Impact of work intensity and autonomy on well-being

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Abstract

Using French surveys data on working conditions, we document the existing relationships between workers' well-being, work organization and human resources' practices that may lead to greater intensity but also greater job decision latitude. The relationships between intensity, autonomy and workers' well-being are first studied on the basis of a descriptive analysis, before estimating the relationship with panel data. In a framework as close as possible to Karasek's conceptual job demand/job control model, our results highlight a detrimental impact of intensity and a positive impact of autonomy.

Mots clés — well-being, autonomy, intensity, management

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1 Introduction

In the past three decades, work has intensified in France and other European countries (Dares, Green et al., 2022). Increased and excessive workload, working under pressure, or having to meet high pace or tight deadline lead to increased efforts that may be unsustainable and damaging for workers' well-being and both physical and mental health. Following Karasek's job demand / job control model, a solution to mitigate the detrimental health effects of increased job demand could be to provide workers with greater autonomy at work. Managerial innovative practices indeed flourish and became more common within the firm, allowing workers to gain autonomy in their working time, locations and/or organization (Beatriz et al., 2021; Beckmann, 2016; Beque et al., 2017; Böckerman, 2015; Böckerman et al., 2012; Memmi et al., 2019).[1] Whether these are enough to offset the detrimental health effect of work intensity is unclear though. First, workers who benefit from greater flexibility and autonomy at work may not be those with intensive work. Second, job control may not be increased enough for its positive health effects to compensate the negative effects of increased job demand. Last, as revealed by the literatures about high-involvement management practices and remote-work, more autonomy at work may also mean more responsibility, work intensification and more stress, so that greater job control may not necessarily improve health and well-being.

In this paper, we document how work intensity and work autonomy are combined and evaluate the effects of the combination of work intensity and work autonomy in the French context. To do so, we use the 2013, 2016 and 2019 French Working Conditions surveys. These surveys give a 3-wave panel of workers and provide detailed information about working conditions, labor market history and health status for about 28,000 individuals representative of the working-age population in France. We use the description of the job and working conditions to build scores and binary indicators of work intensity and work autonomy. After documenting how workers are exposed to different combination of autonomy and intensity, we estimate the effects of autonomy and intensity on the World Health Organization-5 well-being index (WHO-5) and a self-assessed health indicator, two subjective indicators of health.

A preliminary descriptive analysis reveals a clear association between managerial practices, psycho-social risks and well-being. These associations may be (partly) due to composition effects,

[1] These new post-Taylorian work organizations are not new, but seem to be spreading more widely in recent years (COE, Tome 3, 2016).

confounding factors or reverse causality. To remedy these issues and identify the causal effect of intensity and autonomy at work on workers' well-being, we exploit the longitudinal nature of our data and estimate panel data model. Doing so, we control for time-invariant unobserved heterogeneity. Fixed effects model estimations reveal that, for given observed and unobserved individual characteristics, work intensity has a detrimental effect on workers' well-being, while work autonomy has a beneficial effect on workers' well-being. Interactions between the degree of intensity and the degree of autonomy are not systematically significant. Our results are therefore partly in line with theoretical predictions and the existing literature. The effect heterogeneity analysis do not reveal clear patterns about a differential impact of work intensity and/or work autonomy with respect to gender and age.

This paper contributes to the literature that evaluates the impact of working conditions on workers' health using panel data (see for instance Belloni et al. (2022); Ravesteijn and Kippersluis (2018)) and that aim in particular at evaluating the impact of recent changes in management practices on health (Beckmann (2016); Böckerman (2015); Böckerman et al. (2012), Ben Halima et al, 2023). We bring here new knowledge about the effect of specific working conditions, the management practices in terms of autonomy and intensity, in the case of France. By focusing on the joint effect of autonomy and intensity, we follow Karasek's job demand / job control model, and thereby relate to the vast literature in epidemiology and ergonomics that aims at testing the empirical validity of Karasek's model (de Lange et al., 2003; der Doef and Maes, 1999; Häusser et al., 2010; Kristensen, 1995; Niedhammer et al., 2021; Nieuwenhuijsen et al., 2010; Stansfeld and Candy, 2006). Our contribution to this literature is to use larger sample representative to the working population.

The rest of the article is organized as follows. The 2 section reviews the literature on work intensity and autonomy. Section 3 describes the data and provides descriptive analysis about exposure to autonomy and intensity and about the association between managment practices and workers' wellbeing. Section 4 presents our empirical strategy. Section 5 comments our results and 6 concludes.

2 Literature

In his seminal paper, Karasek (1979) reveals the importance of looking jointly at intensity (job demand) and autonomy (job control). Using Swedish and American survey data, he shows that

the combination of low decision latitude and high job demand is associated with mental load or stress (*strain*) and job dissatisfaction. The job demand / job control model then lays the foundations for thinking about the need to counterbalance the job demands imposed on the worker with discretionary power left to the worker to decide how to respond to these demands. It predicts that mental workload increases when the ratio of work demands to decision-making latitude increases (job strain). More demands can be asked to workers without any detrimental effect on their well-being if these additional demands are in line with the workers' skills, or if workers are given the means and leeway to satisfy these new demands.

In addition to autonomy and intensity, social support is added in Karasek and Theorell (1990)'s model as a mitigating factor in the relationship between work demands and decision latitude. If workers do not find support from their colleagues or hierarchy, the damaging effects of high demands on health are reinforced. Conversely, more support moderates the negative impact of increased demands. Workers with low control and low social support, but who have to meet high demands at work, would be therefore the most vulnerable in terms of well-being and health (i.e., they would be in a situation of *iso-strain*). The models of Karasek (1979) and Karasek and Theorell (1990) have been widely used in the literature and have become the reference frameworks for analyzing the impact of work intensity and autonomy on well-being and health.

The empirical literature does highlight associations between, on the one hand, cardiovascular disease, loss of psychological well-being and depression and, on the other hand, the combination of high demand-low control(-low support), but there is no consensus on the extent and interpretation of these associations. The various meta-analyses that list and connect the decades of research do not reach the same conclusions. Still, they all underline the methodological problems that arise when one attempt to test the empirical relevance of the models of Karasek (1979) and Karasek and Theorell (1990) and to formulate causal interpretations (de Lange et al., 2003; der Doef and Maes, 1999; Häusser et al., 2010; Kristensen, 1995; Niedhammer et al., 2021; Nieuwenhuijsen et al., 2010; Stansfeld and Candy, 2006). Additive models are validated on sufficiently large samples of cross-sectional data, but also on longitudinal data. Interactive models tend to validate model predictions less frequently.

A challenge in the empirical literature is to solve the endogenous exposure to different degrees of intensity and autonomy to identify the impact of such work dimension on workers' health and well-being. Overall, when endogeneity biases are taken into account, the effects of working conditions on workers' mental health are less marked, but remain significant and vary according to workers' gender

and age (Barnay, 2016; Belloni et al., 2022; Cottini and Lucifora, 2013; Ravesteijn and Kippersluis, 2018). We can refer here to two recent evaluations that use panel data to evaluate the impact of working conditions on health and that provide in particular results on the impact of work intensity and autonomy. First, Ravesteijn and Kippersluis (2018) use a long German panel to estimate a dynamic model and control for factors that may simultaneously affect the health and selection of workers in different occupations. They find that low autonomy and high physical demands have a negative impact on health. Their study reveals that selection effects (within occupations) explain 60% of the observed gross association between working conditions and worker health at the occupation level. The estimated selection effects are therefore substantial, but the specific effects of poor working conditions are significant. Second, Belloni et al. (2022) use a British long panel to assess the impact of various dimensions of working conditions on mental health, measured by the GHQ-9. They determine working conditions at occupation level, using the European Working Conditions Survey, and estimate fixed-effects models to neutralize the effect of fixed variables over time, only on individuals who do not change occupation over the observation period, to avoid exposure to endogenous occupational change bias. Their identification is therefore based on variations in working conditions over time within each occupation. They also find significant effects of working conditions on mental health, especially for women. Autonomy appears to have a particularly strong effect on mental health, especially for younger and older workers. Work intensity, on the other hand, has a significant effect only for younger workers. All in all, reducing job strain appears to be beneficial to health.

3 Data and descriptive analysis

3.1 Data

We use the French surveys on working conditions 2013, 2016 and 2019, *Conditions de Travail 2013* (CT 2013), *Conditions de Travail - Risques Psycho-Sociaux 2016* (CT-RPS 2016) and *Conditions de Travail 2019* (CT 2019), carried out by the French Ministry of Labour. Since 2013, the survey has been carried out in two sections: an "individual" survey based on a sample of employees, and an "employer" survey based on a questionnaire sent by mail to employers. The targeted sample is representative of the working-age population, and is combined with two additional sub-samples of people working in hospitals (private or public) and in the public sector (civil services), in order to

have sufficiently large samples to carry out specific studies on these sectors.

The "individual" surveys provide a representative panel of workers enabling us to monitor changes in working conditions and psycho-social risks at work in France. They provide information on occupation, working conditions and health of around 28,000 people aged of 15 years old or more, both employed and self-employed. Workers are mainly interviewed face-to-face, and a self-administered questionnaire is used for the more sensitive questions. While some waves offer specific questions, all waves share a few health measures and the description of key elements of working conditions. Insofar as we wish to exploit the panel dimension of the data, we will focus our analysis on these measures, which are present in all three waves.

We select a balanced panel of individuals. We restrict the analysis to workers interviewed at each waves of the survey, in 2013, in 2016 and in 2019. We exclude the self-employed, craftsmen and farmers. The analysis sample is thereby made up of around 11,000 individual observations (i.e. around 34,000 individual-year observations).

3.2 Measures of well-being

According to the World Health Organization (WHO), mental health is a "state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community". The words "mental health" therefore encompasses a whole range of conditions relating to psychology.

In the literature, there are several definitions and measures of mental health, ranging from low levels of well-being to substance misuse or suicide attempts. These measures can be objective, subjective, global or specific. All these different measures have advantages and limitations, and none appears clearly superior to the others. Here, we focus on two measures that are reported in all three waves of the survey: a measure of well-being, the WHO score (the *WHO-5*) and a measure of global health, the self-reported health status.

The WHO-5 score is a standard measure of subjective well-being. A lower value of the score indicates lower well-being (see the precise definition and the five questions on which the indicator is based in the Appendix). In practice, we can use the score in its continuous version, or consider an indicator of low well-being that takes value 1 if the WHO-5 score is below a threshold and 0 otherwise.

Self-reported overall health is a standard indicator, measured on a Likert scale from 1 (very

good health) to 5 (very poor health). We create a binary indicator from the ordered polytomous variable, and thus consider self-reported average, poor or very poor health (as opposed to good or very good). [2].

As shown in Table 1 around one quarter of the sample declares to be in (very) poor health, and around a third of our sample has a low WHO-5 score [3]. Table 13 in the Appendix shows correlation between well-being measures and socio-demographic characteristics in 2019. Individuals with a low WHO-5 score or a poor self-assessed health are older, and more often women. They are more often in a relationship and have higher level of education. Results by sector are not very revealing, although manufacturing sector and services sector seem to be associated with poorer well-being than agriculture and building sectors.

Table 1: Health Measure - panel

	2013	2016	2019
SAH (1 to 5)	2.007	2.097	2.143
(Very) Bad SAH (%)	0.225	0.270	0.287
WHO-5 Score	61.850	63.234	62.214
Low WHO-5 (%)	0.358	0.302	0.312

3.3 Measuring work intensity

Work intensity is not uniquely defined in the literature (Burchell et al., 2009). It can be defined by a large number of tasks to be carried out, by sustained and constrained work pace, by the requirement for a high level of effort, etc. More generally, it refers to the effort the worker has to exert (in a given period of time *stricto sensus*), and it is usually defined by pace constraints. In addition, it should be noted that surveys usually indicate the occurrence of intensity, not its severity.

It is particularly tricky to come up with an objective measure of work intensity (or intensification). Intensity indicators are generally based on subjective questions, so that they do not capture the objective intensity of work, but rather the intensity felt and experienced by workers. Workers

[2] It is more standard in the literature to consider self-reported good or very good health. We take the complement here to be consistent with the binary WHO-5 indicator, which marks the fact of being in a poor well-being state

[3] Figure 4 in the Appendix gives the distribution of the two main health indicators used.

are more likely to judge their work as intensive if they feel pressure to complete a given number of tasks in a given amount of time. Thus, highly efficient workers may not feel the intensity of their work, when for the same job, less efficient workers may feel that their work is intesive.

The Working Conditions survey provides a whole range of variables for approaching the notion of work intensity. Like other indicators found in the empirical literature, the indicator we built is a subjective measure of intensity. We have chosen a definition that focuses on mental and organizational intensity, rather than physical intensity (carrying heavy loads, walking, awkward or painful postures). In this respect, our definition of intensity is similar to the notion of psychological demand or workload, and thus to the notion developped in Karasek's model (Karasek (1979)).

In the survey, individuals do not pass the Karasek questionnaire, but they are asked to answer questions that are closely related to this questionnaire. The correspondence between the two sets of questions, those in the Karasek questionnaire, and those used to build our intensity indicator, is highlighted in Table 2. The left-hand column of the table lists the questions from the Karasek questionnaire, and the right-hand column lists the questions asked in all three waves of the survey. we obtain a fair match for the overall questionnaire, as we cannot find in our survey an appropriate equivalent for only one question of the Karasek questionnaire.

Compared with other studies using the CT-RPS surveys (Davie, 2015; Mauroux et al., 2017), we do not use exactly the same questions (see Table **??** in the Appendix). In (Coutrot, 2018), intensity is measured by an index that is the sum of the indicators associated with the following six risks: having a work rhythm imposed by at least three constraints, having to hurry (always or often), working under pressure, receiving contradictory orders, to think (always or often) about your work even when you're not at work, doing an excessive amount of work. This this measure and ours do not exactly overlap. The differences stem from our desire, on the one hand, not to keep variables that seem too far from the notion of work intensity or that were not close enough to questions asked in the Karasek questionnaire, and, on the other, to include all questions that capture the notion of mental workload.

Answers to the questions listed in the right-hand column of Table TabKintens are dichotomized (in case they were not already binary), by grouping the modalities "Always" and "Often" on one side and "Sometimes" and "Never" on the other. The sum of these dichotomous variables (0/1) gives a score between 0 and 8. This measure takes into account different aspects of work intensity, and in particular the components of work pressure, excessive effort, contradictory orders and task fragmentation. The choice of summing the different variables without specific weighting leads to

Table 2: Correspondence for the intensity component between the Karasek questionnaire and questions from the CT-RPS 2016

Karasek questionnaire	CT-RPS Survey
Quantity - pace	
Q10 - I have to hurry	NO EQUIVALENT (all years) DEPECH Do you have to hurry? (Always, Often, Sometimes, Never)
Q11 - My work is intensive	RPA2A I work under pressure (Always, Often, Sometimes, Never)
Q12 - My workload is excessive	RPA1I My workload is excessive (Always, Often, Sometimes, Never)
Q13 - I have enough time to do good work	CORRTAN To do good work you have, ... enough time (Yes/No)
Complexity - intensity	
Q14 - I receive contradictory orders from other people (Yes/No)	
Q15 - My work requires long periods of focus	NO EQUIVALENT
Fragmentation - predictability	
Q16 - My tasks are often interrupted before they are completed, requiring me to resume them later	DEBORD Do you frequently have to interrupt a task you're doing to perform another? (Yes/No)
Q17 - My work is very hectic	RPA2FI experience unpredictable changes (Always, Often, Sometimes, Never) RPA2B I have to think of too many things at once (Always, Often, Sometimes, Never)
Q18 - Waiting for work from colleagues or other departments often slows down my own work.	RWCOLEG Is your work rhythm imposed by immediate dependence on the work of colleagues? (Yes/No)

impose of perfect substitution between these different dimensions of work intensity. This measure does, however, provide a measure of the importance of work intensity and of the accumulation of different sources of intensity. The higher the score, the more forms of work intensity the individual indeed accumulates, and the greater the intensity felt. On the basis of this score, we construct a dummy variable which is equals 1 if the individual has an intensity score above the mean, and 0 otherwise.[4].

[4]As the mean and median are very close, the results of the descriptive statistics do not differ when centered by the mean or median

3.4 Measuring work autonomy

Like intensity, autonomy is a notion that remains blurred since it draws on personal registers such as individual organization. In other words, autonomy in the workplace can have different forms: autonomy in time and place of work, autonomy in the process of carrying out tasks, autonomy in the objectives set, and so on. Two types of autonomy are distinguished (**?**), depending on whether it is said to be "horizontal" or "vertical". "Horizontal" autonomy, on the one hand, is characterized by the fact that "the work is defined by setting global objectives, rather than by a description of specific tasks to be carried out"; "vertical" autonomy, on the other hand, is characterized by the fact that "employees are encouraged to solve problems themselves first, in the event of a minor incident".

To measure autonomy, we adopt the same approach as the one we use to measure intensity: by autonomy we mean decision-making latitude, and we have taken the Karasek questionnaire as our reference measure. Similar to what we had for intensity, we do not have a perfect replication of the Karasek in the CT-RPS survey, but we are able to build a correspondence between the two questionnaires, as illustrated in Table 3. Our measure attempts to take into account the various components of the model, notably horizontal autonomy and the notion of decision latitude. While the survey does not really enable us to approach the exploitation of workers' skills, it does provide a fair correspondences for questions on room for manoeuvre and skills development.

As for the intensity score, the autonomy score adds up dichotomized variables and provides synthetic information on the decision-making latitude of the worker within the company. Here too, we assume perfect substitution between the different components of autonomy. The score takes values ranging from 0 to 10, and gets higher values when the worker reports having decision latitude. As with the intensity score, to facilitate interpretation of the differences between groups and coefficients in the analysis that follows, we have centered and reduced the score, and constructed an indicator that equals 1 if the individual has an above-average autonomy score, and 0 otherwise.

Table 3: Correspondence for the autonomy component between the Karasek questionnaire and questions from the CT-RPS 2016 survey

Latitude or room to maneuve	
Q4 - My job often requires me to make decisions by myself.	NO EQUIVALENT (each year) When something abnormal happens during your work, do you (1.most of the time, you deal with the incident personally, 2.you deal with the incident personally but in very specific cases, 3.you usually call in others) Can you interrupt your work whenever you want (Yes/No)?
Q6 - In my job, I have very little freedom to decide how I do my work	- The instructions given by your superiors tell you what to do. In general, : 1. they also tell you how to do it; 2. they rather indicate the goal of the work and you choose yourself how to get there - You receive orders, instructions for doing your work correctly, do you 1. strictly apply the instructions; 2. in certain cases, you do otherwise; 3. most of the time you do otherwise; 4. not applicable (no orders nor instructions)
Q8 - I have the possibility to influence my work	I can organize my work in the way that suits me best (1. Not at all agree, 2. Disagree, 3. Agree, 4. Strongly agree) Can you change your goals? (1. Yes, on your own initiative; 2. Yes, by discussing with your superior; 3. Yes, by discussing with several people or collectively; 4. No) To do your work, do you have the possibility of varying the deadlines set? (Yes/No)
Current skills use	
Q5 - My work requires a high level of skills	NO EQUIVALENT
Q7 - In my work, I have varied activities	NO EQUIVALENT
Q2 - In my work, I have repetitive tasks	REPETE Does your job consist of continually repeating the same series of gestures or operations?
Skills development	
Q1 - In my work, I have to learn new thinks	NOUVELLE Does your work allow you to learn new thinks ?
Q3 - My work requires me to be creative	
Q9 - I have the opportunity to develop my professional skills	RPA1L I have the opportunity to develop my professional skills

3.5 Exposure to intensity and autonomy

Overall, of all employed workers in our sample, 44% have a work intensity score higher than average (average score of 3.31 for a score ranging from 0 to 8) and 77% have a higher autonomy score than average (average score of 7.01 for a score that can range from 0 to 10). 11% of workers declare having intensive work without autonomy and thus being in a situation of job strain, while 33% of workers have intensive work but with autonomy, 44% declare having autonomy in their work

without intensity (category "relaxed") and 12% have neither intensity nor marked autonomy[5].

The degrees of exposure to intensity and autonomy (and their combination) vary according to the characteristics of the individuals (Table 4). On average, men report benefiting from more autonomy and less intensity than women, which leads women to be more exposed to job strain than men. The intensity and autonomy scores are higher among middle-aged workers, but the differences are small between the three age groups considered so that there is no marked difference in terms of exposure to job strain by age. The degrees of intensity and autonomy are also even higher when we consider workers with higher levels of diploma or socio-professional category.

Last, we note that workers being the most vulnerable in terms of well-being are those who report the most intensive work and the least autonomy. For instance, employees who have experienced significant (possibly traumatic) events in their lives are more exposed to job strain than the average.

Table 5 also shows how the degrees of exposure to intensity and autonomy (and their combination) are associated with the characteristics of the employer and the job. It is particularly interesting to note that the workers most likely to describe jobs with intensity also report experiencing time constraints, physical arduousness and changes in their professional life over the last 12 months. The intensity also appears stronger for workers employed in large companies and those in the private sector. For all these dimensions, the relationship is reversed for autonomy, even if the differences are less pronounced: autonomy is slightly more important for workers who also declare having better working conditions and not having experienced change in their professional life in the previous year, who work in small or medium-sized companies and who are in the public sector. There is no linear relationship between work intensity and seniority in the company. Last, workers on permanent contracts and full-time workers report both more intensity and more autonomy than the average. Ultimately, the groups of workers who seem most exposed to job strain are workers on temporary and part-time contracts, who have lower incomes, who also have physical constraints and hardships and who have experienced a work environment that was disrupted during the year.

[5]Our classification here gives results comparable to those obtained by Dares (2016) from the Sumer 2010 survey and those obtained by Memmi et al. (2019) from the Sumer 2017 survey.

Table 4: Exposure to intensity and/or autonomy

	Intensity		Autonomy					
	Indicator	score	Indicator	score	Jobstrain	Autonomous less intense	Autonomous Intense	Less autonomous - - less intense
All	0.44	3.31	0.77	7.07	0.11	0.44	0.33	0.12
Male	0.40	3.09	0.81	7.27	0.08	0.49	0.32	0.11
Female	0.48	3.47	0.73	6.93	0.14	0.40	0.34	0.13
below 25 years old	0.36	2.92	0.79	7.10	0.00	0.43	0.36	0.21
25-35 years old	0.46	3.50	0.78	7.06	0.12	0.44	0.34	0.10
35-45 years old	0.49	3.57	0.78	7.09	0.12	0.41	0.38	0.10
45-55 years old	0.44	3.29	0.76	7.03	0.11	0.43	0.33	0.13
55 years old and above	0.39	2.99	0.76	7.10	0.11	0.48	0.28	0.14
French	0.44	3.32	0.77	7.07	0.11	0.44	0.33	0.12
Not French	0.33	2.76	0.70	6.65	0.08	0.45	0.25	0.22
No degree or $<$ high school	0.36	2.89	0.65	6.50	0.14	0.43	0.23	0.21
High school degree	0.43	3.29	0.76	7.01	0.12	0.45	0.31	0.12
College degree	0.50	3.59	0.84	7.51	0.09	0.44	0.40	0.06
Private sector	0.43	3.21	0.79	7.05	0.10	0.46	0.33	0.12
Executive	0.48	3.45	0.93	8.14	0.04	0.49	0.44	0.03
Intermediate	0.50	3.62	0.81	7.27	0.12	0.43	0.38	0.07
Employee	0.41	3.14	0.66	6.60	0.16	0.40	0.26	0.19
Worker	0.33	2.75	0.67	6.43	0.11	0.45	0.22	0.22
Directors, Executives	0.54	3.89	0.96	8.37	0.03	0.45	0.52	0.01
Intellectual professions	0.47	3.40	0.89	7.82	0.06	0.48	0.41	0.05
Intermediary Professions	0.50	3.60	0.78	7.17	0.13	0.42	0.36	0.08
Administrative workers	0.38	3.08	0.80	7.20	0.08	0.50	0.30	0.12
Sales staff	0.47	3.48	0.61	6.31	0.20	0.34	0.27	0.19
Farmers	0.18	2.02	0.68	6.89	0.05	0.55	0.13	0.26
Skilled trades industry crafts	0.33	2.83	0.78	7.16	0.08	0.52	0.26	0.14
Machine operators	0.34	2.75	0.62	5.96	0.12	0.40	0.22	0.26
Elementary Professions	0.33	2.64	0.57	6.31	0.17	0.40	0.17	0.27
Events during childhood	0.48	3.51	0.74	6.91	0.13	0.40	0.34	0.12
Events in past 3 years	0.49	3.59	0.75	6.95	0.13	0.39	0.36	0.12

Sources : 2019 CT survey.

Reading : 40% of employed men in 2019 were classified as having intensive employment and had an average intensity score of 3.3.

Table 5: Exposure to intensity and autonomy - Employment characteristics (en %)

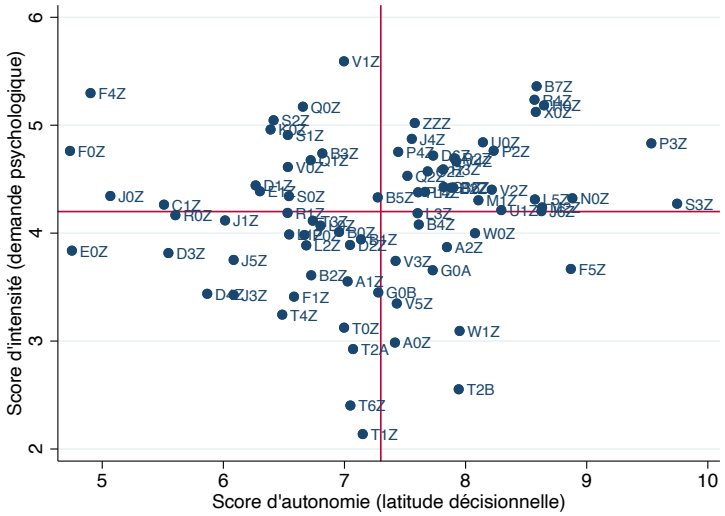
	Intensity		Autonomy					
	Indicator	score	Indicator	score	Jobstrain	Autonomous less intense	Autonomous Intense	Less autonomous - - less intense
Temporary contract	0.33	2.35	0.61	6.32	0.10	0.37	0.24	0.29
Permanent contract	0.27	2.50	0.68	6.73	0.08	0.49	0.19	0.24
Full-time	0.44	3.32	0.78	7.14	0.11	0.44	0.34	0.11
Part-time	0.43	3.24	0.68	6.76	0.15	0.39	0.28	0.17
Income $<$ 1200 euros	0.33	2.61	0.61	6.32	0.14	0.42	0.18	0.25
Income in [1,200;1,800[euros	0.41	3.19	0.68	6.63	0.15	0.41	0.26	0.18
Income in [1,800;2,500[euros	0.47	3.46	0.79	7.18	0.12	0.43	0.35	0.10
Income $>=$ 2,500 euros	0.48	3.46	0.90	7.86	0.06	0.47	0.42	0.05
Tenure in [0;5] years	0.37	2.95	0.79	7.14	0.08	0.50	0.29	0.13
Tenure in]5;20] years	0.46	3.42	0.75	6.99	0.12	0.41	0.34	0.13
Tenure $>$ 20 years	0.44	3.30	0.78	7.15	0.11	0.45	0.33	0.11
Atypical hours	0.49	3.57	0.74	6.89	0.14	0.38	0.35	0.13
Poor work-private lifes balance	0.50	3.63	0.75	6.97	0.13	0.38	0.37	0.12
Exposed to physical risks (answer all)	0.47	3.46	0.72	6.81	0.14	0.39	0.33	0.14
Exposed to constraints	0.56	3.91	0.75	6.92	0.15	0.33	0.41	0.11
Work in interaction with public	0.46	3.42	0.76	7.04	0.12	0.42	0.34	0.12
1 to 49 employees	0.34	2.76	0.78	7.22	0.09	0.53	0.25	0.13
50 to 499 employees	0.46	3.34	0.75	6.91	0.12	0.42	0.34	0.13
500 employees and above	0.46	3.43	0.82	7.08	0.08	0.44	0.38	0.10
Multi-establissement firm	0.45	3.38	0.81	7.10	0.08	0.45	0.37	0.10
Agriculture	0.32	2.57	0.73	6.85	0.07	0.48	0.25	0.20
Food, Drink Manufacturing	0.41	3.21	0.72	6.45	0.11	0.41	0.30	0.17
Electronic Manufacturing	0.43	3.12	0.87	7.61	0.02	0.47	0.40	0.10
Transport Manufacturing	0.45	3.44	0.85	6.99	0.06	0.46	0.39	0.09
Other Manufacturing	0.42	3.23	0.84	7.33	0.06	0.48	0.36	0.10
Water/Waste Industries	0.39	3.02	0.82	7.33	0.05	0.48	0.34	0.13
Building	0.39	2.99	0.81	7.27	0.09	0.50	0.30	0.10
Trade	0.40	3.10	0.79	6.89	0.09	0.48	0.31	0.12
Transport	0.36	3.03	0.70	6.29	0.09	0.43	0.27	0.20
Information Communication	0.40	3.00	0.93	7.96	0.03	0.56	0.38	0.04
Hotel Restaurant	0.42	3.18	0.70	6.50	0.14	0.42	0.28	0.16
Finance and Real Estate	0.42	3.14	0.90	7.79	0.05	0.53	0.37	0.05
Scientific Activities	0.43	3.23	0.85	7.61	0.07	0.49	0.36	0.08
Public Administration	0.47	3.47	0.73	7.00	0.14	0.40	0.33	0.13
Other Service	0.34	2.79	0.81	7.57	0.07	0.54	0.27	0.12
Manufacturing	0.42	3.22	0.82	7.14	0.07	0.47	0.35	0.11
Construction industry	0.39	2.99	0.81	7.27	0.09	0.50	0.30	0.10
Service industries	0.45	3.34	0.75	7.05	0.12	0.43	0.33	0.12
Experienced changes in past year	0.56	3.94	0.78	7.00	0.13	0.35	0.42	0.09

Sources : 2019 CT survey.

Reading : 37.8% of employees on temporary contracts in 2016 were classified as having intensive employment and had an average intensity score of 3.6.

Some professions appear to have specific profiles in terms of intensity and decision-making latitude (Figure 1). The professions with high intensity and low decision-making latitude are mainly unskilled textile and leather workers (F0) as well as workers in the graphic industries (F4). Qualified construction workers (B3Z) and civil service executives (category A and similar) (P2Z) also have a high intensity but declare on average to have a little more decision-making latitude. Domestic workers (T1Z) report relatively low intensity and low decision-making latitude. In contrast, construction and public works executives (B7Z) or even industrial executives and engineers (H0Z) have a strong intensity component and have a lot of autonomy. Trainers or teachers (W0Z-W1Z) or even childminders (T2B) believe they have great decision-making latitude and relatively low intensity. Study and research staff (N0Z) also have a high degree of autonomy but according to our measurement, the intensity is average, just like for bosses and executives in the hotel and catering industry.

Figure 1: Average Scores of autonomy and intensity by professional categories

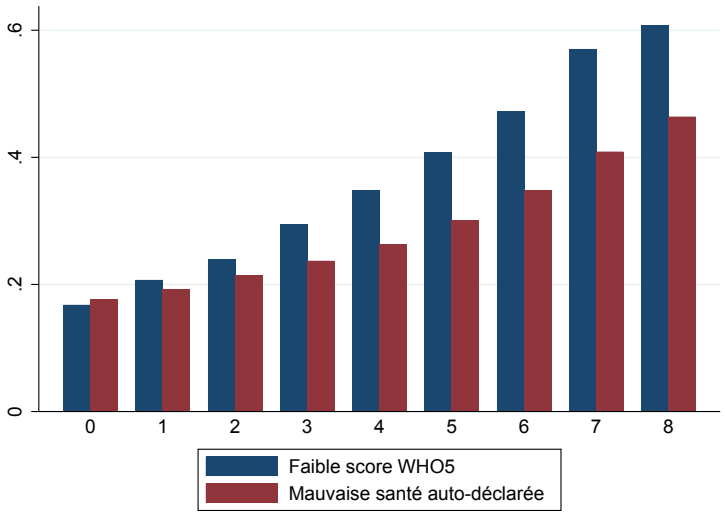


B3Z: Unskilled workers in building finishing work"; "B7Z: Building and public works executives"; "E0Z: Unskilled workers in process industries"; "F0Z: Unskilled textile and leather workers"; "F4Z: Workers in the graphic industries"; "H0Z: Engineers and technical managers in the industry"; "J0Z: Unskilled handling workers"; "N0Z: Study and research personnel"; "P2Z: Civil service executives (category A and similar)"; "S3Z: Hotel and cafe owners and executives , restaurants";"T1Z: Domestic workers";"T2A: Home help and household help";"T2B: Childminders"; "T4Z: Maintenance Agents"; "V4Z: Social action and guidance professionals; "W0Z: Teachers"; "W1Z: Trainers".

3.6 Correlation between well-being and intensity and autonomy at work

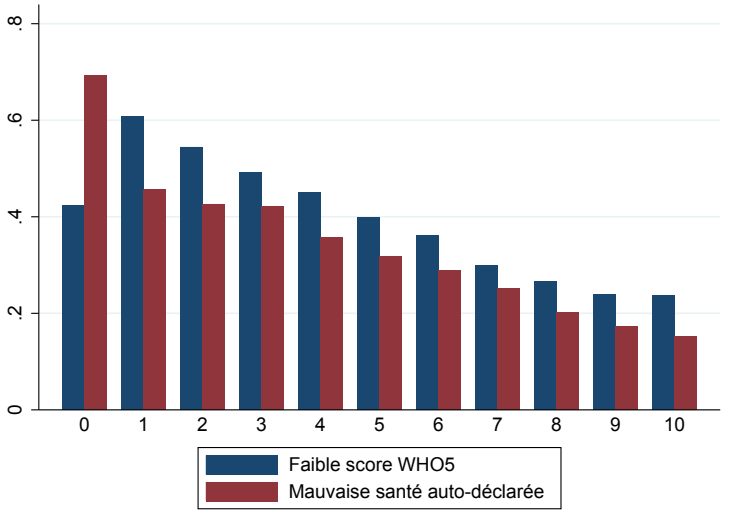
In this subsection, we present some correlations between intensity/autonomy and well-being. The proportion of people with lower level of well-being is greater when the intensity score is high (Figure 2). Less than 10% of individuals who report a low level of intensity also report having a low level of well-being, when more than 30% of individuals who report high intensity also report a low level of well-being. The association is less strong with self-reported overall health, even if the share of workers who think that they have a bad or very bad state of health tends to increase along the intermediary values of the intensity score.

Figure 2: Distribution of self-assessed health and well-being indicators according to intensity level at work



There is no such linear relation between health and autonomy (Figure 3), even if, health status seems to improved as autonomy increases. It looks likes very high level of autonomy or, on the contrary, very low levels of autonomy can be poorly experienced by individuals (using the WHO-5 score).

Figure 3: Distribution of self-assessed health and well-being indicators according to autonomy level at work



Last, we compute the average values of our well-being indicators by the type of combination of intensity and autonomy (Table 6). Individuals exposed to both high work demands and low decision-making latitude (individuals who are in a situation of job strain) report on average poorer health status than others: the share of low WHO-5 score is significantly higher than on average and in particular, 6 points higher than for salaries who have intensive work but more autonomy. Workers who report the best performance in terms of well-being are workers who have less-than-average intensive work but more-than-average autonomy.

Table 6: Correlation between indicators of well-being and combination betwenne intensity and autonomy

	"Job Strain"	"Autonomous' and Intense"	"Less intense and Autonomous"	"Less intense and Less autonomous"
Average WHO-5 score	56.0	58.2	70.1	69.1
Low WHO-5 score (en %)	46.5	40.4	19.2	24.2
(very) Bad SAH (en %)	35.3	27.9	17.3	22.7

Workers are not randomly distributed into different types of employment as revealed by the analysis presented in the previous section. To partially control for these structural effects, we esti-

mate logit models to have conditional association between exposure to autonomy and intensity and well-being. In this analysis "all other things being equal", we express the probability of declaring a low level of well-being as a function of socio-demographic characteristics, professional characteristics, including exposure to intensity and/or autonomy, and health risk factors (the fact of having experienced significant events in the past). We report in Tables 7 and 8 the main results of these estimations.

All things being equal, intensity is associated with poorer well being. This negative association is observed whatever the measure of well-being and whatever the way we introduce intensity into the model (via the score—Table 7—or via the indicator of higher-than-average intensity—Table 8). When we take score of work intensity, intensive work is associated with a probability of having a low WHO-5 score (resp. a poor or very poor self-reported health) higher by 9.2 pp (resp. 5.7 pp) for each additional unit of the intensity score. When we take the indicator of high work intensity, the probability of having a low WHO-5 score (resp. a poor or very poor self-reported health) is 14.4 pp (resp. 9 pp) higher for those who report a work intensity above the average.

Autonomy is associated, all other things being equal, with higher levels of well-being. The association of health with autonomy seems systematically less strong than with intensity: each additional unit of the autonomy score is associated with a probability of having a low WHO-5 score (resp. a poor or very poor self-reported health) lower by 5.2 pp (resp. 4.6 pp). The same, higher-than-average autonomy is, for given characteristics, associated with a probability of having a low WHO-5 (resp. reporting being in poor or very poor health) reduced by 6 pp (resp. 3.5 pp).

The interaction terms between the intensity and autonomy scores are not statistically significant. This indicates that, on average and all other things being equal, the level of autonomy does not modulate the effect of intensity.

Table 7: Correlation between well-being/SAH and Intensity/Autonomy

	Low WHO 5			Poor SAH		
Intensity Score	0.092***		0.079***	0.057***		0.041***
	(0.005)		(0.007)	(0.005)		(0.009)
Autonomy Score		-0.052***	-0.040***		-0.046***	-0.038***
		(0.007)	(0.007)		(0.010)	(0.009)
Interaction			0.004			-0.011*
			(0.006)			(0.006)
log-likelihood	-5347.513	-3687.167	-3595.510	-5147.653	-3501.947	-3462.376
pseudo R-squared	.0932672	.0739379	.0921463	.0952397	.091392	.0966752
N	9524	6538	6505	9524	6538	6505

Marginal Effects. Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1.

The estimations are run controlling for age, gender, level of education, sector, years of experience, type of contract, working time, socio-professional category, others working conditions, income, and important events.

Table 8: Correlation between Well being/SAH and intensity/autonomy

	Low WHO 5				Bad SAH			
High Intensity	0.144***		0.107***		0.090***		0.092***	
	(0.011)		(0.020)		(0.010)		(0.019)	
High Autonomy		-0.060***	-0.081***			-0.035***	-0.029*	
		(0.012)	(0.018)			(0.012)	(0.016)	
Interaction			0.047**				-0.005	
			(0.023)				(0.021)	
Less intense - Less autonomous				ref.				ref.
Intense - Less autonomous				0.114***				0.098***
				(0.022)				(0.021)
Less intense - Autonomous				-0.077***				-0.028*
				(0.016)				(0.015)
Intense - Autonomous				0.076***				0.059***
				(0.018)				(0.017)
log-likelihood	-5431.240	-5509.795	-5418.872	-5418.872	-5201.982	-5234.317	-5198.031	-5198.031
pseudo R-squared	.0846632	.0714242	.0867475	.0867475	.0919573	.0863129	.092647	.092647
N	9578	9578	9578	9578	9578	9578	9578	9578

Marginal Effects. Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1.

The estimations are run controlling for age, gender, level of education, sector, years of experience, type of contract, working time, socio-professional category, others working conditions, income, and important events.

4 Empirical Strategy

In this section, we estimate the effects of work autonomy and intensity on workers' well-being using the panel dimension of the Working Conditions surveys.

The use of a panel of individuals seems necessary since well-being is not independent of autonomy or intensity at work. Unobserved factors, not taken into account in the logit estimation, simultaneously affect well-being or health status and the degree of intensity and autonomy at work. Self-confidence or the tendency to stand back are such unobservable variables that can both affect health and the greater or lesser propensity to be autonomous or to support an intensive workload. If they are constant over time, these factors of unobserved heterogeneity can be modeled through an individual fixed effect which can be estimated or neutralized using panel data.

We carry out the analyzes on a balanced sample which does not include any missing values on the variables used in the econometric analysis. The sample thus includes nearly 12,700 observations.

The estimation of a fixed effect model makes it possible to eliminate unobserved heterogeneity stable over time and thus neutralize the endogenous selection of individuals in the different professions which would be due to these factors. The identification of the effects of working conditions is based on the changes that workers experienced in their working conditions over the three waves. It should be noted that these variations in working conditions may be due to endogenous mobility linked to unobservable factors which vary over time or to reverse causality, which we cannot control here. However, we control for several variables that vary over time to limit bias.

More precisely, we estimate the following fixed effect model for $= 1, ..., N$ and t=$\{1,2,3\}$

$$Health_{it} = \beta X_{it} + \delta WC_{it} + \alpha_i + \tau_t + u_{it}$$

with $Health_{it}$ the WHO-5 score of the individual i at time t, X_{it} explanatory variables that vary over time and measured at time t. Those variables are : age, family situation, type of contract, number of working hours, income, exposure to physical hardship or atypical hours and sector of activity. WC_{it} is a vector of working conditions we are interested in: intensity (score reduced centered or an indicator of high intensity according to the specifications), autonomy (score reduced centered or an indicator of high intensity according to the specifications) and eventually the interaction term between autonomy and intensity. α_i is the fixed effect that capture the unobserved heterogeneity, τ_t the time effect and u_{it} the error term.

Due to the differences expected in the estimated effects according to sex and age, we estimate

the model separately for men and women and for three age groups, namely young people (16–35 years), people of middle age (36–49 years), and seniors (over 50 years). We thus follow Belloni et al. (2022).

5 Results

The main results are reported in Tables 9 and 10. In Table 9 we use the reduced centered scores of intensity and autonomy while when Table 10 we use the indicators of high intensity and autonomy (higher than average).

Whether we take continuous or dichotomized measures, the results are partly consistent: given observed and unobserved individual characteristics, work intensity has a damaging effect on the well-being of workers, unlike worker autonomy which has a beneficial effect on the well-being of workers. The interaction terms appears only to be significant when using the intensity and autonomy scores. The coefficient is positive, which is in line with Karasek's model according to which greater autonomy can counterbalance the negative effects of high intensity.

Following Belloni et al. (2022), we also do a stratified analysis by sex and by age group (Tables 11 and 12). The stratified estimates show that men appear be more inclined to tolerate high intensity when it is counterbalanced by significant autonomy. When we consider the age groups, we can see that intensity plays a negative role for the three groups of workers, but that only intermediate-aged workers seem to benefit from more autonomy. However, this effect is not significant when autonomy is measured through the score.

Table 9: Impact of intensity and autonomy on WHO-5 score - fixed effects model (1/2)

	(1)	(2)	(3)	(4)
Intensity Score	-4.315***	-4.217***	-4.295***	-4.197***
	(0.160)	(0.162)	(0.161)	(0.162)
Autonomy Score	1.677***	1.654***	1.645***	1.620***
	(0.158)	(0.159)	(0.158)	(0.159)
Interaction			0.319**	0.329***
			(0.127)	(0.128)
X	No	Yes	No	Yes

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10: Impact of intensity and autonomy on WHO-5 score - fixed effects model (2/2)

	(1)	(2)	(3)	(4)
High intensity	-5.895***	-5.724***	-5.977***	-5.785***
	(0.248)	(0.249)	(0.376)	(0.377)
High autonomy	2.218***	2.171***	2.157***	2.125***
	(0.242)	(0.243)	(0.320)	(0.321)
Interaction			0.124	0.093
			(0.428)	(0.429)
X	No	Yes	No	Yes

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 11: Impact of intensity and autonomy on WHO-5 score - fixed effects model - by gender

	Men		Women	
	scores	indicators	scores	indicators
Intensity	-3.952***	-6.225***	-4.363***	-5.584***
	(0.242)	(0.586)	(0.218)	(0.493)
Autonomy	1.817***	2.039***	1.521***	2.272***
	(0.233)	(0.476)	(0.216)	(0.432)
Interaction	0.611***	1.439**	0.134	-0.760
	(0.187)	(0.654)	(0.174)	(0.570)
X	Yes	Yes	Yes	Yes

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 12: Impact of intensity and autonomy on WHO-5 score - fixed effects model - by group age

	16-35 years		36-50 years		50 years or more	
	scores	indicators	scores	indicators	scores	indicators
Intensity	-4.138***	-5.828***	-4.402***	-6.044***	-3.558***	-4.796***
	(0.298)	(0.708)	(0.219)	(0.503)	(0.414)	(0.968)
Autonomy	1.545***	1.731***	1.751***	2.480***	1.236***	1.523*
	(0.298)	(0.614)	(0.214)	(0.427)	(0.405)	(0.805)
Interaction	0.097	-0.088	0.533***	-0.037	-0.020	0.856
	(0.239)	(0.812)	(0.172)	(0.571)	(0.318)	(1.091)
X	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6 Conclusion

Our study shows the effects of working conditions in terms of autonomy and intensity on the well-being of workers. We find harmful effects on well-being of high work intensity and beneficial effects on well-being when the worker has significant latitude at work. Individuals with intense work conditions and less decision-making latitude are those whose well-being is the most degraded, while those whose work is not very intense and with more decision-making latitude are those whose well-being is the better.

The estimates carried out, all things being equal, in cross-section or in panels support this result. The latter clearly show that, even taking into account the unobservable (and fixed over time) characteristics of individuals, working conditions (namely intensity and autonomy components) have a significant and important impact on the well being and health status of workers.

These results show that significant reflection in terms of workforce management appears crucial on the part of human resources departments and *managers* or hierarchical chains, to be able to keep employees at work. The place of the employee in the production processes, their ability to manage their workload and the methods to achieve this are all questions that companies must address to help individuals live better at work.

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Appendix

Definition of WHO-5 score (WHO)

For each of the five items on which the score is based, respondents are asked to indicate "How often have you felt the following statements, at work and outside? *(All the time, Most of the time, More than half the time, Less than half the time, Occasionally, Never)*":

1. I felt good and in a good mood
2. I felt calm and peaceful
3. I felt full of energy and vigorous
4. I woke up feeling refreshed and refreshed
5. My daily life has been filled with interesting things

The WHO-5 score is built by adding values of the given answers to the five questions cited above, knowing that a score of 5 is obtained when the individual answers "all the time", 4 "most of the time" ...0 "never".

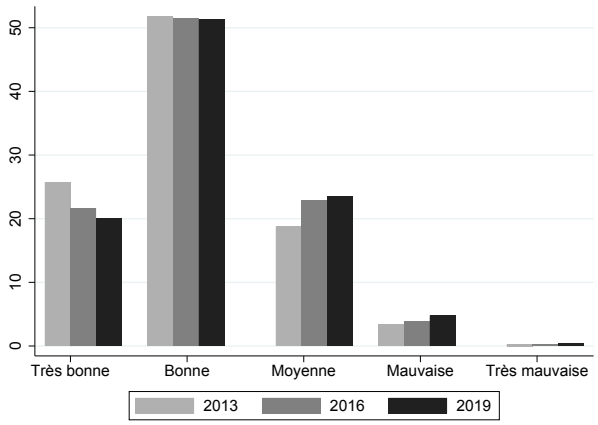
A score is assessed as low when it is below 12 or if the individual answers occasionally or never at least to one item.

Table 13: Socio-demographic composition of workers with low levels of well-being anf SAH - 2019

	Faible Score WHO5	Mauvaise santé auto-déclarée
Female	0.662	0.642
Male	0.338	0.358
below 25 years old	0.001	0.001
25-35 years old	0.078	0.050
35-45 years old	0.266	0.222
45-55 years old	0.411	0.432
55 years old and above	0.244	0.296
50 years old and above	0.453	0.528
60 years old and above	0.071	0.080
French	0.986	0.986
Not French	0.014	0.014
Not single	0.716	0.713
With child(ren)	1.000	1.000
No diploma	0.047	0.062
CEP-BEPC	0.045	0.055
CAP-BEP	0.230	0.286
High-school degree (bac)	0.179	0.172
College degree (bac+2)	0.176	0.160
University degree (> bac+2)	0.323	0.265
< high-school degree	0.322	0.403
> high-school degree	0.499	0.425
Agriculture	0.007	0.008
Manufacturing	0.126	0.120
Construction industry	0.026	0.034
Service industries	0.840	0.838
Part-time	0.192	0.205

Figure 4: Distribution of health/well being indicators

Self-assessed health



WHO-5