that more skills are needed to better perform in the current job = 1; otherwise = 0	0.60
Too low ICT skills	The employee thinks that that the present job requires a higher ICT skills level = 1; otherwise = 0	0.08
Too high ICT skills	The employee thinks that that the present job requires a lower ICT skills level = 1; otherwise = 0	0.19
Instruments		
Task discretion	Z-score of the sum of three aspects of employees’ influence on: what tasks done; how tasks done and order of tasks	0 (1)
Feedback from the superior	The employee agree or strongly agree that the superior gives regular feedback on the work done = 1; otherwise = 0	0.58
Work dependence with colleagues	The work of the employee is closely linked to the work of colleagues = 1; otherwise = 0	0.53
Group financial compensation	A financial compensation such as pension plan, life insurance is provided = 1; otherwise = 0	0.28
Observations		14,248

Source: Survey on working conditions and quality of work life - Luxembourg - 2013.

Notes: Weighted statistics. Standard deviations are shown in parentheses for non-binary variables.

Table A5. Validity of the exclusion restriction for the Model 2 - specification 2 of Table 3

	<i>Controlled motivation</i>	<i>Autonomous motivation</i>
First-stage F test	27.98	70.40
p-value	(0.000)	(0.000)
Over-identification test - Hansen J statistic	0.804	
Chi-square	(0.6690)	

Source: Survey on working conditions and quality of work life - Luxembourg - 2013.

Notes: The work motivation regressions include controls for the participation in HIM (H_i), the ICT use (I_i), the interaction term between the two ($H_i * I_i$), control variables (X_i) and the instruments (Z_i). On-the-job search equation includes the same variables, excludes the instruments and includes the potential endogenous motivation variables (CM_i and AM_i) and the interaction terms of HIM with controlled motivation and with autonomous motivation ($H_i * CM_i$; $H_i * AM_i$). The first-stage F test is based on the exclusion of the instruments from the on-the-job search equation. These tests are given as indicative as they are based on 2SLS linear probability models and not on the estimation strategy described and used to obtain the results presented in Table 3.

Table A6. HIM, ICT, work motivation and on-the-job search (reported results of Model 2 - Specification 2 of Table 3)

<i>Model 2 – Specification 2</i>			
	<i>Controlled motivation index</i>	<i>Autonomous motivation index</i>	<i>On-the-job search</i>
	(8)	(9)	(10)
Controlled motivation (CM)			0.195*** (0.0524)
Autonomous motivation (AM)			-0.208*** (0.0236)
HIM bundle (H)	0.145*** (0.0149)	0.174*** (0.0146)	-0.0236*** (0.00646)
H*CM			0.00879** (0.00380)
H*AM			-0.0128*** (0.00433)
ICT bundle (I)	0.0554*** (0.0161)	0.0406*** (0.0156)	0.0121 (0.00757)
H * I	-0.0143* (0.00798)	-0.00307 (0.00781)	0.00255 (0.00327)
Course	0.0174 (0.0357)	0.0557* (0.0325)	0.0783*** (0.0167)
Too high educational level	-0.0794*** (0.0253)	-0.244*** (0.0236)	0.0356*** (0.0133)
Too low skills	0.0820*** (0.0194)	0.120*** (0.0179)	0.0251*** (0.00831)
Too low ICT skills	0.00940 (0.0340)	0.0358 (0.0287)	0.0478*** (0.0142)
Too high ICT skills	-0.0499** (0.0210)	-0.0270 (0.0191)	0.0339*** (0.00870)
Local unemployment	-0.00517 (0.00379)	-0.00659* (0.00391)	9.77e-05 (0.00163)
Better wage outside	0.0260 (0.0669)	0.0631 (0.0557)	0.0499** (0.0235)
Growing employment in the sector	0.00901* (0.00465)	-0.00257 (0.00536)	-0.000522 (0.00219)
Upper third of employment growth	-0.00225 (0.0223)	0.0389** (0.0196)	-0.00188 (0.00871)
Harm working conditions	0.0208 (0.0262)	-0.0780*** (0.0251)	0.0195 (0.0136)
Shift	0.0369 (0.0243)	-0.0115 (0.0214)	0.00127 (0.0100)
Accident risk	0.109*** (0.0311)	-0.0394 (0.0272)	-0.00369 (0.0160)
Neglected by the hierarchy	-0.183***	-0.303***	0.0911***

	(0.0266)	(0.0288)	(0.0163)
Discrimination	-0.0274	-0.172***	0.0544***
	(0.0296)	(0.0292)	(0.0184)
Male	-0.0214	-0.0259	0.0121
	(0.0255)	(0.0215)	(0.00960)
Age 30-49 years	-0.135***	-0.0657**	0.00488
	(0.0323)	(0.0316)	(0.0137)
50 years and more	-0.214***	-0.0777	-0.0821***
	(0.0504)	(0.0476)	(0.0300)
German	-0.0378	-0.0161	-0.0276*
	(0.0367)	(0.0343)	(0.0152)
Belgian	-0.0333	0.0440	-0.0104
	(0.0346)	(0.0295)	(0.0151)
French	-0.0417	-0.0296	-0.0434***
	(0.0318)	(0.0268)	(0.0162)
Portuguese	-0.0241	0.0434	-0.0672***
	(0.0451)	(0.0366)	(0.0218)
Other nationalities	-0.104**	0.0148	-0.0286
	(0.0436)	(0.0353)	(0.0208)
Living with partner	0.0273	0.0404*	-0.0218**
	(0.0243)	(0.0232)	(0.00938)
Child	0.0106	0.0268	0.00950
	(0.0222)	(0.0196)	(0.00784)
Secondary	-0.0869***	-0.0296	0.0499***
	(0.0304)	(0.0288)	(0.0121)
Higher than	-0.173***	-0.0976***	0.0751***
Secondary	(0.0371)	(0.0336)	(0.0152)
Commuting time	0.00140	-0.00351	0.000745
	(0.00545)	(0.00470)	(0.00207)
Quintile of hourly	0.0532***	0.0608***	0.00489
wage	(0.0125)	(0.0118)	(0.00510)
Permanent contract	0.0644	-0.124***	-0.0165
	(0.0433)	(0.0386)	(0.0196)
Tenure (in months)	-7.43e-05	-0.000554***	-0.000474***
	(0.000120)	(0.000114)	(6.75e-05)
Experience (in	0.00157	0.00500***	-0.00150**
years)	(0.00161)	(0.00153)	(0.000674)
Union	-0.0223	-0.000652	0.0153*
	(0.0214)	(0.0201)	(0.00861)
Part time	-0.138***	-0.144***	-0.00497
	(0.0367)	(0.0333)	(0.0129)
Professionals and	0.0898	0.375***	0.152***
managers	(0.0579)	(0.0537)	(0.0230)
Associate profes-	0.138**	0.311***	0.104***
sionals	(0.0545)	(0.0500)	(0.0220)
Administrative and clerical	0.120**	0.222***	0.0707***
	(0.0551)	(0.0491)	(0.0219)
Sales and service	0.112**	0.254***	0.0751***
personnel	(0.0513)	(0.0495)	(0.0216)
Craft	0.122**	0.374***	0.0642***
	(0.0516)	(0.0521)	(0.0200)
Plant operatives	0.295***	0.432***	0.0379
	(0.0549)	(0.0576)	(0.0234)
Firm size 50-99	-0.00640	-0.0548*	0.00562
	(0.0338)	(0.0294)	(0.0132)
100-249	0.0356	-0.0509*	-0.0128
	(0.0307)	(0.0268)	(0.0124)
250 and more	0.0679**	-0.0220	-0.0614***
	(0.0298)	(0.0252)	(0.0110)
Construction	0.122***	0.249***	0.0347**

	(0.0422)	(0.0389)	(0.0173)
Trade, accommodation	0.00963	0.150***	0.0507***
and food services	(0.0421)	(0.0381)	(0.0165)
Transportation and	-0.108**	0.195***	0.0643***
storage	(0.0448)	(0.0439)	(0.0224)
IT and	0.0116	-0.0100	-0.0124
communication	(0.0495)	(0.0395)	(0.0278)
Finance	0.0736*	-0.135***	-0.0329*
	(0.0393)	(0.0391)	(0.0191)
Other services	-0.0462	0.0382	0.0297
	(0.0458)	(0.0433)	(0.0184)
Task discretion	0.172***	0.296***	
	(0.0116)	(0.0121)	
Feedback from the superior	0.144***	0.176***	
	(0.0206)	(0.0164)	
Work dependence with colleagues	0.0913***	-0.0116	
	(0.0176)	(0.0169)	
Group financial compensation	0.0421*	0.0216	
	(0.0248)	(0.0216)	
Constant	-0.593***	-0.676***	
	(0.112)	(0.104)	
Rho CM-job		-0.442***	
search		(0.168)	
Rho AM-job		0.132***	
search		(0.0395)	
Rho CM - AM		0.528***	
		(0.0111)	
Log L		-43613.954	
Wald Chi 2		11490.48***	
Pseudo R2		0.08	
Observations		14,248	

Source: Survey on working conditions and quality of work life - Luxembourg - 2013.

Notes: Robust standard errors clustered at the level of working in the same organisation in parentheses. Weighted estimations. Column (10) reports average marginal effects; other columns report coefficients. Rho are correlations parameters between error terms of equations. * significant at 10%; ** significant at 5%; *** significant at 1%.

