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Job strain and union membership: An empirical study based on French data

Olivier Guillot *, Magali Jaoul-Grammare **, Isabelle Terraz **

Abstract: This paper aims to contribute to the analysis of the impact of employees' working conditions on union membership by specifically examining whether being exposed to job strain (or job iso-strain) increases the propensity to join unions. The study is based on data from the REPONSE survey, carried out in France in 2011. Two-level (individual / economic sector) logistic regression models are used to analyse the individual decision of union membership while accounting for sectoral effects. The results indicate that having a job with low or medium decision latitude (as opposed to high decision latitude) is associated with a higher probability of union membership. This latter effect is stronger when support from the hierarchy is low rather than high or medium. By contrast, the level of psychological demand does not seem to have any significant influence on unionisation. The link between job iso-strain (or a certain form of iso-strain) and union membership remains significant when the potential endogeneity of this factor is taken into account. These findings lend some support to theories like the frustration-aggression approach, which relates the union membership decision to work dissatisfaction and the desire of employees to change their working conditions.

Key words: Trade unions; Union membership; Working conditions; Job strain; Economic sectors; France.
JEL Classification: J5.

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In 1997, the European Council launched the EU Employment Strategy to foster the development of employment, both in quantity and quality. Since then, under the pressure of globalisation and rapid technological innovation, the issue of job quality has attracted growing interest, with various measurement frameworks being mobilised (UNECE [2010], [2015]; Eurofound [2012], [2016]; OECD [2013], [2014], [2018]). The central focus generally lies in the work environment and its perception by employees. The nature of the working environment can be linked to factors like the type of job, the content of the work performed and working-time arrangements (OECD [2018]). These factors are likely to affect employees' views about their work and influence their level of stress. In the literature, an extensively used measure of stressful working conditions is the concept of job strain.

According to Karasek's model, job strain is a situation where workers face high psychological demands (for instance, having to hurry at work, coping with conflicting instructions) and have little leeway to carry out their tasks (under-use of skills, lack of autonomy in decision making), which is called low decision latitude (Karasek [1979]). To this job strain concept, Johnson and Hall [1988] added the dimension of low social support (defined in the literature as a lack of instrumental or emotional support from supervisors and/or colleagues). They then showed that the combination of high job demand, low decision latitude and low social support – namely a "job iso-strain" situation – appears to be damageable for workers' health and well-being. This has been confirmed in many studies (see, e.g., Kivimäki et al. [2012], or Slopen et al. [2012]). In this paper, leaving aside the health dimension, we examine whether experiencing job strain or job iso-strain may also incite employees to increase their participation in the workplace and, more specifically, to join unions.

A large literature can be found on the determinants of union membership, depicting empirical regularities across countries. Beside macroeconomic and institutional factors (Fazekas [2011]; Ebbinghaus et al. [2011]; Jaoul-Grammare and Terraz [2013]), individual characteristics such as age, education or gender appear to be common determinants of workers' union status. Since the mid-2000s, a number of studies have focused on the role of the working environment. For instance, Macky and Boxall [2009] showed that work intensification increases union membership in New-Zealand. In Anglo-Saxon countries, attention has been concentrated on the link between the working environment and/or the perception of it and the desire to join unions, rather than the actual membership status[1] (Bryson and Freeman [2013]; Friedman et al. [2006]; Godard [2011]). Friedman et al. [2006] found that stress increases the desire to be a union member. Grouping different variables in a job quality index, Godard [2011] reported an inverse relation with the propensity to vote in favour of unions. Similarly, Bryson and Freeman [2013] found that poor job quality was positively related to the desire to join unions.

[1] As certification elections in establishments may hinder union membership, the latter link could give a more accurate picture of the influence of the working environment on the individual decision.

This paper aims to contribute to the analysis of the influence of the working environment on union membership by specifically investigating the role of job strain / job iso-strain in the workers' decision to be union members. In contrast to existing studies that used composite indexes including both working conditions and perception of them (stress / dissatisfaction), we explicitly rely on the concepts of high psychological demand, low decision attitude and low social support. Since these conditions have been shown to lead to mental strain, our hypothesis is that workers may react to this stress by becoming union members. This would then appear as an offensive motive of being in unions, in accordance with the psychologist theory of union membership (where unionisation is seen as a way for workers to change their work environment). To our knowledge, this paper is one of the first to specifically consider the possible link between job strain and union membership. The only existing study on this issue is that of Karasek [2004] who addressed the impact of job strain on workers' participation in political or union activity (with no distinction being made between these two forms of engagement).

Another contribution of this paper is that it focuses on France, where few micro-econometric studies have investigated the determinants of union membership. France is a country which shares common institutional traits with other Western European states. In France, the decision to be a union member is a private decision and is not necessarily related to the presence of a union in the firm. Moreover, as in other continental countries, a majority of workers are covered by collective agreements, whether they are union members or not, due to the existence of *erga omnes* clauses and administrative extensions[2] (OECD [2017]).

This paper also aims to enrich the analysis of union membership by taking into account factors at the sectoral level and analysing the individual decision to be in a union while controlling for these contextual effects. Large discrepancies in union membership rates can be found depending on economic sectors. This fact is largely acknowledged in the literature and usually explained by historical and sociological factors. We here investigate the role of other determinants.

The rest of the paper is organised as follows. Section 2 provides a literature review. Section 3 is devoted to the data and methodology used in this study. Section 4 presents and discusses the main findings. Finally, Section 5 concludes.

Literature review

A number of explanations of union membership have been put forward in the literature. They are related to various fields of research such as economy, sociology, psychology and political science (see, e.g., Schnabel and Wagner [2007], or Godard [2008]).

[2] *Erga omnes* clauses extend an agreement to all workers in a signatory company. Administrative extensions are mechanisms that extend the terms of a collective agreement at sectoral level to workers in firms that have not signed the agreement or are not affiliated to a signatory employer organisation (OECD [2017]).

The economic approach considers a demand-offer framework to explain the decision to become a union member. On the demand side, this decision stems from a cost-benefit analysis and potential union members act as utility-maximisers. Membership is expected to be negatively related to the costs of joining unions and positively related to gains, whether monetary or non-monetary. Membership dues or psychic costs may indeed lower the propensity to join a union. On the opposite, monetary incentives provided by wage premium increase the likelihood of becoming a member. Non-pecuniary incentives such as better working conditions, strike pay, legal advice or dismissal protection (Goerke and Pannenberg [2011]) may also increase the demand for union membership. On the supply side, it is often argued that services offered by unions are related to the establishments' size. The attitude of managers towards unions is also bound to favour or inhibit the implementation of unions in the workplace.

A puzzle raised by this approach is that non-union members may benefit from advantages bargained by unions. Why would then employees support the cost of membership if they can benefit from bargained agreements? This is known as the free-rider problem (Olson [1965]) and is especially an issue in France where discrimination between union and non-union members is not allowed and where extension procedures are common.

Social scientists offer a line of research to explain this puzzle and insist on the social dimension of membership (Booth [1985]; Naylor [1990]). Thus, it could be a way for workers to belong to a community and to conform to the rules of this community. Psychologists also offer different types of explanations. What they call the rational choice theory is close to the economic theory. Other approaches, like the frustration-aggression theory, argue that the decision to become a union member is mainly influenced by the individual's experience in the workplace and by the awareness of the possibility of acting on working conditions.

The empirical literature usually tests a mix of economic, sociological and psychological arguments. Variables taken into account broadly refer to different types of determinants. Beside personal characteristics (age, gender, education), workplace-related factors and job characteristics (type of job contract, public *vs* private sector, economic branch of activity, presence of a union at the workplace, etc.) are usually considered (Schnabel and Wagner [2007]). In this review, we focus on the impact of the employees' perception of their work environment on the union membership decision[3].

Work environment perception and union membership

According to the frustration-aggression theory, the decision of becoming a union member is related to dissatisfaction with work and the desire to change one's work environment. Another theory, the dissonance theory, sees in the gap between expectations and perception of work the motive to join

[3] Institutional features of countries also appear to have a predominant impact on membership (Fazekas [2011]; Ebbinghaus et al. [2011]). As our analysis is carried out on a single country, these factors will not be considered here.

unions. Both theories lead to a higher unionisation of dissatisfied workers. This is also in line with the "voice effect" (Freeman [1978]; Freeman and Medoff [1984]) according to which dissatisfied workers may choose to become union members in order to express their grievances instead of moving to another job.

In a multi-country study, Fazekas [2011] found a small positive effect of dissatisfaction on union membership, a result already obtained by Charlwood [2002] in the UK and by Friedman et al. [2006] in the US. But job dissatisfaction may itself be related to poor working conditions that trigger the decision to join a union. Using data from unionised workplaces in New-Zealand, Macky and Boxall [2009] examined the role of work intensification. They found that work overload, time demand and stress are factors increasing union membership. In the UK and in North America, the literature focused on the desire for union representation since the union membership decision may be hindered by the costs of organising unions' elections in the firm. Considering the desire for union representation may then circumvent this problem. Based on a survey of American production workers, Friedman et al. [2006] found that among non-unionised employees, stress increases the desire to join unions. More recently, Godard [2011] showed the importance of work experience variables in the desire for unions in Canada. Grouping different variables (coercion, stress, fatigue, insecurity, task complexity, influence, rights efficacy) in a job quality index, he found that poor quality jobs are associated with a higher propensity to vote for a union. His conclusion is that work variables *per se* rather than satisfaction are important for union representation. Using three data sources in the US and the UK, Bryson and Freeman [2013] also found a positive link between poor working conditions and the desire for unions. They built an index of employees' perception of poor working conditions based on several questions related to management, climate at the workplace or job quality. Poor economic conditions were found to increase the desire for union representation. Finally, considering the quality of management as an additional covariate, they found that poor economic conditions and bad management are important determinants of union vote.

We depart from the literature, that relies on composite indexes including both indicators of working conditions and perception of work environment (stress, dissatisfaction), by explicitly considering the role of job strain and job iso-strain in the union membership decision. According to Karasek [1979], job strain stems for the combination of high psychological demand at work and low decision latitude. High psychological demand is often caused by the necessity to hurry on the job, to accomplish a large amount of work or caused by the impression to be short of time. Low decision latitude can arise from a lack of autonomy in the way to cope with demand or from a low level of intellectual discretion (low level of skills). Relying on a large set of questions to assess these two dimensions, Karasek [1979] showed that experiencing job strain is related to a higher prevalence of physical or mental disorders. In the 80s, Johnson and Hall [1988] added the notion of social support to the Karasek model with the idea that social interactions at work may buffer the effects of high strained work situations. On the

contrary, low social support in the presence of high psychologic demand and low decision latitude – a situation of job iso-strain – may worsen them. The medical literature showed that job iso-strain results in higher incidence of cardiovascular diseases or high blood pressure (Kivimäki et al. [2012]; Slopen et al. [2012]). It also appears to be negatively linked to satisfaction (Wood [2008]; Bryson et al. [2016]), to mental health (Bakker and Demerouti [2007]), and positively linked to sickness absence (Niedhammer et al. [2013]). In this paper, we question the impact of job strain / job iso-strain on the decision to become a union member. Our intuition is that being in a high-strain job may incite workers to join unions in the hope of changing their working conditions.

Union membership in France

Micro-econometric studies on the determinants of union membership in France are sparse. Using data from the *Working Conditions Survey* of 2013, Pignoni [2016] found results consistent with studies in other countries. The probability of being a union member, among private sector employees, is positively associated with factors such as working in a large establishment (with more than 500 employees) or having an open-ended contract. Men, senior workers and those in intermediate occupations also have a greater probability of membership. A previous work based on the French part of the *European Social Survey* (2002/2003) depicted the same kind of determinants (Sandi [2006]). Women, young employees and those in atypical employment have a lower probability to have ever been members of trade unions. Beyond the effects of individual factors, it also appears from these two studies that working in specific economic sectors increases the probability of union membership.

Our study goes further and deepens the analysis of union membership by explicitly introducing job strain[4]. Moreover, we carry out a multilevel analysis and consider the individual decision to join a union as embedded in a given sectoral environment. Bechter et al. [2012] stressed that the discrepancies in unionisation rates across economic sectors within a country are almost as large as the national differences between countries. To explain this variability across sectors, historical and sociological factors are often invoked. But these arguments could be further explored. Since unions incur some costs to organise, unions are more likely to be present in older establishments (Bain and Elias [1985]; Booth [1985]; Schnabel and Wagner [2007]). Unions also tend to emerge where there are rents to extract. First underlined by the theoretical literature on unions (Booth [1995], for a review), this has been confirmed by several empirical studies (Abowd and Lemieux [1993]; Menezes-Filho and Van Reenen [2003]). Such structural factors might therefore play a role in explaining the differences in union membership rates between sectors. The approach taken in this paper allows us to identify the individual-level factors that influence the decision to be a union member while taking these contextual effects into account.

[4] In the studies by Pignoni [2016] and Sandi [2006], no indicator of job strain was included among the determinants of union membership.

Data and methodology

The REPONSE survey

Our empirical analysis is mainly based on the 4th round of the REPONSE (*Relations professionnelles et négociations d'entreprises*)[5] survey, carried out in 2011[6]. The REPONSE survey, provided by the Statistics department of the French Ministry of employment and labour (DARES), is a survey conducted every six years on social relations in the establishments of the non-agricultural private sector in France. It aims at comparing the points of view of three types of actors on industrial relations: managers, staff representatives, and employees. Indeed, in each of the establishments surveyed, information was collected from a management representative, a staff representative (if any), and a sample of employees. In the present study, we exploited both the employees' questionnaire and the managers' questionnaire.

The employees' questionnaire provides individual information on respondents' job characteristics and their working conditions. It has the advantage of containing both a number of questions relating to exposure to job strain / iso-strain and a question on union membership. The question on union membership was phrased as follows: "*Are you a union member?*" – with three possible answers: 1. "*Yes*"; 2. "*No, I have never been a member*"; 3. "*No, but I used to*"-. As regards the issue of job strain, it should be noted that the questionnaire of the REPONSE survey is far from including the whole set of Karasek's job content questions. The information collected on job psychological demand, decision latitude and support is nonetheless sufficient to identify the employees experiencing job strain / iso-strain. The questions we used were the following: "*Do you have to hurry in your work?*"; "*Are you able to fully utilise your skills in your work?*"; "*Are you free to decide how to do your work?*"; "*Is your work properly recognised?*" (four possible answers: 1. "*Always*"; 2. "*Often*"; 3. "*Sometimes*"; 4. "*Never*"). The first of these four questions, as already mentioned, relates to job demand. The second and third questions were used to measure the two components of decision latitude, namely "skill discretion" and "decision authority" respectively (Karasek et al. [1998]). Finally, social support was captured with the fourth question. For each of these underlying dimensions, based on employees' responses, three levels were distinguished: "low", "medium", and "high" (see Appendix 1)[7].

[5] Professional relationships and companies' bargaining.

[6] The REPONSE survey of 2011 took place in a particular context. Indeed, the economy was still affected by the consequences of the 2008-2009 crisis and by organisational changes that occurred in the early 2000s (Romans [2018]). Nevertheless, both the number of collective conflicts and the unionisation rate remained stable during this period.

[7] As can be seen, we relied on only one question to capture each dimension. It would have been possible to combine the responses to two questions of the survey to measure skill discretion ("*Are you able to fully utilise your skills in your work?*" / "*Does your job allow you to learn new things?*") or social support ("*Is your work properly recognised?*" / "*Does your superior take account of what you say?*"). However, in our opinion, using two questions for each of these two dimensions and only one for the two other ones would have been problematic. The questions selected here are relatively standard in the literature on job strain. The first three ones are comparable, respectively, to questions 10, 9 and 6 of the job content questionnaire included in the SUMER survey of 2003 (Guignon et al. [2008]).

The managers' questionnaire collects information on industrial relations at the workplace level, on labour conflicts, as well as data on firms/establishments' characteristics. A number of variables included in our analysis were extracted from this questionnaire. In particular, the information collected on firms/establishments' main features was used to characterise the structure of economic sectors and explain the discrepancies in union membership rates.

The REPONSE survey of 2011 was carried out among establishments with more than ten workers. It should also be noted that this survey did not cover all workers employed in these establishments. Indeed, due to the sampling procedure, workers with less than 15 months of seniority could not be surveyed. The whole dataset contains 4,023 establishments and 18,536 employees. Our analysis was restricted to workers employed in establishments whose managers also responded to the survey (11,378 employees). From this sample, we excluded employees working in two economic sectors ('Mining and Quarrying'; 'Activities of households as employers') due to an insufficient number of observations. We also removed individuals aged more than 64 years as well as those with missing information on union membership. Our final sample contains 11,051 employees[8].

Methodology

The workers' decision to join a trade union was analysed using two-level logistic regression models (see, for example, Snijders and Bosker [2012]). Level-1 is the individual (*i*) and level-2 is the sector in which he/she works (*j*). The dependent variable is coded 1 if the worker is a union member and 0 otherwise.

The primary factor of interest, i.e. experience of job strain / iso-strain, was introduced (at level-1) through a set of dummy variables combining the levels of job demand, job latitude and support. Six cases were distinguished (see Appendix 1):

(1) Job demand: medium/low; decision latitude: high (reference situation)
(2) Job demand: medium/low; decision latitude: medium/low; support: high/medium
(3) Job demand: medium/low; decision latitude: medium/low; support: low
(4) Job demand: high; decision latitude: high
(5) Job demand: high; decision latitude: medium/low; support: high/medium
(6) Job demand: high; decision latitude: medium/low; support: low.

As level-1 control variables, we included the main factors that have been considered in the literature (Schnabel and Wagner, 2007; Schnabel, 2013), namely age, sex, education level (highest degree obtained), occupation (executive / manual worker / others), type of job contract (permanent / temporary), working time (full-time / part-time), number of employees in the establishment (< 500 / ≥ 500), and whether there is a trade union at the workplace (for establishments with less than 500 employees). To

[8] All our analyses were performed on weighted data. We used the weight variable *pds_sal2* provided in the database.

these covariates, we also added a measure of job loss risk (i.e. whether the worker believes that he/she will lose his/her job in the next 12 months)[9] and two subjective variables coming from the managers' questionnaire. The first of these two variables is coded 1 if the social climate of the establishment is perceived as bad by managers (0 otherwise). The second one relates to managers' perceptions of trade unions. In particular, they had to indicate whether they "fully agree", "somewhat agree", "somewhat disagree" or "fully disagree" with the following statement: "Trade unions hinder the functioning of the enterprise". We thus created a dummy variable coded 1 if the managers' view on unions is negative (i.e. "fully agree" / "somewhat agree" responses) rather than positive or neutral ("somewhat disagree" / "fully disagree").

At level-2, twenty-eight different economic sectors were considered[10]. The nomenclature used in this paper is based on the NACE 2 classification (Appendix 2)[11]. In order to explain the inter-sector differences in trade union membership, a set of variables describing the structure of sectors were introduced as level-2 predictors. The criteria taken into account were the following: age of the establishment (percentage of establishments aged less than 10 years / 10-49 years / 50 years or more), activity evolution (percentage of enterprises/establishments whose volume of activity has increased / remained stable / decreased in the past 3 years), and business area (percentage of export-oriented enterprises). These variables were taken from the managers' questionnaire of the REPONSE survey[12].

Table 1

We began by estimating an "empty" model (i.e. a model without explanatory variables). This model (called "Model I") is of the form:

$$\log\left[\frac{Pr(Y_{ij}=1)}{1-Pr(Y_{ij}=1)}\right]=\alpha_j$$

Where Y_{ij} represents the dependent variable (i.e. the union membership status of individual *i* in sector *j*), and α_j is an intercept specific to sector *j*, defined as:

$$\alpha_j=\alpha+u_j \qquad u_j \rightarrow N(0,\tau_0)$$

The level-2 error term, u_j , is assumed to be normally distributed with mean 0 and variance τ_0.

[9] This perceived risk was only considered for employees with permanent job contracts.

[10] Professional negotiations are organised at the branch level in France. However, these branches are very numerous and disparate. Taking account of sectors seemed more relevant economically.

[11] The NACE (Statistical classification of economic activities) 2 (Rev. 2 – 2008) classification consists of 88 sectors (with numerical codes 01 to 99). Employees in the public sector (code 84) and those in agriculture (codes 01, 02 and 03) were not covered by the REPONSE survey. Similarly, none of the respondents was employed in Sector 99 ('Activities of extraterritorial organisations and bodies'). The 83 classes taken into account were grouped into 30 sectors (coded B to T). Because of the limited number of observations, we finally excluded two of these 30 sectors, namely sectors B ('Mining and quarrying') and T ('Activities of households as employers').

[12] The means of the explanatory variables are given in Table 1.

In a second and third step, we included successively the level-1 and level-2 covariates. Our models ("Model II" and "Model III"), in their reduced form, are written as:

$$\log\left[\frac{Pr(Y_{ij}=1)}{1-Pr(Y_{ij}=1)}\right]=\alpha+X_{ij}\beta_1+u_j$$

$$\log\left[\frac{Pr(Y_{ij}=1)}{1-Pr(Y_{ij}=1)}\right]=\alpha+X_{ij}\beta_1+Z_j\beta_2+u_j$$

Where X_{ij} and Z_j denote, respectively, the vectors of level-1 and level-2 explanatory variables, and β_1 and β_2 are the corresponding vectors of parameters.

The estimations were performed using the Glimmix procedure of the SAS® statistical software.

Descriptive analysis

In the sample studied, 10.8% of employees belong to a union. This rate is very close to the rate of 11% obtained by Pignoni [2016], [2017] using two different data sources (the *Working Conditions Survey* of 2013 and the French part of the 2013 wave of the *European Union Statistics on Income and Living Conditions* [EU-SILC]).

Union membership is only slightly higher among men than among women. Indeed, 11.3% of men are union members as against 10% of women. Larger differences are found between manual workers and executives (13% *vs* 7.3%), as well as between workers with permanent job contracts and those with fixed-term contracts (11.2% vs 3.9%). It can be noted that union membership is more likely among workers employed in establishments where unions are present (with a rate of 15.7%, as against 4.2% among those employed in establishments without union). Permanent contract employees who believe that they are at risk of losing their jobs and employees working in establishments where the social climate is considered as bad are also more likely to be union members (17.4% and 16.4%, respectively, *vs* 10%).

Membership rates vary with individual characteristics but also across economic sectors. In many industrialised countries, employees working in public utilities and in the manufacturing sector are more likely to be in unions (Boeri and Van Ours [2013]). This is particularly the case in France. In the present data, higher-than-average rates are found in the 'Electricity, gas, steam and air conditioning supply' sector (18.4%), manufacturing (21.3% in 'Manufacture of motor vehicles, trailers and semi-trailers; Manufacture of other transport equipment') and transportation sectors (20.5% in 'Water transport; Air transport; Warehousing and support activities for transportation; Postal and courier activities'). This is not surprising since unions first developed in large manufacture industries and gained in importance during the thirty-year post-war boom (Pignoni [2016]). In the transport sector, there is also a long history of unionisation. On the contrary, union membership is lower in the services.

However, a notable exception is the financial sector. Indeed, many French banks are former public establishments with strong unions (Pignoni [2016]).

As regards our primary factor of interest, the data indicate that almost one third (31%) of employees "always" have "to hurry at work" (Appendix 1). Half of them are "never" or only "sometimes" able "to fully utilise [their] skills in [their] work" and/or are "never" or only "sometimes" free "to decide how to do [their] work". Combining these two aspects (job demand and decision latitude), it appears that 17.8% of employees occupy high-strain jobs, i.e. jobs with high demands and low (or medium) decision latitude. A similar proportion of workers report a lack of support from their supervisors. Indeed, 18.2% feel that their work is "never properly recognised". According to the indicators used here, the proportion of employees exposed to iso-strain is 7.5%.

A first look at the data (without controlling for other factors) suggests a positive link between job strain and union membership. Indeed, employees with high job demand and low/medium decision latitude are more likely to be in unions than those not experiencing job strain. In our sample, the observed rates are 13.3% and 10.2% respectively. Furthermore, among workers in high-strain jobs, the proportion of union members is 4 points higher in those who are exposed to iso-strain than in those who are not (15.9% vs 11.6%).

Results and discussion

The results of the empty model show that the level-2 variance (τ_0) is statistically different from zero (with a value of 0.188; cf. Table 2, Model I). This indicates that the probability of union membership varies significantly across sectors, confirming the descriptive results presented above. After including the level-1 explanatory variables, the level-2 variance remains significant, although substantially reduced (estimated value of 0.065; cf. Model II). This is no longer the case when the level-2 covariates are added to the regression model (cf. Model III).

The effect of job strain on union membership

All but one of the estimated parameters of the dummies relating to job strain / iso-strain are of positive sign and statistically significant (at 1 or 5% level). Three observations can be made: (i) other things being equal, having a job with low or medium decision latitude (as opposed to high decision latitude) is associated with a higher probability of union membership; (ii) this latter effect is stronger when support from the hierarchy is low rather than high or medium (estimated odds ratios of around 1.6 and 1.3, respectively); (iii) the level of job demand does not seem to have any significant influence on union membership. Indeed, according to these results, workers exposed to high demands are not more likely to be in unions than those with lower levels. The estimated coefficient of the dummy "Job demand: high; decision latitude: high" is not significant and the parameters of the fourth and fifth

dummies (cases where job demand is high) do not differ in magnitude from those of the second and third dummies (job demand: medium/low)[13].

The Effects of the other level-1 covariates

Looking at the effects of the other level-1 explanatory variables, we see that the probability of being a union member increases with age. As in other studies, the coefficient associated with the squared term is significant and negative, suggesting that the effect of age starts to decline at some point. Interestingly, our analysis does not show any sex difference in union membership when controlling for other factors. Using data from the *Working Conditions Survey* carried out in France in 2013, Pignoni [2016] reported that men are somewhat more likely than women to join unions. This is not confirmed here. Similarly, in the present regressions, none of the education dummies appear significant at the 5% level.

Table 2

As regards job characteristics, we find that executives are less likely to be union members than manual workers and other employees. The same holds true for workers with non-permanent job contracts. The literature generally argues that employees with supervisory activities might be closer to employers and have a lesser need from the "collective voice" of unions (Beck and Fitzenberger [2004]; Checchi et al. [2010]; Pignoni [2016]). Workers with temporary contracts are often said to be more difficult to organise. Their attachment to the workplace might be lower. This is also the case for part-time employees. According to our results, however, this latter factor has no significant effect on union membership.

Beyond individual factors, our results indicate that the decision to become a union member is influenced by workplace characteristics. Working in a large establishment (i.e. with 500 employees or more) is associated with a higher probability of union membership. This is in line with a large literature (e.g. Bain and Elias [1985]; Booth [1985]) which provides different explanations. Unions may incur some fixed costs to organise and tend to emerge in larger establishments. Schnabel and Wagner ([2007], p. 22) also highlighted that union representation is more necessary in "*bureaucratic organisations where workers are likely to be treated impersonally and feel a greater need for representation and protection*". One should add that there are legal obligations to bargain in France which depend on the firms' size[14].

[13] These conclusions remain unchanged when using a standard logistic regression model with sector dummies rather than a two-level (individual/sector) model. Similarly, estimating separately two regressions, one for job strain and the other for iso-strain (with dummies for high job demand, low/medium decision latitude and low support, plus interaction terms), yields results that are consistent with those presented here.

[14] For instance, professional elections are mandatory in establishments with 11 or more employees. For those with more than 50 employees, a work council has to be elected. Establishments with more than 200 employees also have to bargain on specific subjects.

It also appears from the results that the presence of a trade union at the workplace has a major impact on union membership among workers employed in smaller establishments (i.e. with less than 500 employees). Indeed, workers in establishments with on-site union representatives are far more likely to belong to a trade union than those in establishments without union presence, other things being equal.

Beside work characteristics, work context also matters. Indeed, a bad social climate is associated with a higher probability of membership. To our knowledge, this has rarely been shown before. Bryson and Freeman [2013] found that British non-union members in non-union workplaces have a higher desire to vote for union representation when management is doing poorly. The managers' perception on unions, by contrast, does not seem to play a significant role. Flanagan [2005], using US data, showed that unionisation is positively linked to management opposition. We do not find such an effect for France.

Another interesting result from this analysis is the positive link, among employees with permanent job contracts, between job loss risk and union membership. The direction of the relationship remains however unclear. Indeed, the fear of losing their jobs may encourage workers to join a trade union, as a protection strategy or in order to increase their bargaining power in the layoff process. But being in a union may also be associated with a higher risk of being fired, especially in establishments with bad social climate.

The Effects of the level-2 covariates

Two of the three level-2 (sector) factors considered – evolution of activity and business area – have significant effects on the probability of union membership. Our results reveal that workers are more likely to belong to a trade union in sectors with high proportions of establishments with increasing or stable activity. This is in line with the theoretical literature showing that unionisation is more prevalent in economic sectors where there are rents to extract (Boeri and Van Ours [2013]). The argument goes that employers in less competitive environments can more easily pass wage increases on to consumers, without fear of being undercut by other producers. We also find a positive link between the percentage of export-oriented enterprises and the probability for workers to be union members. If international activities increase rents, the incentive to join unions may be greater in these sectors in order to benefit from trade created revenues. Indeed, a recent article on French data showed that the sensibility of wage to exports is higher in firms with collective bargaining (Carluccio et al. [2015]).

As regards the other factor taken into account (age of the establishment), one could have expected that the probability of being a union member would be significantly higher in sectors with high proportions of mature establishments where, partly for historical reasons, unions are more present. This is not confirmed by the data.

Discussion and robustness checks

Our results show a link between job iso-strain (or a certain form of iso-strain) and union membership. On the one hand, we find that the probability of being a union member is higher when workers have low skill discretion or low job control. Moreover, this effect appears to be greater in case of low social support. Hence, workers seem to be more prone to join unions when they are faced with both a lack of autonomy and a lack of recognition of their work. On the other hand, our results do not support the idea that high psychological demand leads workers to become union members. However, it should be noted that our indicator of psychological demand relies on a single factor, namely the necessity to hurry to perform work, whereas Karasek's model [1979] was built on a larger set of questions. Considering other items related to psychological demand could then lead to a different conclusion.

Confronted with job strain, workers are more likely to absent themselves from work (Niedhammer et al. [2013]) and more likely to leave their jobs (Freeman and Medoff [1984]). We here find that workers may also react to job strain in an offensive way and then become union members. This confirms the "voice effect" (Freeman [1978]; Freeman and Medoff [1984]) which states that unions provide a way for workers to express their discontent instead of quitting jobs. Our finding is also in line with the frustration-aggression theory or the dissonance theory which both conclude to a higher unionisation of dissatisfied workers. More generally, unions may provide a collective response to stressful working conditions. They provide a way to react inside the workplace instead of withdrawing from work.

Our results point to a correlation between job strain and union membership but may be not sufficient to conclude to a causal impact. For instance, a number of studies questioned the link between dissatisfaction and union membership. But an extensive literature also addressed the opposite link, building on the fact that union members are less satisfied than non-union members[15]. This fact is largely acknowledged but not uniquely explained. Whether it is due to a sorting effect or a causal effect is still an open debate (Artz [2010], [2012]; Bryson et al. [2004], [2010]; Doucouliagos et al. [2017]; Green and Heywood [2015]; Heywood et al. [2002]; Powdthavee [2011]). More precisely, some studies underline that unions create discontent in order to weigh in collective bargaining. In our study, union members would perhaps be more prone to report conditions related to job strain or job iso-strain. Thus, Green and Whitfield [2009] found that employees in workplaces with recognised unions are more likely to indicate that they have no time to complete tasks and are less likely to say that they have influence over the pace of work and how tasks are done. Bryson and Green [2015] also argued that employees have lower task discretion in unionised jobs. To account for this potential endogeneity problem, we estimated a (recursive) bivariate Probit model (Table 3), with job iso-strain being the

[15] See, in particular, Bryson et al. [2016]. Using comparable data for France and Britain, the authors found a negative relationship between union membership and job satisfaction, as well as between union membership and an index of job quality.

dependent variable of the first equation, while being at the same time introduced as an explanatory variable in the second one (i.e. the union membership equation). The iso-strain variable is here a dummy coded 1 if the worker's job situation is characterised by both low decision latitude and low social support (0 otherwise). In this model, the wage level was used as an "instrument" variable. Indeed, having hourly earnings below the median wage is positively associated with the probability of experiencing iso-strain but has not direct influence on the union membership decision. Given the results of Checchi et al. [2010], who found a significant effect of wage on union membership in a number of European countries[16], relying on this variable appears somewhat questionable. Unfortunately, our attempts to find an alternative instrument have remained unsuccessful. Although the results of this model should thus be taken with some caution, they seem to confirm that low decision latitude, combined with a low hierarchical support, has a positive impact on the probability of being a union member[17]. Furthermore, the estimated correlation between the error terms of the two equations is not statistically significant (ρ = -0.247), suggesting that endogeneity does not really affect the previous estimates.

Table 3

The data used in this analysis suffer from some limitations. Indeed, as previously mentioned, the REPONSE survey is restricted to establishments of the private sector with more than ten workers. Moreover, only employees working in the establishment for at least 15 months responded to the questionnaire. Hence, there is an underestimation of precarious employment in this dataset. This led us, as a robustness test, to re-estimate our regressions on data from another source, namely the 2010 wave of the SRCV (*Statistiques sur les Ressources et les Conditions de Vie*)[18] survey. This survey is the French part of the *European Union Statistics on Income and Living Conditions* (EU-SILC), a household panel survey coordinated by EUROSTAT. The questionnaire of the SRCV survey was asked to individuals aged 16 or over. It then covers all people in employment whatever the firm's size. In 2010, information was collected on union membership[19]. The questionnaire also included some questions about job demand, decision latitude and support (from the hierarchy). Unfortunately, these questions were posed to only two thirds of the employed respondents, which explains why the SRCV survey was not used as the main data source in this study. In the regressions on the SRCV sample (restricted to employees working in the private sector), we included, as in the bivariate Probit model, a

[16] In the literature, the individual's wage level was explicitly included as a determinant of union membership in only a small number of studies. Checchi et al. [2010], in their multi-country study, found that the relative distance from the median earnings (below/above) was associated with a lower probability of union membership in Sweden, Norway, the Netherlands and the UK, but not in Italy, West Germany and East Germany (where no significant effect was observed, after controlling for endogeneity). As regards Germany, their results are in line with those of Goerke and Pannenberg [2004], who also found no significant relationship between earnings and union membership.

[17] When we include this variable in the multilevel model (instead of using the set of dummies), we also find a significant positive effect (results available upon request).

[18] Statistics on resources and life conditions.

[19] It should be noted that the SRCV survey does not provide any longitudinal information on union membership.

dummy variable for low decision latitude and low social support. Again, a positive link with union membership was found (Table 4).

According to our results, the broader context of the establishment as evaluated by managers also matters. A bad social climate seems to increase membership, a finding that lends further support to the aforementioned theoretical approaches. Finally, one could have expected that the political roots of the French trade union movement could influence managers' attitudes and the union membership decision. Indeed, according to Mouriaux [2009], French employers have a long tradition of hostility with respect to unionisation. But, judging from our results, the managers' perception of trade unions does not seem to influence the employees' decision of membership. Nevertheless, our data do not allow us to conclude on eventual actions of managers which could hinder trade union actions. Indeed, as shown by Breda [2014], union representatives in France may be exposed to discrimination.

Table 4

Conclusion

The purpose of this paper was to contribute to the analysis of the impact of employees' working conditions on union membership by specifically examining whether being exposed to job strain / job iso-strain increases the propensity to join unions. Our results, based on French data, did not show any significant link between the level of psychological demands and union membership. But we found that experiencing job iso-strain (or a certain form of iso-strain) has a positive effect on the probability of being a union member. This latter effect remained significant when the potential endogeneity of this factor was controlled for.

Poor working conditions are associated with health problems, higher risk of sickness absence, and reduced well-being. We found here that such a situation also plays a role in the union membership decision. Faced with a lack of autonomy and a lack of recognition of their work, employees may choose to join unions as a protest reaction to an unsatisfactory working environment. This appears to be in line with the frustration-aggression theory or the "voice model" (Freeman and Medoff [1984]).

Nevertheless, further investigation is required. These findings would need to be confirmed by studies on other countries with different institutional backgrounds. In the case of France, a possible extension would be to replicate the analysis using surveys carried out in different years, which would allow us to examine whether the macroeconomic context matters. Access to richer data would also be necessary in order to rely on broader indicators of psychological demand, job latitude and social support.

Table 1
Means of explanatory variables

	Union members	Non-members	All
Level-1 (individual) explanatory variables			
Age	44.2	40.2	40.6
Age-squared	2038.7	1725.4	1759.2
Sex: Male	0.615	0.584	0.587
Education (highest degree)			
Without diploma	0.115	0.094	0.096
< Baccalauréat	0.589	0.527	0.534
Baccalauréat	0.158	0.164	0.163
> Baccalauréat	0.138	0.215	0.207
Occupation			
Executive	0.141	0.217	0.209
Manual worker	0.386	0.311	0.319
Others	0.473	0.472	0.472
Type of job contract / Job loss risk			
Permanent contract – Job loss risk: no	0.562	0.613	0.607
Permanent contract – Job loss risk: yes	0.183	0.104	0.113
Permanent contract – Job loss risk: missing	0.235	0.222	0.223
Non-permanent contract	0.020	0.061	0.057
Part-time work	0.122	0.145	0.142
Number of employees in the establishment / Union presence at the workplace			
< 500 – Union presence: no	0.163	0.453	0.422
< 500 – Union presence: yes	0.590	0.369	0.392
≥ 500	0.247	0.178	0.186
Job strain / Iso-strain			
Demand: medium/low; decision latitude: high	0.302	0.376	0.368
Demand: medium/low; decision latitude: medium/low; support: high/medium	0.278	0.244	0.247
Demand: medium/low; decision latitude: medium/low; support: low	0.112	0.070	0.075
Demand: high; decision latitude: high	0.087	0.137	0.132
Demand: high; decision latitude: medium/low; support: high/medium	0.111	0.102	0.103
Demand: high; decision latitude: medium/low; support: low	0.110	0.071	0.075
Social climate in the establishment : Bad	0.197	0.122	0.130
Managers' view on unions			
Positive or neutral	0.742	0.664	0.673
Negative	0.245	0.300	0.294
Information missing	0.013	0.036	0.033
Level-2 (sector) explanatory variables			
% of establishments aged less than 10 years	13.5	14.0	14.0
aged 10-49 years	65.9	66.9	66.8
aged 50 years or more	20.6	19.1	19.2
% of enterprises/establishments whose volume of activity			
has increased in the past 3 years	40.3	40.7	40.7
has remained stable in the past 3 years	34.4	34.1	34.1
has decreased in the past 3 years	25.3	25.2	25.2
% of export-oriented enterprises	24.7	21.7	22.0
Number of observations			
Individuals	1,251	9,800	11,051
Sectors			28

Source: REPONSE 2011, DARES (Authors' computations).

Table 2
Union membership: estimated parameters of the multilevel regressions

	Model I	Model II	Model III
Fixed effects			
Intercept	-2.107 ***	-6.271 ***	-6.980 ***
Age	-	0.117 ***	0.117 ***
Age-squared	-	-0.001 ***	-0.001 ***
Sex: Male	-	0.086	0.092
Education (highest degree)			
Without diploma	-	*Ref.*	*Ref.*
< Baccalauréat	-	-0.065	-0.076
Baccalauréat	-	0.083	0.055
> Baccalauréat	-	-0.212	-0.246 *
Occupation			
Executive	-	-0.514 ***	-0.529 ***
Manual worker	-	0.169 **	0.179 **
Others	-	*Ref.*	*Ref.*
Type of job contract / Job loss risk			
Permanent contract – Job loss risk: no	-	*Ref.*	*Ref.*
Permanent contract – Job loss risk: yes	-	0.459 ***	0.469 ***
Permanent contract – Job loss risk: missing	-	-0.076	-0.072
Non-permanent contract	-	-0.784 ***	-0.793 ***
Part-time work	-	-0.144	-0.140
Number of employees in the establishment / Union presence at the workplace			
< 500 – Union presence: no	-	*Ref.*	*Ref.*
< 500 – Union presence: yes	-	1.297 ***	1.298 ***
≥ 500	-	1.208 ***	1.212 ***
Job strain / Iso-strain			
Demand: medium/low; decision latitude: high	-	*Ref.*	*Ref.*
Demand: medium/low; decision latitude: medium/low; support: high/medium	-	0.287 ***	0.289 ***
Demand: medium/low; decision latitude: medium/low; support: low	-	0.484 ***	0.484 ***
Demand: high; decision latitude: high	-	-0.165	-0.163
Demand: high; decision latitude: medium/low; support: high/medium	-	0.232 **	0.235 ***
Demand: high; decision latitude: medium/low; support: low	-	0.499 ***	0.500 ***
Social climate in the establishment : Bad		0.234 ***	0.236 ***
Managers' view on unions			
Positive or neutral	-	*Ref.*	*Ref.*
Negative	-	-0.058	-0.051
Information missing	-	-0.457 *	-0.449 *
Level-2 (sector) variables			
% of establishments aged 10-49 years	-	-	-0.011
% of establishments aged 50 years or more	-	-	-0.002
% of enterprises/establishments whose volume of activity has increased in the past 3 years	-	-	0.012 **
% of enterprises/establishments whose volume of activity has remained stable in the past 3 years	-	-	0.024 ***
% of export-oriented enterprises	-	-	0.008 ***
Random effects			
Level-2 intercept variance (τ_0)	0.188 ***	0.065 **	0.036
-2 Residual log pseudo-likelihood	59072.65	61973.16	62056.43
Number of observations	11,051	11,051	11,051

*** significant at 1% level; ** significant at 5% level; * significant at 10% level; *Ref.*: category of reference.
Source: REPONSE 2011, DARES (Authors' computations).

Table 3

Job strain and union membership: estimated parameters of the bivariate Probit model

	Job strain	**Union membership**
Intercept	0.127	-3.616 ***
Age	-0.020	0.054 ***
Age-squared	0.000	-0.000 **
Sex: Male	-0.080 *	0.092
Education (highest degree)		
Without diploma	*Ref.*	*Ref.*
< Baccalauréat	0.026	-0.047
Baccalauréat	0.051	-0.008
> Baccalauréat	0.027	-0.147 *
Occupation		
Executive	-0.537 ***	-0.294 ***
Manual worker	0.236 ***	0.079 *
Others	*Ref.*	*Ref.*
Type of job contract / Job loss risk		
Permanent contract – Job loss risk: no	*Ref.*	*Ref.*
Permanent contract – Job loss risk: yes	0.789 ***	0.203 ***
Permanent contract – Job loss risk: missing	0.151 ***	-0.030
Non-permanent contract	0.062	-0.373 ***
Part-time work	0.042	-0.051
Number of employees in the establishment / Union presence at the workplace		
< 500 – Union presence: no	*Ref.*	*Ref.*
< 500 – Union presence: yes	0.144 ***	0.658 ***
≥ 500	0.137 **	0.622 ***
Hourly wage: < median wage rate	0.169 ***	-
Job strain / Iso-strain: decision latitude: low; support: low	-	0.717 **
Social climate in the establishment : Bad	-0.077	0.159 ***
Managers' view on unions		
Positive or neutral	*Ref.*	*Ref.*
Negative	0.040	-0.038
Information missing	0.094	-0.253 *
Sector variables		
% of establishments aged 10-49 years	-0.016 ***	-0.005
% of establishments aged 50 years or more	-0.017 ***	-0.000
% of enterprises/establishments whose volume of activity has increased in the past 3 years	-0.000	0.006 ***
% of enterprises/establishments whose volume of activity has remained stable in the past 3 years	-0.003	0.013 ***
% of export-oriented enterprises	0.004 ***	0.004 ***
Rho		-0.247
Log likelihood		-6273.93
Number of observations		11,051

*** significant at 1% level; ** significant at 5% level; * significant at 10% level; *Ref.*: category of reference.
Source: REPONSE 2011, DARES (Authors' computations).

Table 4
Union membership: multilevel regressions estimated on SRCV data

	Model I	Model II	Model III
Fixed effects			
Intercept	-2.549 ***	-9.345 ***	-14.159 ***
Age	-	0.221 ***	0.222 ***
Age-squared	-	-0.002 ***	-0.002 ***
Sex: Male	-	0.221 *	0.264 **
Country of birth			
France	-	*Ref.*	*Ref.*
Other EU country	-	0.282	0.285
Non-EU country	-	-0.527 **	-0.522 **
Education (highest degree)			
Without diploma	-	*Ref.*	*Ref.*
< Baccalauréat	-	0.517 ***	0.496 ***
Baccalauréat	-	0.435 *	0.396 *
> Baccalauréat	-	0.382	0.335
Family status: Single	-	-0.008	-0.024
Occupation			
Executive	-	-0.441 ***	-0.453 ***
Manual worker	-	0.212	0.293 **
Others	-	*Ref.*	*Ref.*
Non-permanent job contract	-	-1.915 ***	-1.923 ***
Part-time work	-	-0.393 **	-0.394 **
Number of employees in the establishment / Union presence at the workplace			
< 500 – Union presence: no	-	*Ref.*	*Ref.*
< 500 – Union presence: yes	-	1.946 ***	1.944 ***
≥ 500	-	1.872 ***	1.865 ***
Information missing	-	0.722 ***	0.725 ***
Job strain / Iso-strain			
Decision latitude and/or support: high/medium	-	*Ref.*	*Ref.*
Decision latitude: low; support: low	-	0.560 ***	0.572 ***
Information missing	-	-0.114	-0.111
Association membership (excluding unions)	-	0.231 **	0.225 **
Level-2 (sector) variables			
% of establishments aged 10-49 years	-	-	0.024
% of establishments aged 50 years or more	-	-	0.023 **
% of enterprises/establishments whose volume of activity has increased in the past 3 years	-	-	0.032 ***
% of enterprises/establishments whose volume of activity has remained stable in the past 3 years	-	-	0.035 ***
% of export-oriented enterprises	-	-	0.010 **
Random effects			
Level-2 intercept variance (τ_0)	0.423 ***	0.127 **	0.045
-2 Residual log pseudo-likelihood	34911.13	38471.84	38582.44
Number of observations	6,143	6,143	6,143

*** significant at 1% level; ** significant at 5% level; * significant at 10% level; *Ref.*: category of reference.
Source: SRCV 2010, INSEE (Authors' computations).

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Appendix 1

Measures of job demand, decision latitude and social support used in this study

Questions of the REPONSE survey:

Question 1: "*Do you have to hurry in your work?*"
Question 2: "*Are you able to fully utilise your skills in your work?*"
Question 3: "*Are you free to decide how to do your work?*"
Question 4: "*Is your work properly recognised?*"

1. Job demand:

"High" if answer to Question 1 is "*Always*"
"Medium" if answer to Question 1 is "*Often*" (or missing)
"Low" if answer to Question 1 is "*Sometimes*" or "*Never*"

2. Decision latitude:

"High" if skill discretion is "high"/"medium" and decision authority is "high"/"medium"
"Medium" if skill discretion is "low" and decision authority is "high"/"medium"
or if skill discretion is "high"/"medium" and decision authority is "low"
"Low" if skill discretion is "low" and decision authority is "low"

Skill discretion:

"High" if answer to Question 2 is "*Always*"
"Medium" if answer to Question 2 is "*Often*" (or missing)
"Low" if answer to Question 2 is "*Sometimes*" or "*Never*"

Decision authority:

"High" if answer to Question 3 is "*Always*"
"Medium" if answer to Question 3 is "*Often*" (or missing)
"Low" if answer to Question 3 is "*Sometimes*" or "*Never*"

3. Social support (from the hierarchy):

"High" if answer to Question 4 is "*Always*" or "*Often*"
"Medium" if answer to Question 4 is "*Sometimes*" (or missing)
"Low" if answer to Question 4 is "*Never*"

Table A.1.1
Employees' answers to the four questions

%

	Always	***Often***	***Sometimes***	***Never***	Total
Do you have to hurry in your work?	31.1	41.5	25.1	2.3	100.0
Are you able to fully utilise your skills in your work?	18.4	44.7	29.8	7.1	100.0
Are you free to decide how to do your work?	20.1	46.8	23.5	9.6	100.0
Is your work properly recognised?	6.9	30.1	44.6	18.4	100.0

Note: number of missing values: 51, 79, 54 and 115, respectively.

Source: REPONSE 2011, DARES (Authors' computations).

Table A.1.2
Levels of job demand, decision latitude and social support derived from answers to the four questions

%

	High	***Medium***	***Low***	Total
Job demand	31.0	41.7	27.3	100.0
Decision latitude	50.0	30.5	19.5	100.0
Skill discretion	*18.3*	*45.1*	*36.6*	*100.0*
decision authority	*20.0*	*47.1*	*32.9*	*100.0*
Social support	36.6	45.2	18.2	100.0

Source: REPONSE 2011, DARES (Authors' computations).

Appendix 2

The classification of economic sectors used in this study

Table A.2.1
Definitions of sectors, distribution of employees by sector and union membership rate by sector

NACE 2 classification [(a)]	Classification used	Activities	% of employees working in the sector [(b)]	Union membership rate (%) [(b)]
01, 02, 03	(A)	Products of agriculture, hunting and related services; Products of forestry, logging and related services; Fish and other fishing products; Aquaculture products; Support services to fishing	-	-
05, 06, 07, 08, 09	(B)	Coal and lignite; Crude petroleum and natural gas; Metal ores; Other mining and quarrying products; Mining support services	-	-
10, 11	C1	Manufacture of food products and beverages	3.6	13.4
12, 13, 14, 15, 32	C2	Manufacture of tobacco products, textiles, wearing apparel, leather and related products; other manufacturing	1.4	10.2
16, 17, 18, 31	C3	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials; Manufacture of paper and paper products; Printing and reproduction of recorded media; Manufacture of furniture	2.2	9.0
19, 20, 21, 22, 23	C4	Manufacture of coke and refined petroleum products; Manufacture of chemicals and chemical products; Manufacture of basic pharmaceutical products and pharmaceutical preparations; Manufacture of rubber and plastic products; Manufacture of other non-metallic mineral products	5.4	14.5
24, 25	C5	Manufacture of basic metals; Manufacture of fabricated metal products, except machinery and equipment	3.9	12.6
26, 27, 28, 33	C6	Manufacture of computer, electronic and optical products; Manufacture of electrical equipment; Manufacture of machinery and equipment n.e.c.; Repair and installation of machinery and equipment	5.2	12.2
29, 30	C7	Manufacture of motor vehicles, trailers and semi-trailers; Manufacture of other transport equipment	3.0	21.3
35	D	Electricity, gas, steam and air conditioning supply	0.5	18.4
36, 37, 38, 39	E	Water Supply; Sewerage; Waste Management; Remediation Activities	0.9	15.3
41, 42	F1	Construction of buildings; Civil engineering	2.1	8.3
43	F2	Specialised construction activities	5.4	4.1
45	G1	Wholesale and retail trade and repair of motor vehicles and motorcycles	1.8	2.3
46	G2	Wholesale trade, except of motor vehicles and motorcycles	6.9	6.2
47	G3	Retail trade, except of motor vehicles and motorcycles	8.2	8.3
49	H1	Land transport and transport via pipelines	5.2	12.6
50, 51, 52, 53	H2	Water transport; Air transport; Warehousing and support activities for transportation; Postal and courier activities	3.4	20.5
55, 56	I	Accommodation and food service activities	3.3	9.8
58, 59, 60, 61, 62, 63	J	Information and communication	2.9	9.0
64, 65, 66	K	Financial and insurance activities	5.6	10.5
68	L	Real estate activities	1.3	15.2
69, 70, 71,72, 73, 74, 75	M	Professional, scientific and technical activities	6.4	6.6
77, 78, 79, 80, 81, 82	N	Administrative and support service activities	5.4	10.8
84	(O)	Public administration and defence; Compulsory social security	-	-
85	P	Education	1.4	14.0

86	Q1	Human health activities	3.5	15.3
87	Q2	Residential care activities	3.8	13.4
88	Q3	Social work activities without accommodation	4.8	7.5
90, 91, 92, 93	R	Arts, entertainment and recreation	0.9	9.0
94, 95, 96	S	Other service activities	1.6	13.0
97, 98	(T)	Activities of households as employers of domestic personnel; Undifferentiated goods-and-services-producing activities of private households for own use	-	-
99	(U)	Activities of extraterritorial organisations and bodies	-	-

(a) Source: Eurostat [2008]. Nonexistent codes: 04, 34, 40, 44, 48, 54, 57, 67, 76, 83, 89.

(b) Source: REPONSE 2011, DARES (Authors' computations) – sample of 11,051 employees.