Psychosocial risks exposure and mental health status: analysis from SIP survey

(Preliminary version drafted for a presentation to JESF)

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Abstract

Purpose – The study sets out to examine the effect of exposure to psychosocial risks (PSR) at work ("job demand" and "lack of autonomy and latitude") on and workers mental health status (Major Depressive Episode, MDE) at the same date.
Design/methodology/approach – The study is based on a French survey, "Health and professional career", and focus on workers employed in private sector in 2010. We use an instrumental variable approach to address potential endogeneity of psychosocial risks.
Findings – Results in simple probit show that individual highly exposed to "job demands" have a higher probability to suffer from Major Depressive Episode compared to individuals less exposed. We find similar results for "lack of autonomy and latitude" with a smaller effect on mental health. These results are partially confirmed by instrumentation strategy. Indeed, an increase of one unit of our variable of job demands exposure leads to an average increase of 0.24 in the probability to suffer from a MDE in 2010. However causal effect of lack of autonomy and latitude on mental health is not statistically significant.
Originality/value – The main originality of this study is to take into account potential endogeneity of psychosocial risks exposure thank to an empirical strategy which identifying the causal effect of exposure to PSR at work on worker mental health. Moreover, this study use a rich French database allowing an analysis of the link between two dimensions of PSR for a particular period of changes in labor market. The many variables available allow constructing rich indicators of PSR and a precise indicator of workers mental health status.

Keywords – Worker's mental health, psychosocial risks factors, working population, SIP survey.
JEL: J81; J28; C35

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Introduction

In recent decades labor markets of industrials countries have experienced many changes. Globalization of economies has been accompanied by a rise of competition on products markets, instability of aggregate demand and higher technological progress that had major impacts on workers life through a rise of labor flexibility, major changes in working conditions, and exposure to high degrees of psychosocial risks. Crisis of the end of 2000 has reinforced negative effects of globalization on labor markets. Since late 2000s and especially since 2008, several studies have revealed, in France and in Europe, a rise of perception of employment insecurity, an intensification of work, a reduction of autonomy and more tension at work. (Eurofound, *Impact of the crisis on working conditions in Europe*, (2013)). Job quality has deteriorated in most European country (OECD, 2008) and these worst working conditions may have negative effects on worker's health and especially on mental health. Formerly, an important share of employment exposed workers to physical risks with a direct impact on their physical health. Expansion of services sectors and increasing introduction of information and communication technologies into job tasks transform the nature and origin of risks to which workers are exposed. These changes in the structure of economy modify job content, develop risks and increase concerns on workers mental health. (Robone, Jones, Rice 2011; Cottini 2012). In France, degradation of working conditions and workers mental health are increasingly take into account and are major preoccupations of labor and health ministries. For example, "Health at work" plans (plans santé au travail) aim for improvement working conditions and recommend "implementation of effective actions to prevent occupational hazards and ill-being at work". In this plan, a particular focus is on psychosocial risks that are responsible for 10% of expenditure of the work-related accident / occupational diseases branch of French health insurance but with greater effects on enterprise's economic performances. Concerning mental health, adverse working conditions are increasingly responsible. In several European countries, increasing number of workers reports work-related mental health problems and stressful working conditions (Parent-Thirion and *Al.* 2007).

The evolution of working conditions and emergence of psychosocial risks at work seems to have an implication for worker's mental health status. In this study, we propose to evaluate effects of psychosocial risks exposure in 2010 on French workers' mental health status at the same date. This article makes different contributions to the existing literature. First, it uses an original database, "Health and professional career survey" (enquête santé et itinéraire professionnel, SIP), which is more complete than surveys introduced earlier, and provides better understanding to psychosocial risks evolution through a prospective and retrospective questioning of 13,000 individuals asked both on their health and their career path before and after the 2008' crisis. The use of this data allows to build precise indicators of psychosocial risks thank to many questions similar to those of Karasek model. Moreover, a part of questionnaire MINI (*Mini International Neuropsychiatric Interview)* present in SIP survey provides a diagnostic instrument to construct our mental health indicator according to strict criteria of *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV).

Second, study of the relationship between exposure to psychosocial risks at work and workers mental health is subject to a reverse causality problem. We address potential endogeneity of psychosocial risks exposure thank to an instrumental variables

approach. Our empirical strategy exploits past exposure to psychosocial risks at work and sectorial economic context through resort of temporary work. Overall, the results support the initial intuition; workers more exposed to psychosocial risks have a higher probability to suffer from a major depressive episode. And these results are robust to taking into account potential endogeneity of variable of psychosocial risks exposure; causal effects estimated are slightly higher when endogeneity is corrected.

Working conditions and worker's health

An important part of literature, very influenced by Ruhm's work, focuses on the direct link between macroeconomic situation and especially periods of recession and workers' health, ignoring the transmission channels that may exist. Recent studies have developed this issue and sought to make the connection between visible consequences of recessions characterized by staff reductions, cost reduction measures, corporate restructuring and worker's physical and mental health. The College of expertise on monitoring psychosocial risks at work (2011) recognizes that measures taken by companies during recession can represent important factors in job stress and can lead to a steep rise in employee workloads, less tolerance to errors or restriction of autonomy at work. These degradations of working conditions are considered as psychosocial risks and the study of the relationship between work environment and worker's health is a segment of empirical literature linking macroeconomic situation and worker's health.

Many authors had based on two reference models to assess the professional stress (Karasek 1979; Siegrist 1996) and examine the possible link between exposure to adverse working conditions and various indicators of physical and mental health.

The Job Demand-Control model developed by Karasek (Karasek 1979; Karasek and Theorell 1990) is based on two dimensions of psychosocial risks: job demands (i.e., quantity of work, tight time schedule and fragmented work, difficult and complex tasks) and worker's decision latitude (control on their own activity, ability to use and develop their skills). According to Karasek, in workplace where a high job demands is associated with a low worker's decision latitude, workers will be exposed to a "Jobstrain" situation and this situation is risky for their physical and mental health. Johnson and Hall (1988) and Johnson and *Al* (1989) combine one other dimension to initial "Jobstrain" model and develop the Demand-Control-Support model. They add social support from colleagues or hierarchy that can benefit workers.

Much of the epidemiological literature is based on the model of "jobstrain" exposure, developed by Karasek, which allowed the development of several meta-analysis including results of numerous studies both on physical (Kivimäki and *Al*., 2006a) and mental health (Stansfeld and Candy, 2006). Several reviews of the literature have supplemented to the results highlighted by the meta-analysis of Stansfeld and Candy (2006) on the impact of working conditions on mental health, especially on depressive and anxiety disorders (Bonde 2008; Netterstrom and *Al*., 2008; Siegrist, 2008). For example a review of Netterstrom (2008) is based on 14 longitudinal epidemiological studies exploring the link between psychosocial stressors at work and development of depressive symptoms. Results found in these three works are similar and corroborate results already found by Stansfeld and Candy (2006), that is to say, workers exposed to high psychological demands, low decision latitude and low social

support have a superior probability to develop symptoms of depression or anxiety. Other authors are interested in case of mental health. Mausner-Dorsch and Eaton (2000) examine the relationship between occupational variables based on the Karasek model and three forms of depression (MDE, depression and dysphoria). They find that individuals with jobs characterized by high psychological demand and low autonomy will have a higher prevalence of depression. More recently, Rugulies and *Al*. (2006) are also based on Karasek's model, but integrate more psychosocial characteristics of work to analyze the impact on the symptoms of severe depression. They focused on a representative sample of working population of public employees in Denmark between 1995 and 2000. Similarly, they find that a deteriorated psychosocial work environment adversely affects worker's mental health. Cottini and Lucifora (2013) focused on European case using three waves of European surveys, 1995, 2000 and 2005 in order to determine the impact of job characteristics on recent trends in mental health. This article sets up an identification strategy because working conditions are not independent of workers' mental health. Indeed, distribution of workers with different working conditions is not independent of mental health status and mental health may influence the firm's choices according to job characteristics. The results postulate differences between countries. The authors highlight that many job attributes such as teamwork, execution of complex tasks, and reduction of autonomy leads to a higher probability to report mental health problems. The authors also show that labor market institutions and regulations regarding health and safety at work may largely explain differences between countries.

Other studies, also leaning on Karasek's model (1979), considered effects on physical health. Initial studies have focused on the development of cardiovascular diseases according to the working conditions (Karasek and *Al*., 1981 ; Belkic and *Al.,* 2004 ; Everson-Rose and Lewis, 2005 ; Sultan-Taïeb and *Al*., 2011). Other associations were tested on the impact of working conditions on more general health indicators or focusing on specific diseases such as perceived health (Niedhammer and Chea, 2003), quality of life (Cheng and *Al*, 2000), musculoskeletal disorders (Rugulies and Krause, 2005 ; Sultan-Taïeb and *Al*., 2011), or absenteeism for health reasons (Niehammer and *Al.,* 1998 ; Head and *Al*., 2006).

The second reference model is the effort-rewards model developed by Siegrist (1996). This model is based on the concept of reciprocity that should exist in social relations, particularly in professional life. Principal hypothesis of this model emphasizes that workers may be in stressful situation, which is risky for their health if situation in work is not balance. Situation at work is unbalanced if there exist a disequilibrium between efforts in terms of pressure at work, control, adaptation, investment and reward obtain in return in terms of wages, self-esteem, promotion, job security. Moreover, workers' personality and especially their overinvestment in work can be added to the model. According to Siegrist, exposure to disequilibrium between high efforts and low reward is factor of risks for workers' physical and mental health. This risk is higher if workers are over invested in work. A narrower empirical literature is based on the model of Siegrist (1996) to study the link between working conditions and health of workers. Stanfeld and *Al.* (1998) use the British survey Whitehall II and apply Siegrist's model on a cohort of British civil servants. They postulate that unbalanced relationship between efforts and rewards coupled with bad relationships at work leads, after controlling for potential confounding factors, to poor physical, psychological and

social health. Studies have also been conducted on cardiovascular diseases, mental health and various specific health indicators such as absenteeism for health reasons (Ala-Mursula and *Al.*, 2005), sleep disorders (Ota and *Al.*, 2009) and perceived health (Niedhammer and *Al.*, 2004).

Data and descriptive statistics

In this study we use the two waves (2006, 2010) of the French survey "health and professional careers" (santé et itinéraire professionnel, SIP) to investigate the link between exposure to psychosocial risks factors and mental health of French workers. SIP provides detailed information through variable panels available in three categories: health and risks behaviors, professional life and exposure to psychosocial risks and biographical details of individuals. This study focuses on two dimensions of psychosocial risks factors classified by the College of expertise on monitoring psychosocial risks at work (2011), "job demands" and "lack of autonomy and latitude" and on one mental pathology, Major Depressive Episode (MDE).

We concentrate our analysis on working population in private sector in 2010 and already surveyed in 2006. We focus on individuals working in 2010 because several questions concerning psychosocial risks exposure are not asked to new entrants in 2010. This allows constructing richer indicators of exposure to psychosocial risks in 2010. And we retain individuals already surveyed in 2006 to dispose information about past exposure less rich but useful for our instrumental approach. After deleting missing observations we obtained a sample of 3668 workers aged from 20 to 67 employed in private sector in 2010 and already surveyed in 2006.

Health status

Our definition of mental health is based on recommendations of *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) and we focus more precisely on one pathology: Major Depressive Episode (MDE). Construction of this indicator is based on questionnaire MINI (*Mini International Neuropsychiatric Interview*) of which a part focusing on depressed mood is present in SIP survey.

A two steps process realizes detection of this pathology. In a first time, two filter questions are asked: (1) "Over the past two weeks, have you felt particularly sad, pessimist, depressed, mostly during the day, and this almost every day?" and (2) "Over the past two weeks, have you had almost all the time the feeling of having no interest in anything, to have lost interest or pleasure in things that you usually like?". If the worker gives at least one positive answer, then he indicates symptoms from which he has suffered in a proposed list. (a) Your appetite has significantly changed, or you have gained weight or lost weight without any intention (variation in the month of +/- 5%); (b) You had sleeping problems nearly every night (falling asleep, night or early awakenings, sleep too much); (c) You talk or you move more slowly than usual, or on contrary you feel agitated, and you had trouble staying in place, almost every day; (d) You felt tired almost all the time, without energy, and it almost every day; (e) You feel worthless or guilty almost every day; (f) You had concentrating or making decisions problems almost every day; (g) You have had several dark thoughts (such as thinking that had better be dead), or you thought hurt you.

From this process and in accordance with DSM-IV criteria, we consider that an individual suffer from a major depressive episode if he answered positively at least at one filter question and has suffered from at least four symptoms of the proposed list or if he answered positively at two filter questions and has suffered from at least three symptoms of the proposed list.
Our dependent variable of mental health status, MDE_{2010}, is a dichotomous variable that take a value of 1 if worker is affected by MDE and 0 otherwise.

Psychosocial risks indicators

Our definition of exposure to psychosocial risks factors are based on seminal works of Karasek (1979), Karasek and Therorell (1990) with the model of jobstrain and on recommendations of the "College of experts on statistical monitoring of psychosocial risks" (2011) who propose to distinguish 6 dimensions of exposure to psychosocial risks: “job demands”, “emotional requirements”, “lack of autonomy and latitude”, “social relations and relationships at work”, “value conflicts” and “socio-economic insecurity”. Models of exposure to jobstrain enable to make link between work life and risks that this work imposes to health. They have been widely used in epidemiological studies and helped to highlight the fact that prolonged exposure to psychosocial risks has a potentially negative impact on health and particularly on the risk of developing musculoskeletal disorders, cardiovascular diseases or symptoms of depression. Three dimensions are generally included in these models (psychological demands, decision latitude, social support). We decide to focus our attention on the main two: job demands and decision latitude.
To construct our indicator of job demands, we consider a set of eight variables present in the second wave of the survey. These variables describe characteristics of job that leads to job demands exposure as in Karasek model and as preconizes recommendations of College of expertise (2011): (1) I work under pressure; (2) I have to think about too many things at once; (3) I am asked to do an excessive amount of work; (4) I am thinking of my work before falling asleep; (5) I have difficulties to conciliate my work and my family obligations; (6) I have to hurry; (7) Interrupting a task to another not provided; (8) I suffer at least of one rhythm constraint (among 9).
We make choice to use a multiple component analysis (MCA) to construct our summary indicator of job demands exposure. We extract the first principal component and we use coordinates of this first axis as continuous variable of exposure to job demands. We reverse scale of the variable to facilitate reading of our results. Thus, individuals more exposed to psychosocial risks are those with higher variable score. We hypothesize that the increase of psychosocial risks exposure does not have a linear effect on mental health. As a result, in order to overcome this problem we turn this variable into a logarithmic form.
We proceed in the same way to construct our indicator of lack of autonomy and latitude exposure. We use six variables characterizing this dimension in 2010: (1) My job is to repeat the same series of actions/operations continuously; (2) My job allows me to learn new things; (3) My job allows me to do things I like; (4) I can fully use my skills; (5) In my job, I have very little freedom to decide how I do my work; (6) I was consulted during the last 12 months about changes in work.

Other individual determinants of health

To estimate the impact of psychosocial risks exposure on workers mental health in 2010, it is necessary to take into account a range of variables that directly impact health status or play role of confounding factors. These variables include age, gender, family status, total amount of household resources, education level and a variable indicating whether individual can rely on someone to discuss and take important decision (Cheng and *Al.* 2000).

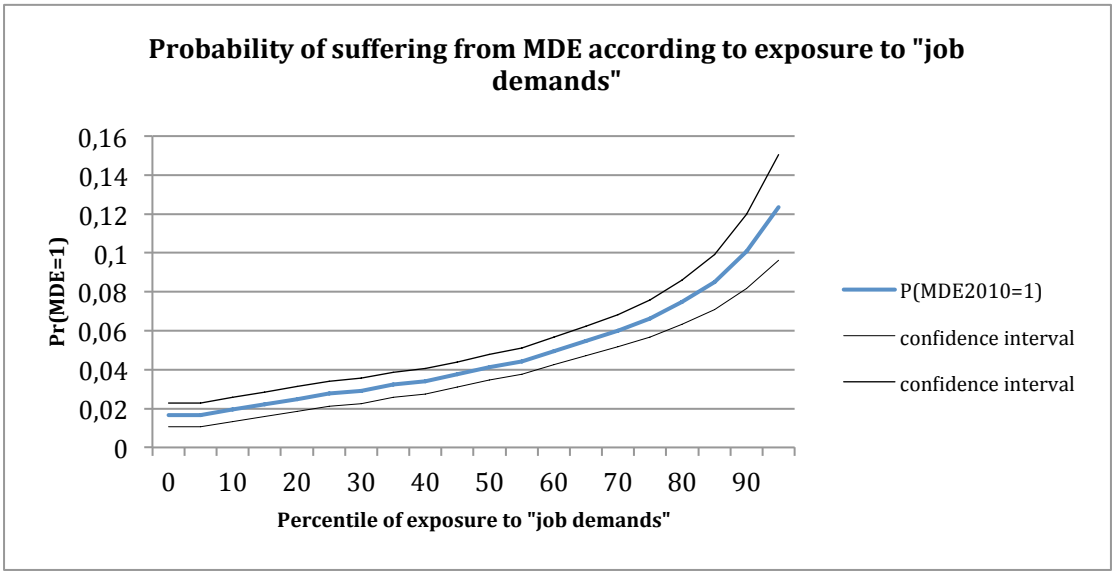
By means of data availability in SIP survey, we can take into account a wide range of job attribute as well as medical and occupational histories of individuals.

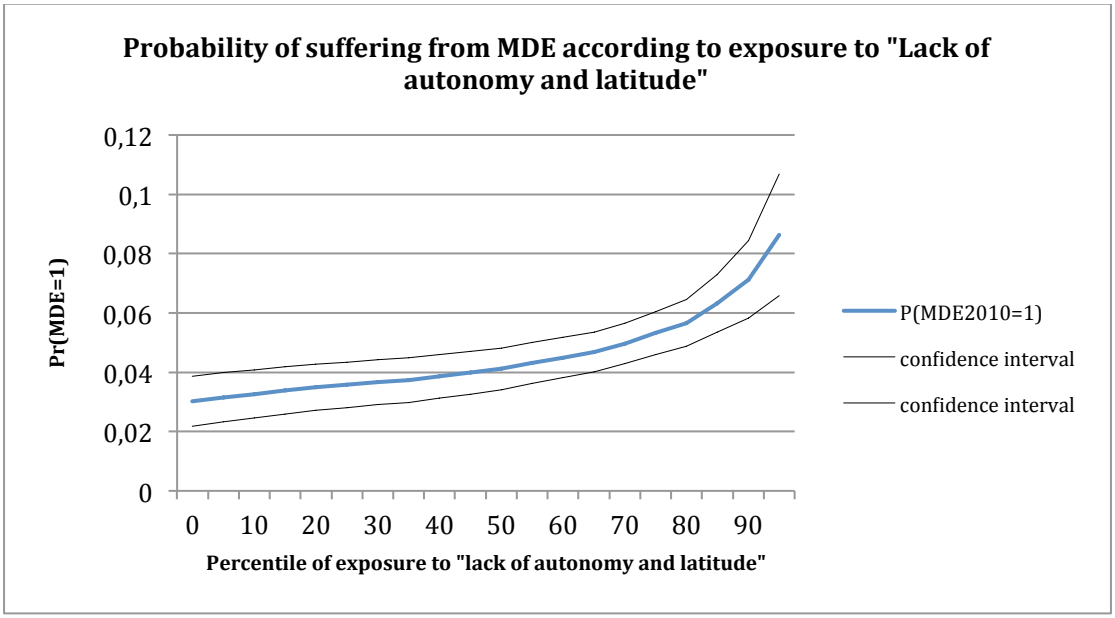
We add a set of variables to capture characteristics of current job especially, atypical characteristics such as night work, shift work, physical work that can have a negative impact on worker's mental health, part-timework, and permanent contract. We also add industry dummies to control unobservable factors in our regression common to all individuals but whose influence depends on the sector considered.

We also include medical and occupational histories of workers in estimates. Medical history is modeled by variables capturing the past physical and mental health. These variables indicate whether individual are physically in pain in 2006, suffer from MDE in 2006 as well as capture a presence during childhood of respondent of physical (illness, disability ...) or psychological (war, separation parents, violence ...) significant events (Llena-Nozal and *Al.* 2004, Leach and *Al.* 2008).

Occupational history is transcribed through career satisfaction, stressful personal events that have had an impact on the professional path between two survey's waves (death of a loved one, divorce, personal conflict, degradation of living conditions...) and through different types of professional mobility, which can have an effect on worker's mental health.

Figure 1 provides a first estimation of the relationship between workers' mental health and "job demands" exposure and figure 2 describes similar relationship for "lack of autonomy and latitude" exposure. These two figures report results from a bivariate regression between our indicator of mental health and our summary indicators of psychosocial risks exposure. We observe a positive correlation between exposure to psychosocial risks and probability to suffer from MDE, that is to say, workers more exposed to psychosocial risks have a higher probability to suffer from MDE. For example, the 10 percent of workers who are the more exposed to "job demands" have a probability to suffer from MDE of 10% in 2010 while the 10 percent who are the least exposed have a probability of 1% to suffer from MDE. We observe the same result for "lack of autonomy and latitude" exposure.





Empirical analysis

We alternatively consider 2 dimensions of PSR exposure: a summary indicator of job demands, constructed from eight items thanks to a principal component analysis; a summary indicator of decision latitude, built from six items similarly as job demands.

We first estimate the impact of PSR exposure (respectively "job demands" and "decision latitude"), on mental health, considering PSR exposure as exogenous. Given that mental health is measuring through a dummy variable equals to 1 if worker suffers from Major Depressive Episode, 0 otherwise, we estimate a Probit Model. Results are compared with those obtained from a Linear Probability Model. In both models, we

control for vectors of demographic characteristics, current job attributes, individual medical history and professional history of worker.

These two specifications are highly informative but provide only estimates of the correlation between workers mental health status and two dimensions of psychosocial risks, respectively job demands and lack of autonomy and latitude, after controlling for a set of confounding factors.

To measure the causal effect of psychosocial risks exposure on mental health status, it is necessary to take into account potential endogeneity of our variable of interest due to measurement error or reverse causality. First, workers with adverse mental health status can answer in more pessimistic way than other workers and declared higher degree of exposure to psychosocial risks. This would lead to an upward bias in impact's estimation of psychosocial risks exposure on mental health. Secondly, workers with a degraded mental health status can be placed in more protected employment for having better working conditions, which would lead to underestimate impact of psychosocial risks exposure on mental health. Thus, bias that appears can be upward or downward. To address these issues, we implement an instrumental variable approach allowing to estimates the causal effect of psychosocial risks exposure on workers mental health status. Our empirical strategy is based on past exposure to psychosocial risks at work (respectively exposure to job demands in 2006 and to lack of autonomy and latitude in 2006)[2] and macroeconomic context through the rate of resort of temporary work in 2010 that seems to be a good indicator of economic climate at sectorial level.

We adopt an instrumental variable approach by comparing results obtained with an IV Probit Model and an IV Linear Probability Model. In this last specification, we thus consider the development of a MDE as a continuous variable in order to easily implement standard tests associated with the use of instrumental variables.
To address the potential endogeneity of PSR exposure, we need to find instruments correlated with our psychosocial risks but without direct influence on the development of a MDE in 2010. Our main instrument is the past exposure to job demands and past exposure to lack of autonomy and latitude. These variables are constructed thanks to an MCA with items present in the first waves of the survey. Psychosocial risks exposure is less considered in 2006 questionnaire, so we have fewer items to build our variables of exposure. We use five items for job demands[3] and only two for lack of autonomy and latitude. Our second instrument is rate of resort to temporary work in 2010 at sectorial level. This variable seems to be a good indicator of economic climate; it fits quickly to variation demands and explain exposure to psychosocial risks exposure.

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[2] Different measures of past exposure to psychosocial risks are tested. Results remain similar in each specification.

[3] Variables allowing construction of our continuous variable of "Job demands" exposure in 2006: (1) I work under pressure; (2) I have to think about too many things at once; (3) I am asked to do an excessive amount of work; (4) I am thinking of my work before falling asleep; (5) I have difficulties to conciliate my work and my family obligations. Variables allowing construction of our continuous variable of "lack of autonomy and latitude" exposure in 2006: (1) I can fully use my skills; (2) In my job, I have very little freedom to decide how I do my work.

Results

The first set of results present estimates of specifications without taking into account potential endogeneity of psychosocial risks exposure, that is to say a Probit Model and a Linear Probability Model modeling the probability to suffer from a major depressive episode in 2010 according to psychosocial risks exposure. We fit these two models of our sample of individuals employed in private sector in 2010 and already surveyed in 2006. In table 1, we detail estimates with and without taking into account endogeneity of PSR exposure from different specifications relating job demands to the indicator of presence of MDE in 2010 and we control for personal characteristics, current job attributes, professional and medical history of individuals. Moreover, each specification includes sectorial dummies. In table 2, we detail same estimations with our second variable of PSR exposure, lack of autonomy and latitude exposure. [4]

Table 1: Marginal effect of job demands on mental health

	(1)	(2)	(3)	(4)
	Probit Model	*Linear Probability Model (OLS)*	*IV Probit Model*	*IV linear Probability Model (2SLS)*
Job demands	0.023***	0.014***	0.024***	0.015**
	(5.08)	(5.16)	(2.65)	(2.06)
			Rhô	**F-test**
			-0.011 *0.117*	287.403 (p=0.000)
				Sargan test
				0.036
				(p=0.850)
				Durbin test of exogeneity
				0.0327
				(p=0.857)
N	3668	3668	3668	3668

Notes: all models are estimated after controlling for age, gender….
Marginal effects; t statistics in parentheses; standard errors in italic
*Significance at 1%, 5% and 10% indicated by ***, ** and * respectively.*

Table 2: Marginal effect of decision latitude on mental health

	(1)	(2)	(3)	(4)
	Probit Model	*Linear Probability Model (OLS)*	*IV Probit Model*	*IV linear Probability Model (2SLS)*
Decision latitude	0.005**	0.003	0.016	0.010
	(2.04)	(1.44)	(0.82)	(0.63)
			Rhô	**F-test**
			-0.205 *0.319*	25.339
				(p=0.000)
				Sargan test
				0.001
				(p = 0.975)
				Durbin test of exogeneity
				0.219
				(p=0.640)
Obs	3668	3668	3668	3668

Notes: all models are estimated after controlling for age, gender….
Marginal effects; t statistics in parentheses; standard errors in italic
*Significance at 1%, 5% and 10% indicated by ***, ** and * respectively.*

[4] Results for the full set of control variables are reported in annex.

Overall, results show that more a worker is exposed to psychosocial risks factors higher is its probability to suffer from a Major depressive episode. In columns (1) and (2) of table 1, we detail estimated coefficients of job demands without taking into account the potential reverse causality issue. Column (1) presents modeling of the impact of job demands exposure on the probability to suffer from a MDE in 2010 for our global sample. For global sample, we notice that estimated coefficients are statistically significant and confirm our first intuition. Our job demands coefficient should be interpreted as the probability of suffer from mental disorder. In other words, an increase of one unit on our variable of job demands exposure leads to an increase of the probability to suffer from a MDE in 2010 of 2,3 percentage points. A result present in column (2) of table 1 is also positive and significant but magnitude of Job demands exposure coefficient is lower.

In previous specifications, we hypothesize that psychosocial risks exposure is exogenous. However allocation of worker in job is probably not random and the degree of exposure to psychosocial risks that workers declared is probably not independent of their initial mental health status. As a result, our first results may be biased by non-observable individual characteristics, measurement errors of job demands and lack of autonomy and latitude and by a simultaneity bias between psychosocial risks exposure and workers' mental health status. We address these issues by implementing an instrumental variable approach. We seek relevant variables to estimate unbiased relation. The selected variables should respect conditions of a "good instrument" that is to say strong and exogenous in relation to dependent variable, ($cov(Z,X) \neq 0$ et $cov(Z,Y) = 0$). We base on psychosocial risks exposure in 2006[5] and on variable identifying economic situation in 2010 at sectorial level that impact directly psychosocial risks exposure but without direct influence on mental health.

Columns (3) and (4) of table 1 present results with taking into account potential endogeneity of Job demands exposure through an IVprobit model and an IVLinear probability model, respectively. Results of the two last columns confirm our first results and show positive and significant causal effects of job demands on workers' mental health status in 2010. The marginal effect of job demands is quite stable compared to simple probit estimate. Indeed, in column (3), an increase of one unit of our variable of job demands exposure leads to an average increase of 0.24 in the probability to suffer from a MDE in 2010. This suggests that our first estimates are not bias.

In the second part of table 1 are presented main statistics that allows confirming validity of our instrumental variables. We report statistics of three main tests: Fisher validity test, Sargan test for the overidentifying restrictions and a Durbin test of exogeneity. Fisher statistic shows explicative power of our instruments and coefficients estimated in first-stage regression[6] confirm that our instruments are highly correlated with our variable of PSR exposure. The Sargan test for the overidentifying restrictions shows that our instruments are uncorrelated with error terms, we cannot reject the null hypothesis of instruments validity. Finally, we test exogeneity of Job demands exposure

[5] When PSR exposure in 2006 is added as explicative variable in simple probit, this variable has any significant effect on mental health status in 2010. So, we conclude that past exposure to PSR can be a good instrument because it has any significant impact on development of MDE in 2010, when we control by current PSR exposure.

[6] Estimated coefficients in first stage regression and full set of results for control variables are detailed in annex.

and Durbin test shows that our variables of interest are exogenous, hence our instrumental approach is not necessary but allows simply confirming our first results.

Results for lack of autonomy and latitude are details in table 2. We observe same phenomenon as in previous specifications, workers more exposed to PSR have a higher probability to develop symptoms of MDE in 2010. More precisely, increasing lack of autonomy and latitude exposure of one unit leads to raise the probability to suffer from a MDE in 2010 of 0,5 percentage point in column (1). We should note that the magnitude of psychosocial risks coefficient is smaller for lack of autonomy and latitude compare to job demands. This result is similar to what is found by literature (Cottini and Lucifora, 2013; Llena-Nozal 2009). However, when potential endogeneity of PSR exposure is taking into account, in columns (3) and (4), our estimates of lack of autonomy and latitude exposure are now not statistically significant. Maybe our measure of this dimension of psychosocial risks is less precise and our instruments are less explicative in this case. To confirm the validity of our instruments, we make several tests and we report them in second part of table 2. As in table 1, statistic of Fisher shows that our instruments have a good explicative power. The Sargan test for the overidentifying restrictions shows that our instruments are uncorrelated with error terms, we cannot reject the null hypothesis of instruments validity in the two main specifications. And as for job demands, Durbin test shows that our variable of interest is exogenous.

Concerning control variables, we notice that past mental health status plays an important and significant role on mental health in 2010. For example in annex 1, column (1), worker who has suffer from a MDE in 2006 have a probability higher of 5.9 percentage points to declare again symptoms of MDE in 2010. We observe same result in Annex 2. Some results about personal and current job characteristics seem also important. In accordance with literature, be a woman raise the probability to suffer from a major depressive episode by 3.5 percentage points in our two main specifications (columns (1) of Annex 1 and 2). Having someone to discuss and take important decision in 2010 and having high incomes seem protective and reduce probability to suffer from MDE in 2010. For example in annex 1, workers earning high incomes, upper than 4000 euros per month, have a probability lower of 4.1 percentage points to have symptoms of depression in 2010 compared to individual living with less than 2000 euros per month. satisfaction toward his career influences the probability to suffer from MDE. Individuals very satisfied by their career have a probability fainter to be depressive compared to workers unsatisfied. Individuals confronted to stressful personal events (deaths, divorces, precarious housing period…) have a higher probability to suffer from MDE compared to those didn't subjected to these types of problems. Indeed, individuals having faced to three or more stressful events before surveys have a larger probability to develop a MDE of 11.2 percentage points compared to those having experienced any problem. Medical history influences in significant way the probability to suffer from MDE in 2010. For instance, having experienced events in childhood affects positively the probability to develop symptoms of MDE. Individuals having been subjected to three or more negative events in childhood (parental separation, death of a loved one, illness, disability…) have a higher probability to develop the mental pathology of 2.3 percentage points compared to those having known any event of this type.

Others variables have no significant impact on the probability to suffer from a MDE in 2010. Age plays any significant role in the development of mental pathology. Level of education is not explicative of mental health status while we expected a protective effect of qualification level. Atypical characteristics of job don't affect significantly the probability to suffer from MDE. We find similar results for type of contract and working hours. These results are similar for each of our main specifications.

Robustness checks

To confirm stability of our results, we performed several sensitivity tests on our main specifications. These robustness checks are realized in our baseline probit models (columns (1) of annexes 1 and 2) and we reported new estimates in table 4. First, we exclude of our models the variable of past mental health that has an important impact on workers' mental health in 2010. We note that correlation between exposure to psychosocial risks and mental health status of workers in 2010 is robust to the exclusion of mental health status in 2006.

Secondly, we take out independent workers of the sample because we can think that their exposure to psychosocial risks is particular and can bias our results. So we check whether our results are sensitive to the exclusion of this population of workers. Results for this new subsample are reported in columns (3) and (4) of table 4. Results remain positive and statistically significant to explain mental health status in 2010 but magnitude of coefficients is quite higher.

Finally, we choose to harmonize construction of variables of exposure to psychosocial risks in 2010 and variables of past exposure. We use exactly same items present in 2006 and in 2010 for construct variables of exposure to job demands and lack of autonomy and latitude and thus avoid introducing noise into the results of the instrumentation.

Results for job demands are detailed in column (5) and for lack of autonomy in column (6). Still in this case, our results are robust, job demands exposure has a positive and significant influence on the probability to suffer from a MDE in 2010 and lack of autonomy and latitude have no significant impact in mental health in 2010.

Table 4 - Robustness checks

	Probit models				*Ivprobit*	
	(1) MDE_{2010}	(2) MDE_{2010}	(3) MDE_{2010}	(4) MDE_{2010}	(5) MDE_{2010}	(6) MDE_{2010}
Job demands (8items)	0.025***	-	0.038***	-	-	-
	(5.48)	-	(6.03)	-	-	-
Decision latitude (5items)	-	0.005**	-	0.026***	-	-
	-	(2.41)	-	(4.68)	-	-
Job demands (5items)	-	-	-	-	0.022***	-
	-	-	-	-	(2.77)	-
Decision latitude (2items)	-	-	-	-	-	0.008
	-	-	-	-	-	(0.94)
MDE_{2006}	-	-	0.067***	0.027***	0.059***	0.065***
	-	-	(5.80)	(6.18)	(5.87)	(6.22)
Pseudo-R^2	0.187	0.160	0.196	0.178	-	-
N	3668	3668	3034	3034	3668	3668

Notes: all models are estimated after controlling for age, gender….
Marginal effects; t statistics in parentheses; standard errors in italic
*Significance at 1%, 5% and 10% indicated by ***, ** and * respectively.*

Conclusion

The purpose of this study was to analyze the impact of psychosocial risks exposure on mental health status of French workers, and especially two dimensions defined by the College of expertise on monitoring psychosocial risks at work (2011): job demands and lack of autonomy and latitude. Using data of the two waves of a French survey, "health and professional career", we concentrate on a particular period characterized by multiple changes in labor market and essentially an increase in psychosocial risks exposure due to economic crisis. We show that an adverse exposure to job demands and to lack of autonomy and latitude in 2010 are associated with a higher probability of workers suffer from a major depressive episode at the same date.
These results in simple probit are robust to our instrumental approach which address issues of potential endogeneity of psychosocial risks exposure as well as a set of sensitivity check, such as restricted sample of workers, withdrawal of past mental health variable and different specifications of current and past psychosocial risks exposure variables.

This study confirms the idea that exposure to psychosocial risks is a crucial phenomenon to take into account by companies to preserve worker's health and especially mental health that play an important role for maintenance and return in employment. If agreements have already been made in the context of public enterprises, the measures must be extended to all firms and allows measuring and preventing psychosocial risks more precisely.

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Annex:

Annex 1 - Mental health and job demands exposure: Marginal effects, Full specification

	(1) *Probit Model*		(2) *Linear Probability Model (OLS)*		(3) *IV Probit Model*		(4) *IV linear Probability Model (2SLS)*	
Job demands	0.023***	(5.08)	0.014***	(5.16)	0.024***	(2.65)	0.015**	(2.06)
MDE_{2006}	0.059***	(5.79)	0.147***	(9.39)	0.059***	(2.65)	0.146****	(9.31)
Female	0.033***	(3.98)	0.032***	(3.83)	0.034***	(3.92)	0.032****	(3.86)
Age	0.001	(0.84)	0.001	(0.63)	0.001	(0.84)	0.001	(0.66)
Family situation								
Couple without children	-0.014	(-1.04)	-0.013	(-0.90)	-0.014	(-1.04)	-0.013	(-0.89)
Single with children	-0.008	(-0.85)	-0.010	(-1.13)	-0.008	(-0.84)	-0.010	(-1.13)
Single without children	-0.022**	(-2.04)	-0.024*	(-1.89)	-0.022**	(-2.03)	-0.024*	(-1.90)
Education								
2	0.037	(1.24)	0.030	(1.15)	0.037	(1.23)	0.030	(1.16)
3	-0.018	(-0.92)	-0.016	(-0.73)	-0.018	(-0.92)	-0.016	(-0.74)
4	0.011	(0.63)	0.009	(0.52)	0.010	(0.61)	0.009	(0.50)
5	0.001	(0.04)	-0.001	(-0.04)	0.001	(0.02)	-0.002	(-0.07)
6	-0.002	(-0.10)	-0.007	(-0.31)	-0.002	(-0.12)	-0.008	(-0.34)
7	-0.005	(-0.28)	-0.007	(-0.33)	-0.006	(-0.29)	-0.008	(-0.37)
8	-0.007	(-0.40)	-0.008	(-0.40)	-0.008	(-0.40)	-0.009	(-0.44)
Household income (€)								
Middle level of income [2000; 3000]	-0.021*	(-1.81)	-0.019*	(-1.82)	-0.022*	(-1.78)	-0.019*	(-1.84)
High level of income >4000	-0.041***	(-3.34)	-0.036***	(-3.18)	-0.041***	(-3.18)	-0.036****	(-3.19)
Has a confident	-0.036***	(-2.28)	-0.051***	(-3.59)	-0.036**	(-2.28)	-0.051***	(-3.61)
Personal stressful events								
One event	0.032***	(3.20)	0.034***	(3.64)	0.032***	(3.19)	0.034***	(3.62)
Two events	0.054***	(2.60)	0.072***	(3.86)	0.054***	(2.59)	0.071***	(3.84)
Three events or more	0.112 **	(1.92)	0.183***	(4.31)	0.112**	(1.92)	0.183***	(4.33)
Childhood events								
One event	0.029***	(3.22)	0.028***	(3.21)	0.029***	(3.19)	0.028***	(3.23)
Two events	0.016	(1.46)	0.014	(1.23)	0.016	(1.45)	0.014***	(1.22)
Three events or more	0.023**	(2.08)	0.033***	(2.73)	0.023*	(2.07)	0.033***	(2.72)
Career satisfaction	-0.007***	(-4.52)	-0.009***	(-5.02)	-0.007***	(-4.40)	-0.009***	(-4.77)
Part-time job	0.017	(1.54)	-0.023**	(2.14)	0.017	(1.48)	0.024***	(2.15)
Night job								
Often	0.029	(0.93)	0.022	(0.88)	0.029	(0.91)	0.022	(0.87)
Sometimes	0.011	(0.48)	0.017	(0.79)	0.011	(0.45)	0.016	(0.75)
Never	-0.013	(-0.64)	-0.006	(-0.3)	-0.013	(-0.64)	-0.007	(-0.36)
Shift job								
Often	0.001	(0.00)	-0.003	(-0.09)	-0.001	(0.00)	-0.003	(-0.10)
Sometimes	0.009	(0.51)	0.026	(1.13)	0.009	(0.51)	0.026	(1.14)
Never	0.019	(1.91)	0.022 *	(1.70)	0.019*	(1.88)	0.022*	(1.72)
Physical job								
Often	-0.005	(-0.53)	-0.014	(-1.22)	-0.005	(-0.52)	-0.014	(-1.21)
Sometimes	-0.001	(-0.07)	-0.006	(-0.53)	-0.001	(-0.04)	-0.005	(-0.47)
Never	-0.001*	(-0.09)	-0.010	(-0.93)	-0.001	(-0.04)	-0.009	(-0.78)
Long working hours (>48h per week)								
Often	0.026	(1.63)	0.030*	(1.84)	0.026	(1.63)	0.030*	(1.86)
Sometimes	0.018	(1.34)	0.017	(1.18)	0.018	(1.34)	0.018	(1.20)
Never	0.018*	(1.60)	0.015	(1.14)	0.018	(1.52)	0.015	(1.15)

Annex 1 – continued

Type of contract								
Fixed-term contract, seasonal job	0.01	(0.49)	0.006	(0.29)	0.010	(0.50)	0.006	(0.32)
Temporary work, apprenticeship, internship	0.01	(0.32)	0.003	(0.09)	0.010	(0.32)	0.003	(0.10)
Physical pain in 2006	0.009	(1.19)	0.005	(0.63)	0.009	(1.17)	0.005	(0.61)
Sectorial dummies								
Manufacturing, mining & others	0.033***	(2.58)	0.034**	(1.87)	0.033***	(2.55)	0.033*	(1.82)
Construction	0.050***	(2.90)	0.045**	(2.31)	0.051***	(2.89)	0.044**	(2.28)
Wholesale trade, retail trade, transport, hotel and restaurant	0.034***	(2.97)	0.036**	(2.06)	0.034***	(2.94)	0.035**	(2.01)
Information & communication	0.044*	(1.78)	0.037	(1.39)	0.043*	(1.76)	0.036	(1.36)
Financial intermediation, real estate activities	0.038**	(2.16)	0.040*	(1.85)	0.038**	(2.14)	0.040*	(1.80)
Professional, scientific and technical activities, administrative and support activities	0.044**	(2.13)	0.037	(1.57)	0.044**	(2.12)	0.036	(1.53)
Public administration, education, health & social work	0.025**	(1.93)	0.023	(1.17)	0.025**	(1.92)	0.022	(1.16)
Others services	0.036***	(2.45)	0.031	(1.57)	0.036***	(2.34)	0.031	(1.59)
Undergo an external job mobility	-0.008	(-0.57)	-0.010	(-0.70)	-0.008	(-0.56)	-0.010	(-0.70)
Benefit from external job mobility	0.001	(0.03)	-0.001	(-0.10)	0.001	(0.05)	-0.001	(-0.07)
Internal job mobility	0.002	(0.19)	0.001	(0.06)	0.001	(0.19)	0.001	(0.05)
Pseudo-R^2	0.208		0.088			-	0.101	
					Rho		**F-test**	
					-0.011	*0.117*	287.403 (p=0.000)	
							Sargan test	
							0.036 (p=0.850)	
							Durbin test of exogeneity	
							0.0327 (p=0.857)	
N	3668		3668		3668		3668	

Notes: Marginal effects; t statistics in parentheses, standard errors in italic
*Significance at 1%, 5% and 10% indicated by ***, ** and * respectively.*

Annex 2 - Mental health and decision latitude exposure: Marginal effects, Full specification

	(1) *Probit Model*		(2) *Linear Probability Model (OLS)*		(3) *IV Probit Model*		(4) *IV linear Probability Model (2SLS)*	
Decision Latitude	0.005**	(2.04)	0.003	(1.44)	0.016	(0.82)	0.010	(0.63)
MDE$_{2006}$	0.065***	(5.79)	0.152***	(9.69)	0.069***	(4.56)	0.152***	(9.74)
Female	0.035 ***	(4.06)	0.032***	(3.76)	0.036***	(3.59)	0.031***	(3.65)
Age	0.001	(0.43)	0.001	(0.40)	0.001	(0.52)	0.001	(0.48)
Family situation								
Couple without children	-0.016	(-1.15)	-0.015	(-1.02)	-0.018	(-1.20)	-0.016	(-1.10)
Single with children	-0.009	(-1.04)	-0.011	(-1.21)	-0.010	(-1.04)	-0.011	(-1.23)
Single without children	-0.022**	(-2.00)	-0.024*	(-1.88)	-0.024*	(-1.89)	-0.025**	(-1.93)
Education								
2	0.026	(1.07)	0.029	(1.13)	0.029	(1.12)	0.031	(1.19)
3	-0.012	(-0.72)	-0.012	(-0.53)	-0.010	(-0.61)	-0.010	(-0.43)
4	0.016	(1.10)	0.015	(0.83)	0.019	(1.20)	0.019	(0.92)
5	0.013	(0.74)	0.010	(0.49)	0.019	(0.89)	0.014	(0.64)
6	0.008	(0.46)	0.006	(0.26)	0.015	(0.66)	0.019	(0.45)
7	0.009	(0.51)	0.008	(0.41)	0.015	(0.71)	0.013	(0.58)
8	0.009	(0.49)	0.009	(0.44)	0.019	(0.71)	0.017	(0.64)
Household income (€)								
Middle level of income [2000; 3000]	-0.015	(-1.31)	-0.016	(-1.60)	-0.016	(-1.31)	-0.017	(-1.64)
High level of income >4000	-0.032***	(-2.80)	-0.031***	(-2.80)	-0.033***	(-2.60)	-0.031***	(-2.72)
Has a confident	-0.038***	(-2.38)	-0.051***	(-3.59)	-0.039**	(-2.29)	-0.051***	(-3.55)
Personal stressful events								
One event	0.038***	(3.60)	0.037***	(3.90)	0.040***	(3.13)	0.037***	(3.93)
Two events	0.064***	(2.85)	0.076***	(4.06)	0.064 ***	(2.77)	0.074***	(3.90)
Three events or more	0.122**	(1.96)	0.188***	(4.40)	0.127**	(1.95)	0.187***	(4.42)
Childhood events								
One event	0.029***	(3.22)	0.028***	(3.21)	0.029***	(3.00)	0.026***	(2.88)
Two events	0.017	(1.55)	0.015	(1.36)	0.017	(1.44)	0.014	(1.22)
Three events or more	0.028***	(2.40)	0.035***	(2.86)	0.028**	(2.24)	0.033***	(2.63)
Career satisfaction	-0.007***	(-4.72)	-0.010***	(-5.25)	-0.005**	(-1.96)	-0.008**	(-2.18)
Part-time job	0.0112	(1.09)	0.018*	(1.69)	0.013	(1.11)	0.019*	(1.73)
Night job								
Often	0.038	(1.32)	0.028	(1.12)	0.040	(1.32)	0.029	(1.14)
Sometimes	0.029	(1.34)	0.026	(1.24)	0.034	(1.38)	0.028	(1.32)
Never	-0.001	(-0.01)	0.002	(0.09)	0.002	(0.13)	0.004	(0.20)
Shift job								
Often	-0.003	(-0.12)	0.001	(-0.00)	-0.004	(-0.14)	-0.001	(-0.01)
Sometimes	0.012	(0.59)	0.027	(1.15)	0.013	(0.62)	0.027	(1.19)
Never	0.016	(1.56)	0.020	(1.52)	0.019	(1.53)	0.021	(1.60)
Physical job								
Often	-0.010	(-0.89)	-0.015	(-1.32)	-0.008	(-0.61)	-0.013	(-1.08)
Sometimes	-0.010	(-0.86)	-0.011	(-1.01)	-0.008	(-0.70)	-0.010	(-0.88)
Never	-0.013	(-1.27)	-0.019*	(-1.81)	-0.010	(-0.81)	-0.016	(-1.31)
Long working hours (>48h per week)								
Often	0.029	(1.59)	0.028*	(1.71)	0.035	(1.47)	0.028*	(1.74)
Sometimes	0.015	(0.99)	0.013	(0.86)	0.013	(0.76)	0.010	(0.66)
Never	0.007	(0.56)	0.004	(0.30)	0.001	(0.04)	-0.001	(-0.08)
Type of contract								
Fixed-term contract, seasonal job	-0.001	(-0.04)	0.008	(0.04)	-0.002	(-0.11)	-0.001	(-0.02)
Temporary work, apprenticeship,	0.002	(0.08)	-0.003	(-0.10)	0.001	(0.01)	-0.004	(-0.15)

internship

Annex 2 – continued

Physical pain in 2006	0.011	(1.42)	0.008	(0.91)	0.012	(1.41)	0.007	(0.98)
Sectorial dummies								
Manufacturing, mining & others	0.037***	(3.01)	0.041**	(2.23)	0.039***	(2.66)	0.033*	(1.82)
Construction	0.054***	(3.11)	0.050***	(2.59)	0.059***	(2.61)	0.044**	(2.28)
Wholesale trade, retail trade, transport, hotel and restaurant	0.037***	(3.37)	0.042**	(2.39)	0.040***	(2.82)	0.035**	(2.01)
Information & communication	0.050**	(1.95)	0.045*	(1.71)	0.053**	(1.86)	0.036	(1.36)
Financial intermediation, real estate activities	0.045 ***	(2.46)	0.048**	(2.22)	0.048**	(2.25)	0.040*	(1.80)
Professional, scientific and technical activities, administrative and support activities	0.047**	(2.27)	0.044**	(1.88)	0.049**	(2.12)	0.036	(1.53)
Public administration, education, health & social work	0.026**	(2.16)	0.027	(1.39)	0.029**	(1.92)	0.022	(1.16)
Others services	0.029**	(2.26)	0.027	(1.37)	0.031**	(2.05)	0.031	(1.59)
Undergo an external job mobility	-0.013	(-0.92)	-0.012	(-0.78)	-0.014	(-0.91)	-0.010	(-0.70)
Benefit from external job mobility	-0.007	(-0.50)	-0.005	(-0.40)	-0.006	(-0.44)	-0.005	(-0.36)
Internal job mobility	0.005	(0.62)	- 0.002	(0.25)	0.007	(0.73)	0.003	(0.35)
Pseudo-R^2	0.1866		0.082		-		0.091	
					Rho : -0.205 *0.319*		**F-test** 25.339 (p=0.000) **Sargan test** 0.001 (p = 0.975) **Durbin test of exogeneity** 0.219 (p=0.640)	
N	3668		3668		3668		3668	

Notes: Marginal effects; t statistics in parentheses, standard errors in italic
*Significance at 1%, 5% and 10% indicated by ***, ** and * respectively.*

Annex 3 - Mental health and job demands exposure: instrumental approach full specification

	IV Probit Model				*IV linear Probability Model (2SLS)*			
	(1) *First-stage equation Job demands*		(2) *Second-stage equation MDE_{2010}*		(3) *First-stage equation Job demands*		(4) *Second-stage equation MDE_{2010}*	
Job demands	-		0.024***	(2.65)	-		0.015**	(2.09)
MDE_{2006}	0.212**	(2.35)	0.059***	(2.65)	0.212**	(2.34)	0.146***	(9.31)
Female	0.023	(0.46)	0.034***	(3.92)	0.023	(0.46)	0.032***	(3.86)
Age	-0.009***	(-3.43)	0.001	(0.84)	-0.009 ***	(-3.41)	0.001	(0.66)
Family situation								
Couple without children	-0.088	(-1.08)	-0.014	(-1.04)	-0.088	(-1.07)	-0.013	(-0.89)
Single with children	-0.036	(-0.68)	-0.008	(-0.84)	-0.036	(-0.68)	-0.010	(-1.13)
Single without children	0.053	(0.72)	-0.022**	(-2.03)	0.053	(0.71)	-0.024**	(-1.90)
Education								
2	-0.020	(-0.14)	0.037	(1.23)	-0.020	(-0.13)	0.030	(1.16)
3	0.193	(1.52)	-0.018	(-0.92)	0.193	(1.51)	-0.016	(-0.74)
4	0.219**	(2.16)	0.010	(0.61)	0.219**	(2.14)	0.009	(0.50)
5	0.418***	(3.62)	0.001	(0.02)	0.418***	(3.60)	-0.002	(-0.07)
6	0.512***	(4.14)	-0.002	(-0.12)	0.512***	(4.11)	-0.008	(-0.34)
7	0.649***	(5.67)	-0.006	(-0.29)	0.650***	(5.63)	-0.008	(-0.37)
8	0.731***	(6.28)	-0.008	(-0.40)	0.731***	(6.24)	-0.009	(-0.44)
Household income (€)								
Middle level of income [2000; 3000]	0.140**	(2.37)	-0.022*	(-1.78)	0.140**	(2.35)	-0.019*	(-1.84)
High level of income >4000	0.214***	(3.32)	-0.041***	(-3.18)	0.214***	(3.30)	-0.036***	(-3.19)
Has a confident	-0.024	(-0.30)	-0.036**	(-2.28)	-0.024	(-0.30)	-0.051***	(-3.61)
Personal stressful events								
One event	0.151***	(2.81)	0.032***	(3.19)	0.151***	(2.79)	0.034***	(3.62)
Two events	0.280***	(2.62)	0.054***	(2.59)	0.280***	(2.61)	0.071***	(3.84)
Three events or more	0.1534	(0.63)	0.112**	(1.92)	0.154	(0.62)	0.182***	(4.33)
Childhood events								
One event	0.006	(0.12)	0.029***	(3.19)	0.006	(0.12)	0.028***	(3.23)
Two events	0.104	(1.59)	0.016	(1.45)	0.104	(1.58)	0.014	(1.22)
Three events or more	0.061	(0.87)	0.023*	(2.07)	0.061	(0.87)	0.033***	(2.72)
Career satisfaction	-0.068***	(-6.66)	-0.007***	(-4.40)	-0.068***	(-6.61)	-0.009***	(-4.77)
Part-time job	-0.306***	(-4.91)	0.017	(1.48)	-0.306***	(-4.87)	0.024**	(2.15)
Night job								
Often	0.385***	(2.65)	0.029	(0.91)	0.385***	(2.63)	0.022	(0.87)
Sometimes	0.517***	(4.29)	0.011	(0.45)	0.517 ***	(4.26)	0.016	(0.75)
Never	0.422***	(3.97)	-0.013	(-0.64)	0.422***	(3.94)	-0.007	(-0.36)
Shift job								
Often	0.093	(0.51)	-0.001	(0.00)	0.093	(0.50)	-0.003	(-0.10)
Sometimes	0.016	(0.12)	0.009	(0.51)	0.016	(0.12)	0.026	(1.14)
Never	-0.174**	(-2.37)	0.019*	(1.88)	-0.174**	(-2.35)	0.022*	(1.72)
Physical job								
Often	-0.112*	(-1.70)	-0.005	(-0.52)	-0.112*	(-1.69)	-0.014	(-1.21)
Sometimes	-0.378***	(-5.92)	-0.001	(-0.04)	-0.378***	(-5.88)	-0.005	(-0.47)
Never	-0.700***	(-11.50)	-0.001	(-0.04)	-0.700***	(-11.41)	-0.009	(-0.78)
Long working hours (>48h per week)								
Often	-0.133	(-1.42)	0.026	(1.63)	-0.133	(-1.41)	0.030*	(1.86)
Sometimes	-0.211***	(-2.52)	0.018	(1.34)	-0.211**	(-2.50)	0.017	(1.20)
Never	-0.450***	(-6.13)	0.018	(1.52)	-0.450***	(-6.09)	0.015	(1.15)

Annex 3-Continued

Type of contract								
Fixed-term contract, seasonal job	-0.364***	(-3.17)	0.010	(0.50)	-0.364***	(-3.15)	0.006	(0.32)
Temporary work, apprenticeship, internship	-0.356**	(-2.11)	0.010	(0.32)	-0.3569**	(-2.09)	0.003	(0.10)
Physical pain in 2006	0.039	(0.93)	0.009	(1.17)	0.039	(0.92)	0.005	(0.61)
Sectorial dummies								
Manufacturing, mining & others	0.131	(0.66)	0.033***	(2.55)	0.131	(0.66)	0.033*	(1.82)
Construction	0.023	(0.11)	0.051***	(2.89)	0.023	(0.11)	0.044**	(2.28)
Wholesale trade, retail trade, transport, hotel and restaurant	0.371***	(3.60)	0.034***	(2.94)	0.371***	(3.57)	0.035**	(2.01)
Information & communication	0.591***	(3.90)	0.043*	(1.76)	0.591***	(3.87)	0.036	(1.36)
Financial intermediation, real estate activities	0.555 ***	(4.43)	0.038**	(2.14)	0.555***	(4.40)	0.040*	(1.80)
Professional, scientific and technical activities, administrative and support activities	0.573***	(4.21)	0.044**	(2.12)	0.573***	(4.18)	0.036	(1.53)
Public administration, education, health & social work	0.339***	(3.04)	0.025**	(1.92)	0.339***	(3.01)	0.022	(1.16)
Others services	-0.080	(-0.70)	0.036***	(2.34)	-0.080	(-0.69)	0.031	(1.59)
Undergo an external job mobility	-0.076	(-0.89)	-0.008	(-0.56)	-0.076	(-0.88)	-0.010	(-0.70)
Benefit from external job mobility	-0.271***	(-3.49)	0.001	(0.05)	-0.271***	(-3.47)	-0.001	(-0.07)
Internal job mobility	0.047	(0.99)	0.001	(0.19)	0.047	(0.98)	0.001	(0.05)
Job demands $_{2006}$	0.239***	(24.12)	-		-		-	
Decision latitude $_{2006}$	-		-		0.239***	(23.94)	-	
Rate of resort to temporary work $_{2010}$	6.198**	(2.02)	-		6.199**	(2.01)	-	
N	3668		3668		3668		3668	

Notes:
Second-stage equation: Marginal effects; t statistics in parentheses, standard errors in italic
*Significance at 1%, 5% and 10% indicated by ***, ** and * respectively.*
First-stage equation: coefficients; t statistics in parentheses, standard errors in italic
*Significance at 1%, 5% and 10% indicated by ***, ** and * respectively.*

Annex 4 - Mental health and decision latitude exposure: instrumental approach full specification

	IV Probit Model				*IV linear Probability Model (2SLS)*			
	(1)		(2)		(3)		(4)	
	First-stage equation Decision latitude		*Second-stage equation MDE_{2010}*		*First-stage equation Decision latitude*		*Second-stage equation MDE_{2010}*	
Decision latitude	-		0.016	(0.82)	-		0.010	(0.63)
MDE_{2006}	-0.063	(-0.46)	0.152***	(9.74)	0.063	(-0.46)	0.152***	(9.74)
Female	0.083	(1.14)	0.031***	(3.65)	0.084	(1.13)	0.031***	(3.65)
Age	-0.004	(-1.12)	0.001	(0.48)	-0.004	(-1.11)	0.001	(0.48)
Family situation								
Couple without children	0.178	(1.45)	-0.016	(-1.10)	0.178	(1.43)	-0.016	(-1.10)
Single with children	0.030	(0.38)	-0.011	(-1.23)	0.030	(0.38)	-0.011	(-1.23)
Single without children	0.040	(0.36)	-0.025**	(-1.93)	0.040	(0.36)	-0.025**	(-1.93)
Education								
2	-0.140	(-0.63)	0.031	(1.19)	-0.140	(-0.62)	0.031	(1.19)
3	-0.201	(-1.06)	-0.010	(-0.43)	-0.201	(-1.05)	-0.010	(-0.43)
4	-0.250*	(-1.64)	0.019	(0.92)	-0.250*	(-1.63)	0.019	(0.92)
5	-0.482***	(-2.79)	0.014	(0.64)	-0.482***	(-2.77)	0.014	(0.64)
6	-0.650***	(-3.51)	0.019	(0.45)	-0.650***	(-3.49)	0.019	(0.45)
7	-0.620***	(-3.63)	0.013	(0.58)	-0.620***	(-3.60)	0.013	(0.58)
8	-1.022***	(-5.89)	0.017	(0.64)	-1.022***	(-5.85)	0.017	(0.64)
Household income (€)								
Middle level of income [2000; 3000]	0.065	(0.73)	-0.017	(-1.64)	0.065	(0.73)	-0.017	(-1.64)
High level of income >4000	-0.088	(-0.91)	-0.031***	(-2.72)	-0.088	(-0.90)	-0.031***	(-2.72)
Has a confident	-0.086	(-0.70)	-0.051***	(-3.55)	-0.086	(-0.70)	-0.051***	(-3.55)
Personal stressful events								
One event	-0.012	(-0.15)	0.037***	(3.93)	-0.012	(-0.15)	0.037***	(3.93)
Two events	0.198	(1.23)	0.074***	(3.90)	0.198	(1.22)	0.074***	(3.90)
Three events or more	-0.002	(-0.01)	0.187***	(4.42)	-0.002	(-0.01)	0.187***	(4.42)
Childhood events								
One event	0.191***	(2.57)	0.026***	(2.88)	0.191***	(2.55)	0.026***	(2.88)
Two events	0.162*	(1.66)	0.014	(1.22)	0.162*	(1.64)	0.014	(1.22)
Three events or more	0.179*	(1.72)	0.033***	(2.63)	0.179*	(1.71)	0.033***	(2.63)
Career satisfaction	-0.181***	(-11.62)	-0.008**	(-2.18)	-0.181***	(-11.54)	-0.008**	(-2.18)
Part-time job	-0.075	(-0.81)	0.019*	(1.73)	-0.075	(-0.80)	0.019*	(1.73)
Night job								
Often	-0.072	(-0.33)	0.029	(1.14)	-0.072	(-0.33)	0.029	(1.14)
Sometimes	-0.320*	(-1.77)	0.028	(1.32)	-0.320*	(-1.76)	0.028	(1.32)
Never	-0.280*	(-1.76)	0.004	(0.20)	-0.280*	(-1.75)	0.004	(0.20)
Shift job								
Often	0.039	(0.14)	-0.001	(-0.01)	0.039	(0.14)	-0.001	(-0.01)
Sometimes	-0.119	(-0.60)	0.027	(1.19)	-0.119	(-0.59)	0.027	(1.19)
Never	-0.145	(-1.31)	0.021	(1.60)	-0.145	(-1.31)	0.021	(1.60)
Physical job								
Often	-0.283***	(-2.86)	-0.013	(-1.08)	-0.283***	(-2.84)	-0.013	(-1.08)
Sometimes	-0.184**	(-1.92)	-0.010	(-0.88)	-0.184*	(-1.91)	-0.010	(-0.88)
Never	-0.387***	(-4.25)	-0.016	(-1.31)	-0.387***	(-4.21)	-0.016	(-1.31)
Long working hours (>48h per week)								
Often	-0.046	(-0.33)	0.028*	(1.74)	-0.046	(-0.33)	0.028*	(1.74)
Sometimes	0.296**	(2.35)	0.010	(0.66)	0.296**	(2.34)	0.010	(0.66)
Never	0.637***	(5.82)	-0.001	(-0.08)	0.637***	(5.78)	-0.001	(-0.08)

Annex 4-Continued

Type of contract								
Fixed-term contract, seasonal job	0.131	(0.76)	-0.001	(-0.02)	0.131	(0.76)	-0.001	(-0.02)
Temporary work, apprenticeship, internship	0.219	(0.87)	-0.004	(-0.15)	0.219	(0.86)	-0.004	(-0.15)
Physical pain in 2006	-0.079	(-1.25)	0.012	(1.41)	-0.079	(-1.24)	0.007	(0.98)
Sectorial dummies								
Manufacturing, mining & others	0.317	(1.08)	0.039***	(2.66)	0.319	(1.07)	0.033*	(1.82)
Construction	0.181	(0.56)	0.059***	(2.61)	0.184	(0.56)	0.044**	(2.28)
Wholesale trade, retail trade, transport, hotel and restaurant	0.121	(0.79)	0.040***	(2.82)	0.122	(0.78)	0.035**	(2.01)
Information & communication	0.066	(0.29)	0.053**	(1.86)	0.066	(0.29)	0.036	(1.36)
Financial intermediation, real estate activities	0.086	(0.46)	0.048**	(2.25)	0.086	(0.46)	0.040*	(1.80)
Professional, scientific and technical activities, administrative and support activities	0.145	(0.71)	0.049**	(2.12)	0.145	(0.71)	0.036	(1.53)
Public administration, education, health & social work	-0.015	(-0.09)	0.029**	(1.92)	-0.016	(-0.09)	0.022	(1.16)
Others services	0.113	(0.66)	0.031**	(2.05)	0.113	(0.65)	0.031	(1.59)
Undergo an external job mobility	-0.019	(-0.15)	-0.014	(-0.91)	-0.019	(-0.15)	-0.010	(-0.70)
Benefit from external job mobility	-0.105	(-0.91)	-0.006	(-0.44)	-0.105	(-0.90)	-0.005	(-0.36)
Internal job mobility	-0.158**	(-2.21)	0.007	(0.73)	-0.158**	(-2.19)	0.003	(0.35)
Decision latitude $_{2006}$	0.139***	(7.15)		-	0.139***	(7.10)		-
Rate of resort to temporary work $_{2010}$	-3.415	(-0.75)		-	-3.458	(-0.75)		-
N	3668		3668		3668		3668	

Notes:

Second-stage equation: Marginal effects; t statistics in parentheses, standard errors in italic
*Significance at 1%, 5% and 10% indicated by ***, ** and * respectively.*

First-stage equation: coefficients; t statistics in parentheses, standard errors in italic
*Significance at 1%, 5% and 10% indicated by ***, ** and * respectively.*

Annex 5 - Variables definition

Name	*Definition*
Dependent variable	
MDE_{2010}	1 if worker suffer from a Major Depressive Episode in 2010, 0 otherwise
Job demands	
I work under pressure	0 if worker is never under pressure, 1 if worker is sometimes under pressure, 2 if worker is often under pressure and 3 if worker is always under pressure
I have to think about too many things at once	0 if worker has never to think about too many things at once, 1 if worker has sometimes to think about too many things at once, 2 if worker has often to think about too many things at once and 3 if worker has always to think about too many things at once
I am asked to do an excessive amount of work	0 if worker has never an excessive amount of work to do, 1 if worker has sometimes an excessive amount of work to do, 2 if worker has often an excessive amount of work to do and 3 if worker has always an excessive amount of work to do
I am thinking of my work before falling asleep	0 if worker never think to his job before sleeping, 1 if worker sometimes think to his job before sleeping, 2 if worker often think to his job before sleeping and 3 if worker always think to his job before sleeping
I have difficulties to conciliate my work and my family obligations	0 if worker has never difficulties to conciliate professional and personal life, 1 if worker has sometimes difficulties to conciliate professional and personal life, 2 if worker has often difficulties to conciliate professional and personal life and 3 if worker has always difficulties to conciliate professional and personal life
I have to hurry	0 if worker has never needs to hurry, 1 if worker has sometimes needs to hurry, 2 if worker has often needs to hurry and 3 if worker has always needs to hurry
Interrupting a task to another not provided	0 if worker is interrupted and this is a positive aspect of his job, 1 if worker is not interrupted or if interruption is inconsequential to his work and 2 if worker is interrupted and this is a negative aspect of his job
I suffer at least of three rhythm constraints imposed by (among 9):	1 if worker is exposed to three or more rhythm constraints imposed by: automatic removal of a product or a piece? Production rate? Other technical constraints? Immediate dependence in relation to co-workers? Production standards, or delays, meet in an hour at the most? Production standards, or delays, meet in a day at most? External demand (customers, public) requiring an immediate response? Checks or permanent monitoring (at least daily) exercised by the hierarchy? Control or computerized tracking? , 0 otherwise
Lack of autonomy and latitude	
My job is to repeat the same series of actions/operations continuously	1 if works is to repeat the same series of actions/operations continuously, 0 otherwise
My job allows me to learn new things	0 if work allows always to learn new things, 1 if work allows often to learn new things, 2 if work allows sometimes to learn new things and 3 if work allows never to learn new things
My job allows me to do things I like	0 if works allows always the worker to do things he like, 1 if works allows often the worker to do things he like, 2 if works allows sometimes the worker to do things he like and 3 if works allows never to learn new things
I can fully use my skills	0 if worker can never use their skills, 1 if worker can sometimes use their skills, 2 if worker can sometimes use their skill and 3 if worker can always use their skills
In my job, I have very little freedom to decide how I do my work	0 if worker has never very little freedom to decide how he do his work, 1 if worker has sometimes very little freedom to decide how he do his work, 2 if worker has often very little freedom to decide how he do his work and 3 if worker has always very little freedom to decide how he do his work
I was consulted during the last 12 months about changes in work	1 if worker has been consulted about change in work or working conditions, 0 otherwise
Demographic characteristics	
Female	1 if female, 0 otherwise
Age	Workers are aged from 16 to 67 in our sample
Family situation	0 if in a couple with children in 2010, 1 if in a couple without children in 2010, 2 if single with children in 2010 and 3 if single without children in 2010
Education level	1 if "Aucun diplôme, 2 if "CEP (certificat d'études primaires) ou diplôme étranger de même niveau, 3 if "Brevet des collèges, BEPC, brevet élémentaire ou diplôme étranger de même niveau", 4 if CAP, BEP ou diplôme étranger de même niveau, 5 if "Baccalauréat technologique ou professionnel ou diplôme de ce niveau", 6 if Baccalauréat général (séries A, B, C, D, E, ES, L, S), brevet supérieur, capacité en droit, DAEU, ou diplôme étranger de même niveau", 7 if "Diplôme de niveau BAC + 2", 8 if "Diplôme de niveau supérieur à BAC + 2"
Household income	0 if low level of income between 0 and 2000 € per month, 1 if middle level of income between 2000€ and 3000€ per month and 3 if high level of income upper than 4000 € per month
1 if individuals have someone to discuss and take important decisions in 2010, 0 otherwise	1 if individual have someone to discuss and take important decisions in 2010, 0 otherwise

Annex 5 - Continued

Current job characteristics	
Part-time job	1 if works part time, 0 otherwise
Night job	0 if works always the night, 1 if works often the night, 2 if works sometimes the night and 3 if works never the night
Shift job	0 if works always at shift, 1 if works often at shift, 2 if works sometimes at shift and 3 if works never at shift
Physical job	0 if work is always physically demanding, 1 if work is often physically demanding, 2 if work is sometimes physically demanding and 3 if work is never physically demanding
Long working hours	0 if working hours are always more than 48 hours a week, 1 if working hours are often more than 48 hours a week, 2 if working hours are sometimes more than 48 hours a week, 3 if working hours are never more than 48 hours a week
Type of contract	0 if current job is a permanent job contract or if worker is independent, 1 if current job is a fixed terms contract or a seasonal job and 2 if current job is precarious employment like temporary work, apprenticeship or internship
Professional history	
Personal stressful events	1 if individual have been subjected to one personal stressful event between 2006 and 2010 with repercussion on professional life (death of a close, separation or divorce, precarious housing period, personal conflict, form of violence suffered individually, move, care of a relative with health problems, disability or others problems, deterioration of living conditions), 2 if individual have been subjected to two personal stressful events between 2006 and 2010 with repercussion on professional life and 3 if individual have been subjected to three or more personal stressful events between 2006 and 2010
Career satisfaction	Scale of professional satisfaction. 0 if individual is not at all satisfied with his career path and 10 if individual is very satisfied with his career path.
Undergo an external job mobility	1 if the contract or the mission expire or is not renewed by the employer or worker is dismissed, 0 otherwise
Benefit from external job mobility	1 if worker resigns or refuses to renew his contract or following a conventional contract termination, 0 otherwise
Internal job mobility	1 if function, profession or workplace of worker change (indented or not) without change of employer, 0 otherwise
Medical history	
MDE_{2006}	1 if individual suffer from a MDE in 2006, 0 otherwise
Childhood events	1 if individual have been subjected to one traumatic event during childhood among eleven (serious events, family conflicts, death of a close, bad treatments, difficult material conditions, war, disability at birth or following an accident, long illness, adverse health condition of a close, parental separation, violence), 2 if individual have been subjected to two traumatic events during childhood and 3 if individual have been subjected to three or more traumatic events during childhood
Physical pain in 2006	1 if individual declared one or more physical pain in 2006, 0 otherwise
Sectorial dummies	0 if industry is agriculture, 1 if industry is manufacturing, mining & others, 2 if industry is construction, 3 if industry is wholesale trade, retail trade, transport, hotel and restaurant, 4 if industry is information & communication, 5 if industry is financial intermediation & real estate activities, 6 if industry is professional, scientific and technical activities, 7 if industry is administrative and support activities, 8 if industry is public administration, education, health & social work and 9 if others services.