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# Disparities in taking sick leave between sectors of activity in France: a longitudinal analysis of administrative data<sup>1</sup>

Thomas Barnay<sup>2</sup>, Sandrine Juin<sup>3</sup> and Renaud Legal<sup>4</sup>

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The DREES cannot be held responsible for this work

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**Abstract:** The main objective of this study is to analyse the effect of the professional environment on sick leaves. The professional context is approximated by the sector of activity. The database used – Hygie (2005-2008) – allows taking individual heterogeneity into account thanks to the longitudinal dimension. Sick leave probability is estimated through a fixed effects logit model and the duration (number of days absent due to sickness) is estimated through a fixed effects Poisson model. The results show that sectors of activity differ in sick leave duration rather than in the occurrence. Indeed, taking into account individual heterogeneity and differences in health status and wages reduces the variability in sick leave probability between sectors by half. On the other hand, the sector remains decisive in explaining sick leave durations. This residual variability may refer to unobserved differences in working conditions, in the generosity of daily sick pay benefits or in job insecurity.

**Keywords:** sick leaves, health insurance, government policy, longitudinal data, fixed-effects, conditional maximum likelihood.

**JEL:** I13, I18, I38, J24.

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# 1. Introduction

French health expenditures on daily sick pay benefits (see annex 6.1) paid by the National Health Insurance Fund for Salaried Workers, rose to 6.8 billion euros in 2010. On the macroeconomic level, the main drivers in daily sick pay benefits' dynamic are relatively well known: the salary level (*price effect*), the employment environment including unemployment (*volume effect*), the proportion of workers over 50 years in the Labour force (health effect), and also the intensity of sickness absence control policy by the public authorities.

By contrast, on the microeconomic level, the study of determinants is still insufficient, although it is a major issue in terms of French public policies (the role of work conditions, the social cost of absenteeism, the optimal level of coverage...). Taking sick leave should essentially be due to a bad health status (Ose, 2005). Nevertheless, other factors can intervene such as medical's prescriptions, the employees' moral hazard behaviour (Allen, 1981; Brown and Sessions, 1996), the role of collective agreements or again the work demands forcing some employees to take sick leave or inversely, to be present despite bad health status.

This study falls within empiric publications on sick leaves and proposes, in the French case, to sharply analyze the microeconomic determinants. More precisely, it endeavours to estimate the net effect of the professional context on the individual disparities in the occurrence and the duration of sick leaves after controlling composition effects.

It is important to isolate the *professional context* effect – which is relative to characteristics of the professional environment (work conditions, sick leave benefits...) from *composition effects* - which relate to the individuals' personal characteristics (age, gender, salary level, health status...) and *environmental* determinants – which relate to the non-professional environment (provision of care characteristics, unemployment rate...).

Indeed, in terms of public policies, the effects of the *professional context* will not require the same answers as those pertaining to *composition effects*. For instance, a sector of activity distinguished by a particularly high claim rate could involve incentive measures aiming to improve work conditions. Conversely, a given category of employees presenting atypical rates of sick leave could suggest targeted actions focussed on prescribers.

Moreover, social contributions that fund daily sick pay benefits paid by the Health insurance solely depend upon the individual's salary level: the rules for funding sick leave ignore the possible effect due to the professional context and hardly encourage companies to anticipate sick leaves. It is therefore interesting to estimate the extent to which the professional context explains sick leave disparities.

Several levels of analysis are permitted in order to analyse the effects of the *professional context* such as the company or the sector of activity... This study chooses to understand the professional context at the sector of activity level. There were two reasons this choice was made. First, in the absence of being able to observe the levels of sick leave coverage in each company, the sector of activity enables us to approach this compensation level. Indeed, beyond mandatory compensation for sick leaves paid by the Health insurance, there exists an optional compensation provided for through collective bargaining which is highly dependent upon the branch of activity. Second, the sector of activity also enables taking gaps in working conditions into account.

This study was carried out using a panel of over 400,000 employees in the private sector on whom we had access to much administrative information: consumption of medical care, sick leaves, retrospective information on professional careers, etc.

From a methodological point of view, it is not easy to isolate the net effect of the professional context, due to the problems linked to unobserved individual heterogeneity, potentially correlated to the professional context. For instance, if a company recruits unhealthy people, but whose health status is not correctly observed, we could assign the professional context what is indeed a composition effect. Having access to panel data gave valuable answers to the problems of endogeneity. The empirical strategy consists in using changes in sectors on an individual level to estimate the net effect of the professional context: it fully exploits the longitudinal dimension of the data. The effect of the professional context is analysed both in terms of the occurrence of sick leaves and in terms of the duration thereof.

The article is organized as follows: part 2 proposes a critical review of publications pertaining to sick leave; part 3 presents the database and methodology used; part 4 presents the main results obtained. Finally, the last part is devoted to discussion and the conclusion.

## 2. Review of the literature

Many papers have endeavoured to empirically study the determinants of sick leave. Two types of determinants can be identified: individual and contextual.

### 2.1. The individual determinants

Socioeconomic characteristics play a large role. Thus, women generally take longer and more frequent sick leaves than do men (Chaupain-Guillot and Guillot, 2007; Ben Halima *et al.*, 2012; Ben Halima and Regaert, 2013; Frick and Malo, 1008; Livanos *et al.*, 2010). They are thus more sensitive to economic incentives (compensation system effect) and are more influenced by unemployment (Henrekson and Persson, 2004; Ose, 2005). Moreover, the length of sick leaves increases with age, without actually making them more frequent (Chaupain-Guillot and Guillot, *op. Cit.*).

This surprising result can be partially explained by the existence of a *healthy worker effect*: employed seniors are healthier than those who are not employed (Barnay, 2010). Having young children increases the probability of a sick leave (Chaupain-Guillot and Guillot, *op. cit.*). Education, rarely studied, seems to decrease sick leave: the later an individual starts their career (high education and human capital levels), the shorter the sick leave (Ben Halima and Regaert, 2013).

Health status is equally a determining factor. A degradation of the health capital could lead to sick leave by making the individual unable to work. In addition, careful management of health capital can suppose forms of preventive sick leaves to prevent more damaging consequences on the individual's occupational status (Grossman, 1972). Chaupain-Guillot and Guillot (*op. cit.*) demonstrated that a person suffering from a chronic disease or disability has a higher probability of taking sick leave. Furthermore, Ben Halima and Regaert (*op.cit.*) highlight that an individual with an Acute chronic disease (ACD)<sup>5</sup> has longer sick leaves. Additionally, Case and Deaton (2005) explain that manual workers self-report to be in the poorest health status.

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<sup>5</sup> In France, the costs of 30 Acute chronic diseases (ACD) are fully paid by the social security.

Finally, concerning individual characteristics linked to employment, several theoretical mechanisms underlie sick leaves. In the Shapiro-Stiglitz efficiency wage model (1984), the individuals, whose utility positively depends upon wages and negatively upon effort, would be less inclined to be voluntarily absent (*shirking model*) when the probability of finding a new job is lower. Thus, the critical wage (the minimum wage satisfying the *non-shirking* condition) is an increasing function of the expected utility associated with unemployment. Ben Halima and Regaert (*op.cit.*) demonstrate a negative relationship between wages and the length of sick leaves (in which case leisure is considered to be a normal good) by controlling those individuals with *ACD* while Chaupain-Guillot and Guillot (*op. cit.*) indicate that the impact of wages on the probability of absence in men is negative, corroborating the *shirking model*.

As concerns the type of work contract, a permanent contract increases the probability of returning to work (Ben Halima and Regaert, *op.cit.*). Women with fixed-term contract have a lower probability of being absent (Chaupain-Guillot and Guillot, *op. cit.*). In the economic theory, absenteeism results from a work-leisure trade-off in a neoclassical model of labour supply (Allen, 1981; Brown and Sessions, 1996). Within this framework, sick leaves could correspond to the differential between the contractual number of hours and the desired number of hours. For instance, women working part time (ensuring a better balance between family and professional lives) have a lower probability of absence (Chaupain-Guillot and Guillot, *op. cit.*).

## 2.2. The contextual determinants

Based on Shapiro and Stiglitz (1984), it is commonly argued that labour market uncertainty has a negative impact on absenteeism (in other words, absenteeism is countercyclical) but empirical evidences have to be more nuanced. We can assume that the unemployment rate constitutes a worker discipline device and employees may fear to lose their job if they report sickness. Nevertheless, the duration of sick leave is determining. Thus, Ose (2005) found that short-term absences (shorter than 3 days) do not depend on the unemployment rate while long-term absences do. Livanos and Zangelidis (2013) showed that a higher proportion of dependents persons (inactive and unemployed individuals) decreases sickness absence, probably because of the increasing pressure active people may experience.

The geographic context is equally important. For instance, interaction effects on the local neighborhood level play a role on the utilization of the Swedish sickpay insurance (Lindbeck *et al.*, 2011). In France, Ben Halima *et al.* (2012) highlight that sick leave county<sup>6</sup> disparities subsist even after controlling composition effect into counties. These county gaps could notably be due to an unequal access to healthcare across the territory.

Econometric work on sickness absence little studied sector of activity and this variable has, to our knowledge, never been a dedicated study on panel data. Nonetheless, there seems to exist that which could be called a sector of activity effect. Thus, the probability of sick leave seems to be higher in the public sector than in the private sector (Chaupain-Guillot and Guillot, *op. cit.*). More recently, Ben Halima and Regaert (*op. cit.*) showed that relative to the commercial sector, employees in the sectors of healthcare and social work, industry, construction, finance, real-estate, transportation and communication take shorter sick leaves, contrary to those in the

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<sup>6</sup> France counts 101 counties across 22 regions.

hotel and catering sector. These inter-sectoral gaps can be explained by differences in employment characteristics, work conditions and sick leave coverage between sectors.

As concerns the generosity of the insurance coverage, it has been demonstrated that a generous compensation system increases the number of sick leaves and their duration (Henrekson and Persson, 2004; Frick and Malo, *op. cit.*). Moreover, the intensification of sickness absence's checks by health insurance, which has reduced the moral hazard, seems to reduce the probability of taking sick leaves, at least in the short term (Ben Halima *et al.*, *op. cit.*).

As for work conditions, Afsa and Givord (2009) show that a high percentage of absenteeism in unskilled workers is, in fact, due to irregular working hours. Chaupain-Guillot and Guillot (*op. cit.*) reveal that a person unsatisfied with their work has a higher probability of absenteeism. Moreover, the positive relationship between the company's size and the probability of absence due to illness (Ben Halima *et al.*, *op. cit.*; Ose, 2005) seems to confirm the importance of work conditions (nevertheless, this positive relationship could also reveal differences in verification policies or individual effort within the company).

In reference to this short review of publications, our study attempts to analyse the inter-sectoral disparities in terms of probability and duration of sick leave. To what extent are they explained by the differences between the individuals composing the sectors (in this case, we refer to composition effects)? What part does the sectoral context play?

### **3. Method**

#### **3.1. Data**

The Hygie panel 2005-2008 (Information System on Daily Sick Pay Benefits) is the first French database enabling a simultaneous study of health, work and company factors intervening in sick leaves of private sector employees. It was built by matching data from the French Pension insurance and the statutory National Health insurance. We thus know the identity of the insured persons, their professional trajectories, the last establishment in which they worked and their retirement information. The French Health insurance provides data on individual healthcare consumptions, sickness benefits as well as information relative to accidents at work and occupational diseases. Our sample is composed of 414,185 employees in the private sector (working or unemployed), aged between 22 and 60 in 2008 and having contributed to the general Pension scheme at least once over the course of their lives and living over the entire period from 2005-2008 (*cf.* annex 6.2, table A for the descriptive statistics).

Almost 20 % of the individuals had at least one period of sick leave in 2008 and the majority had only one (table B in annex). These sick leaves were characterised by a median number of 16 sickness absence days (days cumulated in 2008) and a median amount of 352 € in daily sick pay compensation benefits paid. Half of the employees belong to four of the sixteen sectors of activity studied (table C in annex): real estate, renting and business activities (18 % of the sample); manufacturing industry (14 %); commerce (14 %) and health and social work (8 %).

#### **3.2. Variables used**

##### ***The sectoral context***

The sector of activity constitutes this study's variable of interest. It is understood according to the French Classification of Economic Activities (National Institute of Statistics, 2003), which

describes 16 sectors of activity. The geographic context here is controlled throughout the individual's region of residence. This variable acts as a control and will not be analysed as such. Finally, the temporal heterogeneity is taken into account by introducing annual indicators.

### ***Individual / composition effects***

The observable sociodemographic characteristics are age and gender. However, the Hygie database gives no information on either the family composition or the level of education. The health status is approximated using *ACD* as well as by the annual medical consumption in the previous year (reimbursement by the compulsory Health Insurance for general practitioners and specialists, reimbursement for medication and number of hospital days in the private sector<sup>7</sup>). The use of lagged variables linked to health consumption enables establishing a causality link and avoids the simultaneity of taking sick leave and the health consumption associated therewith<sup>8</sup>. Furthermore, we chose reimbursement by compulsory Health Insurance rather than the total expenditure so as to not falsify the results by introducing charges exceeding the statutory fees widely practiced by specialists that are not necessarily linked to any health need. Finally, having access to general practitioners and specialists was added in order to take into account substitution and complementarity effects that exist between these two types of expenditures<sup>9</sup>.

*A priori*, many sometimes conflicting hypotheses can explain the relationship between medical consumption in  $t-1$ , state of health and sick leaves. A high medical consumption in  $t-1$  could characterise those individuals in poor health at the time  $t-1$  and who we may assume remain in poor health in  $t$ <sup>10</sup>. It must be noted that this proxy of the state of health remains imperfect. First, this is an objective variable that does not reflect as largely upon the state of health as do subjective variables such as the perceived state of health or functional limitations. Also, this variable reflects a past state of health: the ideal would have been to have information on healthcare at the time the sick leave occurred, but the data does not allow this. Finally, it should be noted that medical consumption is multi-factorial and is linked in particular to socioeconomic characteristics (income, insurance coverage, socio-professional category) and to healthcare access (density). It is thus appropriate to control for these variables.

The individual work factors retained in the analysis are: the capped gross annual salary quintile in  $t-1$ , the fact of working part-time or full-time, the declaration of an accident at work or occupational sickness (*AT-MP*) in  $t-1$ . The income quintile is lagged for one period so as to take the potential impact of a sick leave on an individual's salary into account. The *AT-MP* are likely to influence the behaviour of taking sick leaves insofar as they reflect an effect of the state of health. Moreover, the pricing for *AT-MPs* could incite some establishments not to declare them and to instead pass them off as sick leaves. Additionally, unemployment is introduced here at the individual level through an indicator signalling those individuals in the sample having been unemployed for at least a quarter over the year before the study. The individual unemployment variable is lagged for a period as the data does not allow us to distinguish whether an episode of unemployment in  $t$  occurred before or after a sick leave. So

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7. The Hygie database does not have data pertaining to public hospitalisation.

8. Data on consumption, added annually, does not allow us to distinguish between consumption having occurred before or after the sick leave.

9. This medical consumption is introduced on a scale of 1:10 so as to avoid problems of software convergence.

10. The results will allow testing this hypothesis. An alternative would be considering that the individuals having had access to healthcare in  $t-1$  are in better health in  $t$  than those not treated in  $t-1$  (prevention behaviour). However, this could be access to expensive specialised care that is not necessarily essential (wealth effect superior to degraded state of health effect) from whence the necessity to control for the income level.

as to take into account the specific case of sick leaves for the unemployed, a second indicator tags those individuals having had an episode of unemployment in  $t$ .

### 3.3. Methodology

So as to study the determinants of the occurrence of sick leaves, the probability of having taken at least one sick leave over the year is estimated (logit model). The duration is learned through the number of sick days cumulated throughout the year (Poisson model). This estimation of the duration of sick leaves relates to all individuals and not uniquely those who took sick leaves. Consequently, at the interpretation stage, results on sick leave duration must be linked to those on the probability.

The longitudinal utilisation of the Hygie panel enables to control for the unobserved individual heterogeneity and thus avoiding the attribution of unobserved individual effects to the sectoral context.

In studying the crossed phenomena between sectors of activity and taking sick leaves, we assume that some unobserved individual characteristics are correlated to the explanatory variables. We thus chose a fixed effects model rather than a random effects specification that does not require an independence hypothesis between the terms of individual heterogeneity  $\alpha_i$  and the explanatory variables  $X_{it}$  (Wooldridge, 2002). We estimate a fixed effects logit for the probability of sick leave and a fixed effects Poisson model for duration. Within the framework of these non-linear fixed effect models, the estimation by maximum likelihood is not convergent due to the problem of incidental parameters. The solution consists of basing the likelihood function on a conditional distribution of data that is no longer dependent in terms of individual heterogeneity  $\alpha_i$ . This conditional maximum likelihood estimator uses the

distribution  $(y_{i1}, \dots, y_{iT})$  conditional to  $X_{it}, \alpha_i$  and  $\sum_{t=1}^T y_{it}$  (Chamberlain, 1980 for the fixed effect logit; Hausman *et al.*, 1984 for the fixed effect Poisson model).

Moreover, we should clarify that, by construction, the fixed effects specification does not allow an estimation of the effect of variables fixed in time at the individual level. For instance, the gender effect will not be present in the econometric results. It is, however, controlled for throughout the term of individual heterogeneity  $\alpha_i$  that captures all the constant variables – observed or not – in the temporal dimension. This constraint on fixed effects seems to bear little importance on this study insofar as the sector of activity varies over time for some individuals (this inter-sectoral mobility concerns approximately 10% of the individuals from one year to the next<sup>11</sup>).

In summary, the estimation strategy consists of taking changes in sector of activity at an individual level and seeing whether they explain the sequences of daily sick pay compensation benefits at an individual level, whilst controlling for the unobserved individual heterogeneity fixed in time (see boxed text 3).

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11. These proportions of inter-sectoral mobility concern the mobility between sectors of which the titles are reported, it is higher when the mobility between a missing sector and a reported sector is also considered (15 %, 16 % and 23 % respectively).

### Boxed text 3. The models

#### - Probability of sick leave (fixed effects Logit)

The fixed effects logit model is based on the following equation:

$$\begin{cases} Y_{it}^* = \alpha_i + \beta X_{it} + \gamma \text{sector}_{it} + \varepsilon_{it} \\ Y_{it} = \begin{cases} 1 & \text{if } Y_{it}^* > 0 \\ 0 & \text{otherwise} \end{cases} \end{cases}$$

$Y_{it}^*$  represents the model's latent variable.  $Y_{it}$  is a binary variable equal to 1 if individual  $i$  has taken sick leave over the year  $t$  and 0 if not.  $X_{it}$  represents the explanatory variables introduced (besides sector of activity),  $\alpha_i$  is the individual heterogeneity term and  $\varepsilon_{it}$  the error term that follows a logistic law.

#### - Expected duration of sick leave (fixed effects Poisson Model)

The Poisson model is based on the hypothesis according to which the sick days are independently and identically distributed. Moreover, it assumes there is equality between expectation and variance in the number of sickness absence days conditional to the explanatory variables. While these hypotheses appear to be very restrictive in cross-section, they are less restrictive on longitudinal data. In fact, individual heterogeneity, which is added to other explanatory variables, allows us to explain a portion of the over-dispersion of the variance relative to expectation as well as a part of the correlation of residual terms in time. The Poisson model assumes that:

$$P(Y_{it} = y_{it}) = \frac{e^{-\mu_{it}} \mu_{it}^{y_{it}}}{y_{it}!}$$

The Poisson law's parameter  $\mu_{it}$  is such that  $\ln(\mu_{it}) = \alpha_i + \beta X_{it} + \gamma \text{sector}_{it}$ .

The explained variable  $Y_{it}$  corresponds to the number of sick days,  $X_{it}$  represents the explanatory variables (besides sector of activity) and  $\alpha_i$  the individual heterogeneity term.

## 4. Results

This section first provides descriptive statistics pointing out inter-sectoral disparities in sick leaves as well as the differences between employees from one sector to another. Then, the fixed effects regressions allow to disentangle the relative shares of i) individual variables introduced (composition effects) and ii) differences in sectoral context in the explanation of inter-sectoral disparities. The descriptive statistics relate to all sectors besides fishing, a sector for which only seventeen observations are available. The fixed effects regressions are run on all sectors of activity but only eight sectors will be analysed in this article, notably due to the

low number of observations for some atypical sectors or a lack of homogeneity in some groups of sectors<sup>12</sup>.

#### **4.1. Descriptive statistics: great inter-sectoral disparities in sick leaves**

The descriptive statistics bring to light the existence of disparities between sectors of activity as much so in the frequency level as in the duration of the sick leaves (see table D in annex). The proportion of individuals having taken sick leave at least once in 2008 thus varies from 10 % in agriculture to 25 % in the manufacturing industry while the average length of sick leave (cumulated number of sickness absence days in 2008) ranges between 3 days for extra-territorial activities and “agriculture, hunting, forestry” to 12 days in the health and social work sectors. In addition to these absolute gaps, some atypical sectors differentiate themselves, such as in the health and social work sectors where sick leaves appear to be both highly probable and longer.

Nevertheless, these inter-sectoral disparities can both be due to differences in individual characteristics (sociodemographic characteristics, health status, individual factors linked to employment) and in the sectoral context between employees in different sectors<sup>13</sup>. The proportion of women is, for instance, particularly high in health and social work (78 %). The median age varies between 34 in real estate, renting and business activities to 42 in extractive industries. The median reimbursement for general practitioners from the compulsory National Health Insurance in 2007 varied between 31 euros for agriculture and 107 euros for health and social work.

Concerning the variables linked to employment, in 2007, 23 % of employees working in the sectors of real estate, education and community, social and personal services experienced a period of unemployment while for extractive industries and financial activities, this proportion is 4 % and 6 % respectively. Part time is common in the hotels and restaurants sector (24 %) and the health-social work sector (31 %) while it is rarer in the sectors of construction (4.5 %) and the extraction industry (3 %). Finally, the salary level fluctuates noticeably depending upon the sector. Some sectors, like construction and real estate have both low wages and high salaries. Other sectors appear to group the highest salaries of the sample (industry, financial activities, production and distribution of electricity gas and water) or, on the contrary, the lowest salaries (hotels and restaurants, education).

#### **4.2. The inter-sectoral disparities in sick leaves decrease after taking composition effects into account**

Chart I *infra* enables a comparison of inter-sectoral disparities in probability and duration of sick leaves i) in raw statistics and ii) in fixed effects regressions controlling for composition effects, the geographical context and the macroeconomic context.

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12. The “fishing”, “agriculture, hunting and forestry”, “extractive industries” and “extraterritorial activities” sectors are not represented in the charts as the estimates were too imprecise due to a low number of observations and a low intra-individual variability. This can be explained by the fact that these sectors are generally associated with special social security schemes or very specific activities. Also, the “education”, “public administration” and “production and distribution of electricity, gas and water” sectors, for which we dispose of very few elements for interpretation; and the “community, social and personal service activities” within which there is only relative homogeneity are not commented on.

13. Statistics not integrated herein. Available upon request.

The duration and probability of sick leaves are based at 100 for the manufacturing industry. This normalisation allows us to reason in percentages and on a similar scale for variations in probability and duration.

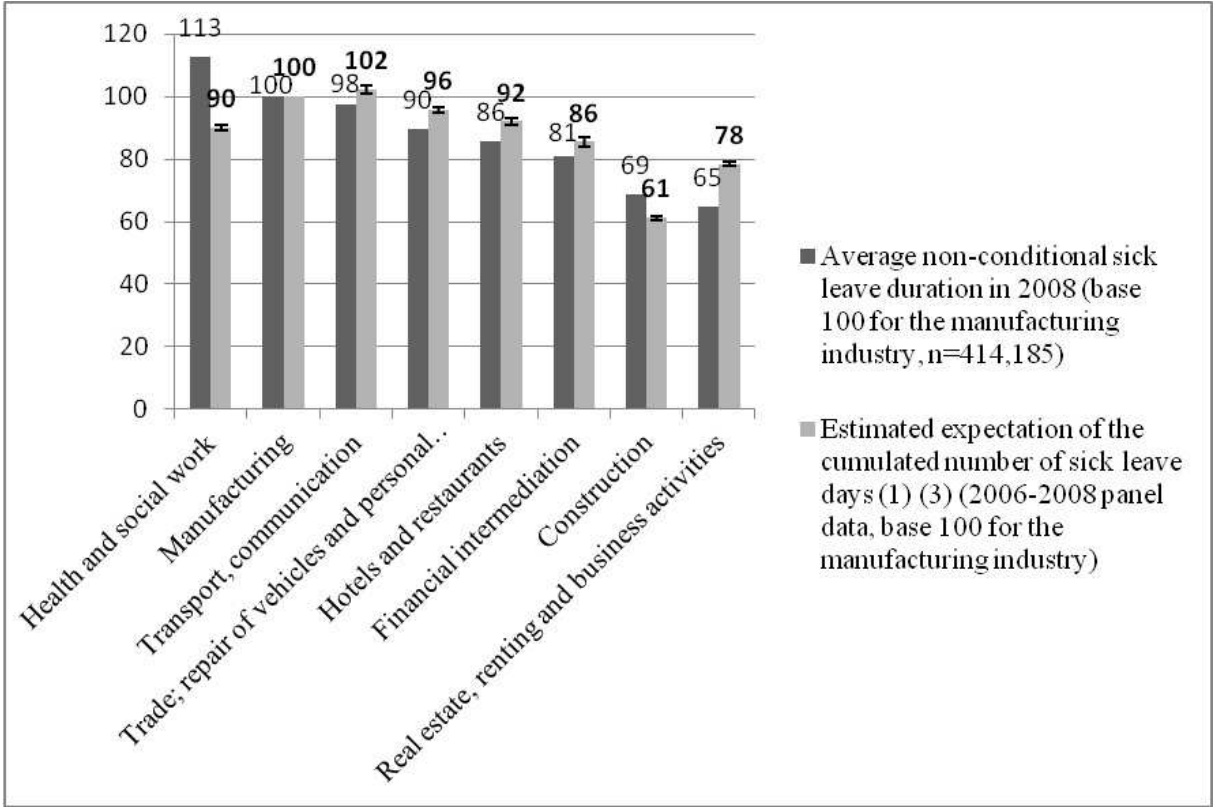
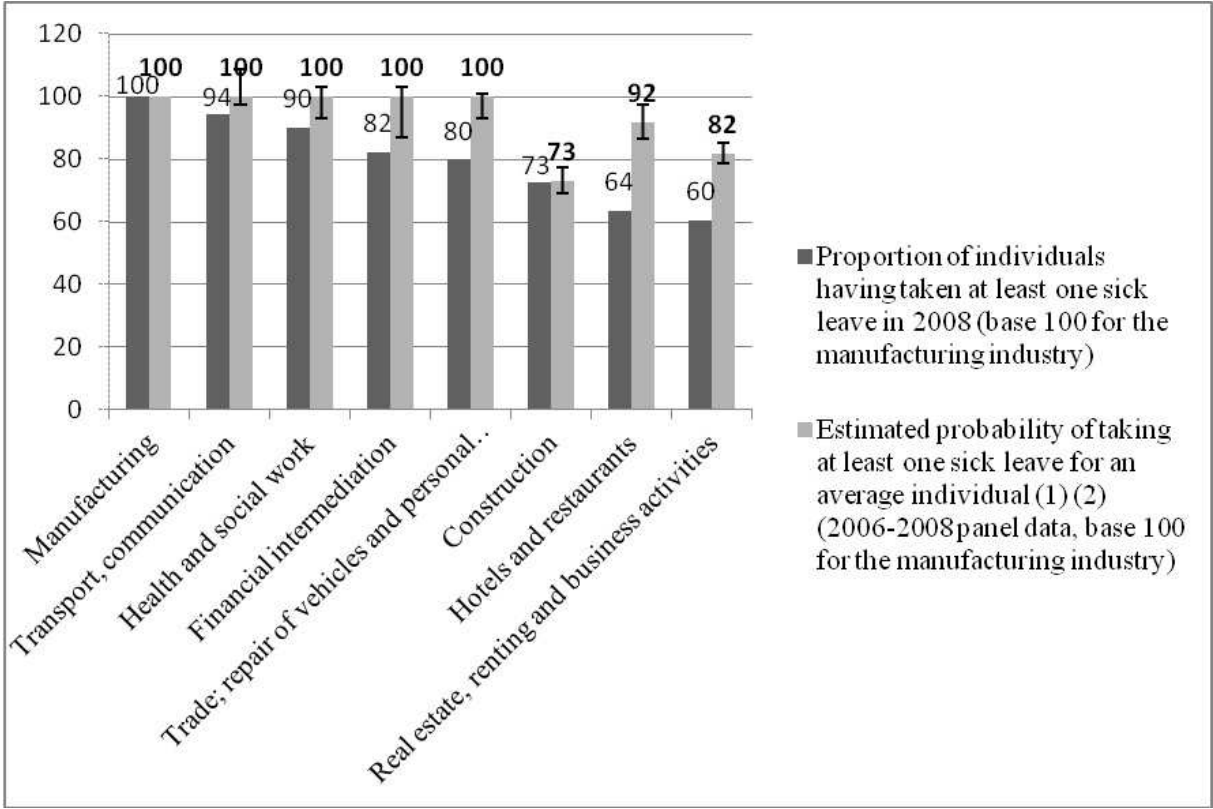
Only the sectors of construction, hotels-restaurants and real estate significantly distinguish themselves from the others as concerns their impact on individual probability for taking sick leave, everything else being equal. Taking individual, macroeconomic and geographic effects into account thus enables us to noticeably decrease the inter-sectoral disparities in terms of probability of sick leave. However, although they have been reduced, the gaps in duration of sick leave remain significant. Thus, the individual effects appear to be dominant in the choice of taking sick leave or not while the sectoral context (coverage of sick leaves, characteristics of employment and work conditions) appears to be dominant in the duration of sick leaves<sup>14</sup>.

So as to quantify the relative shares of individual effects and of sectoral context in the disparities in sick leave between sectors, it is interesting to compare the raw variance with the variance after regression for both probability and duration of sick leaves. Initially, the variance between the eight sectors represented graphically is higher for duration than for proportion of sick leaves: 224 as compared to 177. After controlling for individual characteristics, the macroeconomic and geographic contexts, the inter-sectoral variance on the duration of sick leave level changed to 155 and that associated with probability was reduced to 95. The variables introduced in our model enable us to reduce the inter-sectoral variability of the probability of sick leave by practically half (precisely 46% reduction in the variance) and the variability between sectors in terms of duration of sick leave by almost one third (precisely 31% reduction in the variance). The remaining share is attributable to the sectoral context.

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<sup>14</sup> Let us note here that the estimates on duration of sick leaves concern the individuals whether they take sick leave or not; they can thus mask a gap in the probability of sick leave. However, the fact that most sectors do not significantly differ from one another in terms of probability of taking sick leave leads us to believe that the disparities in duration brought to light by the Poisson model stem from a “duration of sick leave in case of sick leave” effect rather than a taking sick leave effect.

**Chart I – Inter-sectoral disparities in sick leaves: comparison between descriptive statistics (2008) and fixed effects estimations (2006-2008)**



Reading: the fixed effects regressions indicate that working in the construction sector diminishes the probability of sick leaves by 27 % and the duration of the sick leave by 39 % relative to the manufacturing industry.

(1) Some sectors are not represented here due to important imprecision in the estimations (lack of observations and individual variability). For these sectors, refer to annex 6.3 for the estimations.(2) It is necessary to set an average individual for the probability of taking sick leave so as to compare the sectors of activity. This individual works full time, has not been unemployed in  $t-1$  nor in  $t$ , has not had any accident at work or occupational disease in  $t-1$  and does not have any ACD. His annual salary is within the sample's third quintile, his medical consumption is equal to the sample's median and he resides within the Pays de la Loire region.

(3) For the duration of sick leave, the comparisons between sectors are independent of the choice of the average individual.

Field: employed persons in the private sector, 23-60 years of age, years 2006-2008.

Source: Hygie database (national Pension insurance and national Health insurance data).

Concerning the probability of taking sick leave, taking a leave for accident at work or occupational disease, having an ACD, a high salary level and not having been unemployed over the current (or past) year appear to favour taking sick leave. Consistent with the empirical literature, the age has no significant effect on the probability of taking sick leave. Degradation of health on the current date or past date plays a decisive role on the duration of the sick leave. Chronic Disease, a high medical consumption in  $t-1$ , having an accident at work or an occupational illness in  $t-1$  favour an increase in the duration of sick leave. Suffering from an ACD multiplies the duration of the sick leave by four, for example (see results of panel estimations, annex 6.3).

## 5. Discussion

The intension of this study was to define the net effect of the professional context, identified at the level of the sector of activity, in individual disparities in taking sick leaves. Let us first remember that this study does not allow a normative approach on the legitimacy of sick leaves. More generally, measuring the efficiency of expenditures on Daily Sick Pay Benefits is delicate. In fact, sick leaves can be “voluntary” or “involuntary” (linked to individual health status and working conditions; Ose, 2005). Distinguishing the former from the later is extremely complicated, since the employee's effort level and prevention behaviour regarding sick leave is neither observable by the employer nor by the insurer. In the same manner, the prevention level regarding professional risks or promotion of health at work (e.g. adaptation of the workplace) implemented by the employer are imperfectly observable.

Our results indicate that *professional context* effects are massive: they explain over half of the inter-sectoral disparities in terms of occurrence of sick leaves and two thirds of inter-sectoral disparities in terms of duration. Moreover, inter-sectoral gaps in terms of sick leaves remain high – especially when it comes to estimating the duration of the sick leave – and this despite individual, macroeconomic and geographic control variables.

As regards the occurrence of sick leaves, three sectors, *Construction*, *Hotels-restaurants* and *Real estate* remain subject to significantly less frequent sick leaves<sup>15</sup>. In other words, employees in the Construction sector, notably, do not appear to have equal access to sick leaves, for a given set of individual characteristics. Potentially, workers safety (work conditions, coverage...) could limit these disparities in access to sickness benefits. Great inter-sectoral disparities remain between the duration of sick leaves with a similar hierarchy. An in-depth study of the sectoral characteristics could clarify these residual gaps. The structure of the size of the companies according to the sector is doubtlessly a key variable. Sectors characterised by large companies could propose higher quality coverage and a more organised job security. The atomicity of the real estate sector could, for instance, explain the shorter sick leaves in this sector.

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<sup>15</sup> Provided that abusive sick leaves are equally distributed across sectors of activity.

Nevertheless, the importance of the professional context brought to light by our study questions the current rules for funding sick leaves that do not take into account the *professional context* effect. In the French regulatory context, the exercise enables highlighting transfers between sectors of activity occurring through social contributions and daily sick pay benefits. Indeed, we can point the fact that the benefits paid in cases of accidents at work and occupational diseases are funded via company contributions that are dependent upon the claim rate. On the contrary, social contributions that fund sickness benefits are solely dependent upon the individual's salary level: compulsory French Health insurance rules funding sick leaves thus do not take the *professional context* into consideration. Moreover, the compulsory scheme intervenes as of the fourth day of sickness absence and companies are not legally bound by the law to be responsible for the three days waiting period (although, in practice, the majority do so). In the end, there are few incentives for the companies to lower the number of short sick leaves in France.

Our results invite a reflection on a possible transfer of benefits as of the first days to the companies. These transfers would, in principle, be likely to associate the companies with regulating sick leaves by creating incentives for bettering work conditions. However, there will very probably be numerous consequences (among which, incentives on presenteeism), which are difficult to understand *ex ante*.

## **Acknowledgements**

## References

- Afsa C, Givord P. 2009. Le rôle des conditions de travail dans les absences pour maladie : le cas des horaires irréguliers. *Économie et Prévision* **187**: 83-103.
- Allen SG. 1981. An empirical model of work attendance. *The Review of Economics and Statistics* **63-1**: 77-87.
- Barnay T. 2010. In which ways do unhealthy people older than 50 exit the Labour Market in France? *European Journal of Health Economics* **11-2**: 127-140.
- Brown S, Sessions JG. 1996. The Economics of Absence: Theory and Evidence. *Journal of Economic Surveys* **10**: 23-53.
- Ben Halima MA, Regaert C. 2013. Duration of Sick Leave, Income and Health Insurance: Evidence from French linked employer-employee data. *Economics Bulletin* **33-1**: 46-55.
- Ben Halima MA, Debrand T, Regaert C. 2012. Sick Leaves: Understanding Disparities Between French Departments. IRDES Working papers **50**.
- Case A, Deaton A. 2005. *Broken down by work and sex: how our health declines*, in D. Wise (ed.), *Analyses in the Economics of Aging*, University of Chicago Press.
- Chamberlain G. 1980. Analysis of Covariance with Qualitative Data. *Review of Economic Studies* **47**: 225-238.
- Chaupain-Guillot S, Guillot O. 2007. Les absences au travail : une analyse à partir des données françaises du Panel européen des ménages. *Economie et Statistique* **408-409**.
- Frick B, Malo MA. 2008. Labor market institutions and individual absenteeism in the European Union: the relative importance of sickness benefit systems and employment protection legislation. *Industrial Relations* **47-4**: 505-529.
- Grossman M. 1972. On the Concept of Health Capital and the Demand for Health. *The Journal of Political Economy* **80-2**: 223-255.
- Hausman J, Hall BH, Griliches Z. 1984. Econometric Models for Count Data with an Application to the Patent-R&D Relationship. *Econometrica* **52-4**: 909-938.
- Henrekson M, Persson M. 2004. The effects on sick leave of changes in the Sickness Insurance system. *Journal of Labor Economics* **22-1**: 87-113.
- Karasek R, Theorell T. 1990. *Healthy work: stress, productivity, and the reconstruction of working life*. New York, NY: Basic. Books, pp. 89-103.
- Linbeck A, Palme M, Persson M. 2011. Sickness Absence and Local Benefit Cultures. IZA Working Paper 6245.

Livanos I, Zangelidis A. 2013. Unemployment, Labour Market Flexibility and Absenteeism: A Pan-European Study. *Industrial Relations* **52-2**: 492-515.

Ose SO. 2005. Working conditions, compensation and absenteeism. *Journal of Health Economics* **24**: 161-188.

Shapiro C, Stiglitz JE. 1984. Equilibrium unemployment as a worker discipline device. *The American Economic Review* **74-3**: 433-444.

Wooldridge JM. 2002. *Econometric Analysis of Cross Section and Panel Data*, Cambridge, MA: MIT Press.

## 6. Annexes

### 6.1. Health insurance and sick leaves in France

There exist three main Social security plans in France, the General scheme, the Agricultural scheme and the scheme for self-employed persons alongside which exists an ensemble of special employee schemes. Our study concerns the employees of the **General scheme**, which insures four out of five people in France and funds 75 % of healthcare expenditures.

This General Social security scheme is composed of 4 branches (sickness, family, accidents at work and occupational diseases, old-age pension) and is funded through contributions from employers and employees and, more recently, by taxes following the introduction of the General Social Contribution in 1991 and the Contribution for the Reimbursement of the Social Debt in 1996. Here, we are interested in the **sickness branch** (called Health insurance) that covers sickness, maternity, disability and death, and more specifically **sick leaves**.

#### Coverage of sick leaves by Health insurance:

In cases of sick leave, the insured person receives daily sick pay benefits starting on day four of the inability to work (there is a three days waiting period) and for three years maximum if they worked for the minimum number of hours or contributed a sufficient salary during the period preceding their sick leave (this condition becomes stricter for sick leaves lasting over 6 months).

The daily sick pay benefits correspond to a fraction of the daily salary calculated using the average gross salary of the three months preceding the sick leave (12 months in case of seasonal or irregular work) and within the Social security ceiling (2 574,40 euros on January 1, 2013). This fraction is equal to 50 % of the salary and increases to 66.66 % as of the 31<sup>st</sup> day of sick leave for employees with more than three dependent children. In the case of unemployment, the insured person can also receive sick pay benefits. The unemployment benefits are then interrupted and differed.

Other than the compensation paid by the national Health insurance, employers are required by law (1978 and 2008) to pay a salary supplement to employees on sick leave having worked for the company for over a year. The amount and the duration of this benefit are equally linked to years of service. Finally, there exists a third level of compensation: optional branch agreements contracted by companies.

## 6.2. Descriptive statistics (2008)

**Table A – Individual characteristics, work-related factors, health status and place of residence (N=414,185)**

<i>Individual characteristics</i>		
Average age in 2008 (years)	40.8	
Proportion of women (%)	48.8	
<i>Work-related factors</i>		
Proportion of individuals having been unemployed for at least one quarter in t-1 (%)	14.7	
Annual salary (€) in t-1 (2007)	1 <sup>st</sup> quintile value	6509
	2 <sup>nd</sup> quintile value	15790
	3 <sup>rd</sup> quintile value	21271
	4 <sup>th</sup> quintile value	29554
Employment contract	Full time	69.9
	Part time	16.8
	Not reported	13.3
Proportion of individuals having had an accident at work or occupational disease in t-1	3.3	
<i>Health status</i>		
Proportion of individuals with an acute chronic disease (%)	8.7	
Access to a general practitioner and/or specialist (%) in t-1	83.8	
(Compulsory) Health insurance reimbursement for generalist and/or specialist (€) in t-1 for those resorting to them	1 <sup>st</sup> quintile value	42.5
	2 <sup>nd</sup> quintile value	104.9
	3 <sup>rd</sup> quintile value	234.0
	Average	202.1
Drug consumers (%) in t-1	82.2	
Health insurance drug reimbursement (€) in t-1 for those consuming drugs	1 <sup>st</sup> quintile value	21.1
	2 <sup>nd</sup> quintile value	60.8
	3 <sup>rd</sup> quintile value	178.3

	Average	242.0
Access to private hospitalisation (%) in t-1	6.4	
Number of days of private hospitalisation in t-1 for those resorting to it	1 <sup>st</sup> quintile value	1
	2 <sup>nd</sup> quintile value	1
	3 <sup>rd</sup> quintile value	1
	Average	4.4
<i>Region of residence (in percentage of the sample)</i>		
Alsace	2.9	
Aquitaine	4.7	
Auvergne	2.1	
Bourgogne	2.4	
Bretagne	4.6	
Centre	3.9	
Champagne-Ardenne	2.0	
Corse	0.4	
Franche-Comté	1.8	
Ile-de-France	20.7	
Languedoc-Roussillon	3.7	
Limousin	1.0	
Midi-Pyrénées	4.2	
Nord-Pas-de-Calais	6.3	
Basse-Normandie	2.2	
Haute-Normandie	3.0	
Pays de la Loire	5.6	
Picardie	3.1	
Poitou-Charentes	2.5	
Lorraine	3.4	
Provence-Alpes-Côte d'Azur	7.4	
Rhône-Alpes	10.0	
Abroad	0.01	
French Overseas Departments and Territories	2.3	
Region not reported	0.1	

Field: people working in the private sector, 25-60 years of age, in 2008.

Source: Hygie database (national Pension insurance and national Health insurance data).

**Table B – Sick leaves in the total sample (N=414,185)**

Proportion of individuals having taken at least one sick leave over the year 2008 (%)	18.57			
Number of sick leaves taken among those individuals having taken at least one sick leave in 2008	Quart1	Quart2	Quart3	Average
	1	1	2	1.4
Total number of sick days in 2008 among those individuals having taken at least one sick leave	Quart1	Quart2	Quart3	Average
	7	16	45	45.5
Amount of sick pay benefits paid by Health insurance to individuals having taken sick leave in 2008 (€)	Quart1	Quart2	Quart3	Average
	104.2	352.8	1253.0	1430.6

Field: people working in the private sector, 25-60 years of age, in 2008.

Source: Hygie database (national Pension insurance and national Health insurance data).

**Table C – Distribution of the sample (%) by sectors of activity (N=414,185)**

Agriculture, hunting, forestry	0.07
Fishing	0 (17 individuals)
Extractive industries	0.11
Manufacturing	14.45
Production and distribution of electricity, gas and water	0.28
Construction	4.49
Trade; repair of vehicles and personal and household goods	13.58
Hotels and restaurants	3.79
Transport, communication	4.74
Financial intermediation	2.78
Real estate, renting and business activities	17.94
Public administration	7.37
Education	1.91
Health and social work	8.27
Community, social and personal service activities	3.17
Extraterritorial organizations and bodies	0.03
Not reported	17.02
Total	100

Reading: 14.43% of the individuals in the sample work in the manufacturing industry.

Field: people employed in the private sector, 25-60 years of age, in 2008.

Source: Hygie database (national Pension insurance and national Health insurance data).

**Table D – Proportion and duration of sick leaves by sector of activity**

<i>Sector of activity</i>	<i>Proportion of individuals having taken sick leave at least once in 2008 (%, N=414,185)</i>	<i>Average duration of sick leave for the ensemble of individuals in the sector (N=414,185)</i>
Agriculture, hunting, forestry	10.3	3.0

Extractive industries	21.1	8.5
Manufacturing	25.2	10.4
Production and distribution of electricity, gas and water	20.1	7.7
Construction	18.3	7.2
Trade; repair of vehicles and personal and household goods	20.2	9.3
Hotels and restaurants	16.0	8.9
Transport; communication	23.8	10.1
Financial intermediation	20.7	8.4
Real estate, renting and business activities	15.3	6.7
Public administration	15.6	7.8
Education	13.8	6.4
Health and social work	22.7	11.7
Community, social and personal service activities	14.5	7.0
Extraterritorial organization and bodies	11.6	3.2

Reading: in 2008, 25.2% of individuals working in the manufacturing industry took at least one sick leave; the total average days of sick leave in this sector was 10.4.

Field: people working in the private sector, 25-60 years of age, in 2008.

Source: Hygie database (national Pension insurance and national Health insurance data).

### 6.3. Panel estimations

	<i>Conditional Logit model (individual fixed effects)</i>	<i>Conditional Poisson model (individual fixed effects)</i>
	Probability of taking at least one sick leave over the year (marginal coefficients).	Expected duration of sick leave (cumulated number of sick days); notation in incidence rate ratio.
Age (ref. ]20; 30 years of age])		
]30; 40]	-0.003	1.007***
]40; 50]	-0.025	1.022***
]50; 60]	-0.003	1.003
Work-related factors		
Annual salary in t-1 (ref. 5 <sup>th</sup> quintile)		
1 <sup>st</sup> quintile	-1.263***	0.384***
2 <sup>nd</sup> quintile	-0.769***	0.587***
3 <sup>rd</sup> quintile	-0.409***	0.748***
4 <sup>th</sup> quintile	-0.190***	0.875***
Part time (ref. Full time)	-0.009	0.987***
Accident at work or occupational disease in t-1 (ref. neither accident at work nor occupational disease)	0.048***	1.107***
Unemployment		
Unemployment in t-1 (ref. No quarters of unemployment)	-0.442***	0.768***
Unemployment in t (ref. No quarters of unemployment)	-0.641***	0.520***
State of health proxy		
Acute chronic disease (ref. No ACD)	1.539***	4.112***
(Compulsory) Health insurance reimbursement for general practitioners and/or specialists in t-1 (1/10 scale)	-0.004***	1.0006***
Health insurance drug reimbursement in t-1 (1/10 scale)	-0.0002**	1.0002***
Place of residence (ref. Pays de la Loire)		
Alsace	-0.001	0.977

Aquitaine	0.199	1.144***
Auvergne	-0.128	1.333***
Bourgogne	0.030	1.150***
Bretagne	0.156	1.191***
Centre	0.078	1.058***
Champagne-Ardenne	0.17	1.066**
Corse	-0.684	0.925*
Franche-Comté	-0.216	0.787***
Ile-de-France	0.186*	1.038***
Languedoc-Roussillon	-0.180	1.051***
Limousin	0.101	1.145***
Lorraine	-0.168	0.918***
Midi-Pyrénées	0.169	0.981
Nord-Pas-de-Calais	0.128	0.975
Basse-Normandie	-0.247	0.854***
Haute-Normandie	0.138	1.031
Picardie	0.287*	1.064***
Poitou-Charentes	0.169	1.096***
Provence-Alpes-Côte d'Azur	0.222*	1.113***
Rhône-Alpes	0.194	0.933***
Abroad	-0.011	1.261***
French Overseas Departments and Territories	-0.299	0.582***
Sector of activity (ref. Manufacturing)		
-Agriculture, hunting, forestry	0.225	0.971
-Fishing	-0.047	2.112**
- Extractive industries	0.310	1.609***
-Production and distribution of electricity, gas and water	-0.426**	0.435***
-Construction	-0.470***	0.613***
-Trade; repair of vehicles and personal and household goods	-0.050	0.957***
-Hotels and restaurants	-0.136***	0.920***
-Transport; communication	0.051	1.023***
-Financial intermediation	-0.085	0.855***
-Real estate, renting and business		

activities	-0.309***	0.784***
-Public administration		
-Education	0.172***	1.036***
-Health and social work	-0.183***	0.689***
-Community, social and personal services	-0.031	0.900***
-Extraterritorial organization and bodies	-0.149***	0.819***
	-0.542	0.168***
Year (ref. 2006)		
2007	0.016**	1.029***
2008	0.043***	1.111***
- Number of individuals used	135,914	153,007
- Number of observations used	407,722	459,001
Log likelihood	-141,252.45	-5,730,128.8

Reading:

- \*\*\*: significance at the 1% level; \*\*: 5% level; \*: 10% level.

- Interpretation of the incident rate ratio coefficients: "having had a long-term illness multiplies the duration of the sick leaves by 4.112".

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