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The Effects of Mass Layoffs on Mental Health

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Abstract:

This article assesses the effects of mass layoffs on the mental health of workers remaining in plants after layoffs, using a French survey merged with administrative health insurance data covering the period 2010–2013. We rely on the consumption of psychotropic drugs prescribed by doctors as an indicator of mental health. Results show that mass layoffs induce a sizeable rise in the use of psychotropic drugs amongst job stayers: we measure an increase of 41% in psychotropic drug consumption rates amongst them after displacement, as compared with the pre-displacement period. We find evidence for a social gradient whereby employees belonging to the lowest socio-economic are more affected by the adverse effect of mass layoffs on their mental health, leading to psychotropic drug consumption, than those in the highest socio-economic groups.

JEL Codes: J6, I10

Keywords: Mass layoffs, Downsizing, Mental health, and Psychotropic drug prescriptions

Les effets des licenciements collectifs sur la santé mentale des salariés

Résumé : Ce travail présente une étude des effets des licenciements collectifs sur la santé mentale des salariés restant en entreprise après une vague de licenciements, à partir de données françaises couvrant la période 2010-2013. L'indicateur de santé mentale sur lequel nous nous appuyons est la consommation médicale de médicaments psychotropes prescrite par le médecin. Nos résultats indiquent une forte augmentation de la consommation de médicaments psychotropes des salariés exposés à des licenciements collectifs mis en œuvre par l'entreprise : parmi ces salariés, le taux de consommation de ces médicaments augmente de 41 % à la suite des licenciements, par rapport à la période qui précède les licenciements. Les résultats mettent en évidence, par ailleurs, un gradient social selon lequel les salariés appartenant aux groupes socioéconomiques les moins favorisés sont davantage affectés par des troubles de santé mentale les conduisant à consommer des médicaments psychotropes, et ce, dans un contexte de licenciements collectifs, par comparaison aux populations socio-économiquement plus favorisées.

1. Introduction

The economic literature on the link between the labor market and health has grown considerably, in particular in the United States since the 1970s (Currie and Madrian, 1999). This literature has examined the effects of health on participation in the labor market, hours worked and earnings, on the one hand, and the relationships between health insurance and labor market outcomes, on the other hand. A significant literature has also examined the consequence of job loss on health outcomes; studies show significant negative effects on health for workers who have lost their job as a result of mass layoffs or plant closures (e.g. Sullivan and Von Waechter, 2009; Eliason et al., 2009; Browning and Heinesen, 2012; Schaller et al., 2014; Black et al., 2015). Sullivan and Von Waechter (2009) provide key elements for understanding the impact of job losses on mortality. The authors assessed the long-term effects on mortality of job losses due to mass layoffs and plant closures in firms with more than 50 employees, in the male population in Pennsylvania, in the 1970s and 1980s. They show that job losses led to a 15–20% increase in death hazards over the following 20 years; these effects were greater for workers who experienced larger losses in earnings associated with job losses,[1] which may be an important mediator of mortality effects.

This research stream also highlights the fact that mass layoff events affect not only workers who lose their job but also those who remain in downsizing firms even if they themselves are not laid off (Clark et al., 2010; Black et al. 2015). In a context of mass layoffs, remaining workers may be affected by others' layoffs and the company's hardships in many ways. They may be affected by uncertainty regarding their job security, linked to the fear of being the next one to be laid off, and experience a feeling of job insecurity, which may have adverse effects on their health status (Caroli and Godard, 2016; Cottini and Ghinetti, 2017). Stayers may be worried about the consequences a future job loss could entail for their social and family life. Seeing their co-workers becoming unemployed may have detrimental psychological impact on them; and they may be affected by a feeling of guilt or failure. Furthermore, mass layoffs may result in an increase in their workload, and a decrease in autonomy and cooperation at work. In the case of Norway, Black et al. (2015) studied the effects of job displacement due to downsizings or plant closures on cardiovascular health and severe risk factors for

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[1] A large body of literature has assessed the effects of downsizings and plant closures on labor participation and earnings over time, to apprehend the degree of job and income insecurity associated with job displacement in different countries. It shows in general negative effects but with effects of varying magnitude in different countries (e.g. Jacobson et al., 1993; Eliason and Storrie, 2006; Hijzen et al., 2010; Cough and Placzek, 2010; Black et al., 2015; Deelen et al., 2018).

cardiovascular diseases, using data covering a period of five years before displacement and seven years after. The authors show that job displacement induces a persistent increase in smoking behaviour among displaced workers as compared with non-displaced workers, but also among non-displaced workers in downsizing firms, as compared with employees in non-downsizing firms, and that this latter effect is only temporary and disappears one year later. This suggests a short-run increase in stress among these workers during downsizings and that, after some time, remaining workers may actually recover job security and work satisfaction, as the firm regains stability and its employees are confident in its viability. The way employee downsizing influences individuals' outcomes, notably in terms of lower job involvement, job satisfaction or self-esteem among remaining workers, has received more attention in the literature (Datta et al., 2010). The magnitude of the downsizing activity has been intensified in the aftermath of the 2008 economic crisis, inducing large increases in unemployment rates, but with large disparities across countries depending on the characteristics of the economies, their size, their external competitiveness, their responsiveness to policy stimuli, and the role of institutions in the labor market.

In France, the 2008 economic shock induced an important rise in mass layoffs and a drastic increase in unemployment, with a persistent increase in long-term unemployment[2]. In this article, we study the effects of mass layoffs on the health of workers remaining after plant downsizing, in that context, by focusing specifically on mental health effects, using French data covering the period 2010–2013. The way in which mass layoffs affect the remaining workers' mental health status in France had not yet been studied. The originality of our study is also reflected in the way we measure mental health using the consumption of psychotropic drugs prescribed by doctors—namely anxiolytics, hypnotic drugs, and antidepressants—, based on administrative data, unlike prior studies which have examined the effects of downsizings on self-assessed mental health indicators using survey data. The drug consumption data enable us to identify objectified mental health problems, as the prescription of these psychotropic drugs is indicated for patients who have mental health disorders affecting daily life—individuals who are no longer able to adjust their lifestyle without taking such medications, to cope with workload demands and ease the psychological pressure hindering them in their daily activities (WHO, 2005; Torres et al., 2013; HAS, 2018). According to medical guidelines, anxiolytics and hypnotic drugs must only be prescribed on a short-term basis—for less than one month at a time, as if they are used for extended periods their benefits diminish and may cause harmful

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side effects (Ansm, 2017; Lembke et al., 2018), such as memory and concentration difficulties, medical drug addiction and increased anxiety. An increase in these medications over the last decades and, at the same time, in the number of cases of overdose deaths related to misuse is documented for the United States (Lembke et al., 2018). Antidepressants are more effective after 6 weeks; that is why they are often prescribed together with anxiolytics at the start of treatment. In France, psychotropic drug consumption, which is high compared with similar countries, has decreased during the last decades, reflecting a stricter prescription monitoring policy and better information targeting doctors about the negative side effects of these medications.

The paper proceeds as follows. In the next section, we present the economic and institutional context, data and descriptive evidence. Section 3 describes the empirical strategy. In Section 4, we present the results. Section 5 concludes.

2. Economic context, institutional framework, data and descriptive evidence

2.1 Economic context and legislation on mass layoffs in France

The Great Recession has had significant effects on employment in Europe, more so than in the United States, due to macroeconomic reasons as well as structural reasons associated with labor market rigidity. In 2009, unemployment rates in Europe and in the United States were similar (around 10%); then the unemployment rate declined to less than 7% in the last quarter of 2013 in the United States, while it continued to grow in the EU-28, where it exceeded 11% in 2013. The EU-28 unemployment rate decreased to 8.5% in the last quarter of 2016, but with very large disparities in levels and trends across European countries. Germany, benefitting from a dynamic economic growth driven by exports, has a structurally lower unemployment rate than France and countries in Southern Europe. The latter have been strongly hit by the economic crisis: unemployment rates rose by 25% in Spain and Greece in 2010. The countries of Northern Europe have been much less affected by the crisis. Norway is one of the most productive countries, with part of its economic growth drained by the oil rent, and where wages are high on average and unemployment rates are low. In Sweden, as in Denmark, labor market flexibility policies and associated employment protection schemes may have limited the extent of the effects of the 2008 crisis on unemployment.

In this landscape, France is marked by the persistence of a massive and long-lasting unemployment in the aftermath of the 2008 economic shock and, at the same time, by a high

level of social protection for workers benefitting from permanent employment contracts. The persistence of massive unemployment puts pressure on wages and the labor market is characterised by a strong duality: the youngest and most qualified graduates are more likely to find a new job quickly if they lose their job than older and less educated people; job mobility exists for insiders, while outsiders are more likely to stay out of permanent employment. The risk of long-term unemployment linked to dismissals therefore weighs more heavily on the less educated employees. During the period preceding the 2008 crisis, unemployment rates had been declining since the end of the 1990s. The unemployment rate was 7.4% at the beginning of 2001 (Figure 1). The rise in unemployment in the third quarter of 2001 followed the bursting of the Internet bubble. The recovery that took hold in 2006 was drained by the dynamics of international trade. Then, the US subprime crisis, which became global, weakened the European economies. In France, the unemployment rate rose from 6.8% in early 2008 to 9.0% in the first quarter of 2010. It declined slightly during 2010 and subsequently rose in 2011 until the beginning of 2013; it was stable around 10 % till the end of 2015, and is on the decrease from then onwards.

[Figure 1]

In the aftermath of the 2008 economic crisis, the magnitude of the downsizing activity has been intensified, leading to an increasing proportion of employees exposed to mass layoffs implemented by companies. A mass layoff plan is defined legally as layoffs of two or more employees occurring during a period of 30 days, justified by the economic situation of the company and the need to restore its competitiveness. At the same time, the law guarantees a series of employment provisions aimed at reinforcing employment protection for laid-off employees. In companies with at least 50 employees, French legislation legally obliges employers to draw up an Employment Protection Plan (*Plan de Sauvegarde de l'Emploi*), to facilitate the reclassification (within or outside the company) of employees facing obstacles to work reintegration (for senior workers, workers with insufficient or obsolete professional qualifications). In addition, in firms with less than 1,000 employees, the employer must provide dismissed people with the possibility of entering into a Professional Security Contract (*Contrat de Sécurisation Professionnelle*). The purpose of the latter is—with the help of the Job Centre or a private organisation—to organise and monitor the return to work path, by means of skill assessments, training plans, professional reconversions, or the creation or takeover of a business. It entitles workers to a premium or a Reclassification Allowance (for a limited period of time). Larger firms with more than 1,000 workers have to offer reclassification leave. French

law stipulates that economic dismissals can only take place if all the training and adaptation efforts have been made and if employees cannot be reclassified into the available jobs located on the national territory in the company or other companies in the group to which it belongs. Thus, except for the cessation of activity of a firm that does not belong to any group (Cass. soc. 15-12-2010 n° 09-42.795 F-D: RJS 3/11 n° 219), the employer must endeavour to reclassify employees.

Beyond this legal framework regulating mass layoffs, there are other ways of breaking the employment contract. The conventional break is a modality often used, which does not fall within the framework of the measures associated with economic layoffs. The employer and the employee can jointly decide to terminate the employment contract by signing an agreement subject to administrative approval. Unless otherwise required by law (Cass. soc. 15-10-2014 n° 11-22.251: RJS 12/14 n° 854), this procedure is the only amicable way of breaking the employment contract. In addition, the law excludes the implementation of the conventional break in the context of a forward-looking management agreement on employment and skills or the Employment Protection Plan (*PSE*) mentioned above. This procedure allows the employer and the employee to agree on the conditions of the termination of the employment contract. It cannot be imposed by one or other of the parties. In addition, it allows for the payment of unemployment benefits.

2.3 Data and definition of treated and control groups

We use data from the French Health and Social Protection Survey (*ESPS*) carried out between May and November 2012. This survey was administered to a random sample of individuals insured by the French National Health Insurance scheme covering private-sector employees. This sample frame enables us to merge the survey with administrative health insurance data for the period 2010 to 2013.[3] We use both survey and administrative health information: survey data provide information about employees' characteristics, notably the occurrence of mass layoffs in the firm where they work; and administrative health insurance data over the period 2010–2013 enable us to observe psychotropic drug prescriptions given by doctors before, during, and after the period of time when workers experienced mass layoffs.

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[3] Note that this observation period is determined by the data availability: health insurance data provided individual chained data only for this period, and this was not available for years before 2010 and after 2013.

We selected the sample of employees who responded to the survey aged between 20 and 65 in 2012 and who have an open-ended labor contract at the time of the survey.[4] This sample consists of 1,717 employees. We identify employees who experienced a mass layoff implemented by their current plant through answers to the following survey question: 'In the last 12 months, was there a mass layoff implemented in the plant where you currently work?' As mass layoffs were reported by surveyed workers, it is obvious that this reporting may reflect a notion that is different from the legal definition of a mass layoff: it reflects the surveyed worker's knowledge about the notification by the employer of layoffs in their current plant. In our sample, 10.8% reported a mass layoff plan at their current plant during the last twelve months.

For our purpose, we define the following two groups of interest: the first one consists of individuals who declare they have experienced a mass layoff in their current plant during the twelve months preceding the survey date — hereinafter referred to as the treated group — and the second one comprises individuals who reported they did not — referred to as the control group. The treated group is thus composed of employees following an episode of downsizing, who survived this event and did not move to a new employer at the date of the survey. The control group consists of employees who did not experience a mass layoff in their current plant during the twelve months preceding the survey. Given these definitions, it is worth noting that both groups may have experienced layoff episodes earlier in the past or may experience a layoff episode in the years after the survey date.

It should be underlined also that the survey does provide neither follow-up information about the employment trajectory of individuals before and after the survey date, nor information on the implementation of mass layoffs before the twelve-month period or beyond the survey date.

Table 1 presents descriptive statistics for these two groups. Men represent 54.3% of employees who reported a mass layoff against 52.6% who did not. The average age is almost the same in the two groups, around 42 years old. Descriptive statistics indicate significant differences between the two groups in some respects. These differences may partly reflect legal employment protection and collective agreement rules that dictate which workers should not be laid off first as part of a redundancy plan. Employees with children, particularly single adults with children, are guaranteed not to be laid off first; this may explain why we observe a higher proportion of individuals with children amongst remaining workers in the sample, as compared

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[4] We chose to restrict the sample to employees with an open-ended labor contract, thus removing those on a fixed-term contract, because given the treated group contains very few employees on a fixed-term contract who reported mass layoffs at their plant.

with the control group. Employment protection is also guaranteed for employees of long tenure[5] and disabled workers. In our sample, we do not find that workers with serious health conditions are more represented in the group of remaining workers; employees having an administratively recognised chronic disease in 2010 are actually less represented in the group of remaining workers: 6% amongst remaining workers compared with 8.7% in the rest of the employee population. Furthermore, as documented in the French context, blue-collar employees are much more likely to be laid off as part of mass layoffs than white-collar employees (Charozé, 2015); white collars should therefore be much more represented amongst remaining workers, in our sample; this is indeed confirmed: white collars constitute 32.3% of employees who reported mass layoffs in their company compared to only 19.7% in the control group. We also find that the proportion of employees with a higher or middle education degree is higher for employees who reported a mass layoff: 67.7% compared with 53.6% for those who did not experience a mass layoff; and we observe also a higher monthly household net income per consumption unit for employees who reported a mass layoff. In addition, data show, as expected, that the fear of job loss is higher in the group of employees who reported a mass layoff as compared with individuals who did not; data also indicate a faster pace of work and a higher proportion of night workers in the group of employees who reported a mass layoff; this result suggests that remaining employees experience an increase in job strain and stress after a mass layoff. Lastly, employees who report a mass layoff are more likely to work in large companies: 47.3% of these employees worked in companies with more than 500 employees, compared to only 33.6% of those who did not report a mass layoff.

[Table 1]

2.5 Outcome: the consumption of psychotropic drug

The outcome of interest is the use of psychotropic drugs prescribed by doctors, registered in health insurance data. These medications comprise anxiolytics, hypnotic drugs and antidepressants, as registered in their medical class: the classes N05 (the 'Psycholeptics') and N06 (the 'Psychoanaleptics'), according to the Anatomical Therapeutic Chemical (ATC) classification system developed by the World Health Organization. Data provide the date on which individuals bought prescribed medications at the chemist. Individuals cannot have access to these medications without prescriptions. In our population, on an annual basis, we calculate that around 20% of employees bought psychotropic drugs prescribed by doctors each year. Most

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[5] Note that the survey data did not provide information about the employee's seniority within the company.

of them consumed only anxiolytics or hypnotic drugs: 14% of employees bought these medications, without antidepressants; and 6% of employees used antidepressants (often combined with anxiolytics or hypnotics).

We consider the proportion of employees having psychotropic drug consumption at a two-month frequency throughout the period 2010–2013, as this two-month frequency corresponds with medication guidelines for anxiolytics and hypnotics: the maximum medication duration is two months in most cases for these drugs, as beyond this maximum duration medications may cause harmful side effects. Antidepressants are usually prescribed for several months and are often first combined with anxiolytics during a maximum period of two months.

Figure 2 shows the evolution of this psychotropic drug use rate observed at a two-month frequency over the period 2010–2013 in treated and control groups. It also presents smoothed trends obtained by using local polynomials; we observe fluctuations around the smoothed lines, more pronounced in the treated group than in the control group, as the number of observations in the treated group is smaller than in the control group. Smoothed trends show a strong increase in consumption rates between 2010 and 2013 for employees who reported mass layoffs, as compared with those who did not. Also, what is noticeable is that during the pre-displacement period, the trend in the treated group is quite close to that observed in the control group. And during 2012–2013, the consumption rates of workers who reported a mass layoff is persistently higher than those of the control group. These trends suggest that mass layoffs induce an increase in the use of psychotropic drugs. We also note that there is a slight upward trend during the year 2011 in the two groups, which is coherent with global trends in psychotropic drug consumption observed during this period (ANSM, 2017).

[Figure 2]

3. Empirical strategy

Mass layoffs may induce a negative effect on remaining employees' mental health, due to an increased fear of being laid off during subsequent mass layoffs, or an increase in stress or workload after the mass layoff. Descriptive statistics (*see* Table 1) are consistent with an increase in perceived job insecurity and stress at work at the date of the survey. This effect may be temporary, due to the fact that remaining workers regain confidence in the viability of the firm after downsizing and, as a result, see an improvement in their job security (Black et al., 2015).

Our empirical strategy relies on a difference-in-differences (DiD) approach to assess the effect of mass layoffs on remaining workers' psychotropic drug consumption. We consider the two groups: employees who reported a mass layoff during the twelve months preceding the survey date in 2012 (the treated group) and employees who did not (the control group). We consider two periods: the pre-mass-layoff period from January 2010 to April 2011 and the period from May 2011 to the end of the year 2013 thus including the mass layoff period reported by respondents.

We estimate the following linear probability equation:

$$Y_{it} = \alpha + X_{it}\beta + \gamma MLO_i + \delta After_t + \lambda MLO_i * After_t + \mu_i + \varepsilon_{it} \tag{1}$$

where Y_{it} is a dummy variable indicating whether employee i has bought prescribed psychotropic drug at time t; t is a discrete two-month time period ranging from the first two months of the year 2010 to the last two months of the year 2013. MLO_i is the dummy indicating whether individual i works in a plant where a mass layoff has been implemented during the year preceding the survey date in 2012. $After_t$ is a dummy variable taking the value 1 for the period after 1 May 2011 (thus including the mass layoff period and the post displacement period). X_{it} is a vector of workers' characteristics: note that the only time-varying variable is workers' age; all other controls are time-invariant socio-demographic characteristics collected only at the date of the survey (gender, education, household composition, household net income per consumption unit, firm's size, socio-professional category, part-time working, and night working). The term μ_i is an individual fixed effect; and ε_{it} is the residual term.

The DiD coefficient is denoted as λ in Equation (1): this is the coefficient of interest. As explained in the previous Section, the occurrence of a mass layoff is reported only for the last twelve months before the survey date. The DiD coefficient is thus interpreted as the causal effect of the mass layoff occurring during the last twelve months before the survey date on the outcome, amongst employees who survived the mass layoff and did not move to another employer at the date of the survey, relative to no layoff episode during the year before the survey date (which does not exclude that the groups may have been exposed to layoff episodes earlier in the past).

Since a mass layoff is an objective event that does not depend on the personal and health characteristics of the employee at the plant where it occurs, this event is exogenous to a worker's health outcome. The difference-in-differences approach makes it possible to control for the

omission of time-invariant unobservable variables. These unobservable variables may be notably firms' characteristics. Employees' health status may be better in firms belonging to economic sectors that offer higher wages and a safer and healthier work environment, and thus may attract more productive and healthier employees, while firms in declining sectors that lay off a sizable share of their workforce may offer lower remuneration, a worse work environment, and be less attractive. A naive estimate, without taking into account time-invariant unobserved heterogeneity linked to these firms' characteristics could result in an overestimation of the effect of mass layoffs on health outcome.

In this design, the potential threat to internal validity is the violation of the common trend hypothesis whereby, conditional on observable variables, the controls and the treated have common health outcome trends. It would occur notably if treated and controls have unequal rates of depreciation of mental health, leading to non-parallel patterns; unequal rates are likely to happen due to differences between the two groups according to individuals' (observable or unobservable) characteristics, such as age, education or poor initial mental health conditions. It would also occur if employees who become ill are the first ones to quit the company during business contraction and layoffs episodes; empirical evidence showing that employment of individuals with bad health conditions is more adversely affected in times of recession workers (e.g. Bharadwaj et al., 2015; OECD, 2010) suggests this. Accordingly, remaining workers may be employees whose mental health does not worsen before and during the mass layoff period; this mechanism would result in an underestimation of the effect of mass layoffs on psychotropic drug consumption; thus, the DiD estimator would be interpreted as a lower bound of the causal effect of mass layoffs on the mental health outcome.

However, one may argue that, on the contrary, the estimates may suffer from an upward bias, if workers who remain in the firm are actually those whose mental health conditions worsen during the period of company's business difficulties, since the most productive and healthier workers may have higher job opportunities to quit the firm voluntarily, while less healthier ones would be more likely to stay in downsizing firms. Also, remaining workers in a downsizing firm may be those whose mental health worsens for the reason that employment protection legislation obliges employers to avoid laying off workers with disabilities.

In order to examine this, we compare trends between treated and controls during the period before May 2011, i.e. preceding the mass layoffs reported by respondents. This period may coincide with a phase of business contraction and be marked by employee downsizing and episodes of layoffs. During this time, employees may search for a new job and move to another

employer as they observe the business decline, or if they have been notified that a mass layoff is planned – but this may be unlikely as, from a company's perspective, advance notice of a mass layoff plan can cause it to lose valued employees; in addition, downsizing may be unforeseen at the organizational level, several months before the event. During the pre-displacement time, stayers may be those whose mental health worsens, while movers may be those whose mental health do not worsen or improve; this would lead to non-parallel trends over our pre-displacement period. However, as we can see in Figure 3, a graphical test suggests that the controls (*MLO=0*) and the treated group (*MLO=1*) have close patterns before May 2011, preceding the implementation of the mass layoffs in the treated group. In the following section, we perform tests to examine whether the controls and the treated group have common trends during this phase. It confirms that treated and controls have close psychotropic drug use rate trends.

Another important issue is the potential influence of spillover effects of the local labor market on estimates. Mass layoffs reported by an employee and the local labor market context may be closely connected. This may be the case if, locally, as business activity contracts, several firms downsize or if a large firm that plays an important role in the local labor market implements a mass layoff, which creates a domino effect in the local labor market with subcontractor downsizings and multiplying job losses in the region. This will result in higher local unemployment rates, and a higher perceived job insecurity in both groups, treated and controls. Locally, mass layoffs in the treated group could trigger perceived job insecurity and adverse stress in the control group. One may argue that it would introduce a downward bias in the magnitude of the estimates; however, it is not clear insofar as this local macroeconomic climate may also trigger effects within the treated group: treated individuals may actually be more threatened by the climate of job insecurity than the controls, as they may be more directly and closely concerned by the risk of losing their jobs. In order to examine the extent to which the local labor market context influences our estimates, we isolate the direct role of a mass layoff from these contextual effects by introducing *départements* dummies interacted with year dummies in Equation (1), to control for the evolution of the local labor market. In order to identify local areas of employment, here we rely on the aggregated *départements* level[6]. We estimate the linear probability equation:

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[6] Data enable us to identify French *départements* where workers lived at the time of the survey. These *départements* correspond to 95 distinct areas.

$$Y_{it} = \widetilde{\alpha} + X_{it}\widetilde{\beta} + \widetilde{\gamma}MLO_i + \widetilde{\delta}After_t + \widetilde{\lambda}MLO_i * After_t + \phi_d^k D_{dk} + \widetilde{\mu}_i + \widetilde{\varepsilon}_{it} \qquad (2)$$

where D_{dk} is a dummy taking the value 1 for individuals living in the *département* d (d=1…95) at time periods corresponding to the year k (with k=2010…2013), excluding the reference group (d=1 and k=2010). The interaction dummies aim to capture the effect of the evolutions of the local labor market on the outcome. Controlling for these evolutions, the DiD coefficient isolates the direct effect of mass layoffs from this local context effect. Comparing this estimate to the DiD coefficient from Equation (1) enables us to assess the extent to which the local context effect contributes to explaining the mental health effect of a mass layoff experienced by a worker.

4. Results

4.1 Baseline results

As presented in Equation (1), we estimate a linear probability model to measure the impact of mass layoffs on psychotropic drug prescriptions of remaining employees.[7] We present below the results of three specifications: the first one is a linear probability model without control variables and without individual fixed effects (1); then we introduce control variables (2); in the third specification, we estimate a model with individual fixed effects (3).

Table 2 reports these regression results. The coefficients associated with the dummy *MLO*After* show significant positive effects of mass-layoffs on psychotropic drug consumption in all three specifications, and effects of a similar magnitude across specifications. In specifications (2) and (3), the introduction of controls and fixed-effects does not modify the magnitude of estimates obtained through the first specification. The estimated effect is sizeable, since we find a 2.3 percentage points increase in the consumption rate. It corresponds to an increase of 41% of the consumption rate in the treated group during displacement and post-displacement period, as compared with the pre-displacement period.

These results are confirmed by further estimations measuring the immediate effects on the outcome for the period 2011-2012 and for the year 2013, based on models taking into account two period dummies instead of a single period captured by the variable *After*.[8] These

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[7] As an alternative, we have also estimated LOGIT models. This specification yields results similar to estimations based on linear probability models.

[8] More specifically, we substituted in the basic specification of Equation (1) the variables *After* and *MLO*After* with the following set of variables: *After1, After2, MLO*After1* and *MLO*After2*, where *After1* represents a dummy for the period from 1 May 2011 to 31 December 2012 and *After2* represents a dummy for the period from 1 January 2013 to 31 December 2013.

estimations indicate that the magnitude and significance of the estimated effects associated with these two dummies are similar to those obtained through the baseline model and persistent in 2013. Overall, these results suggest that mass layoffs induce a sizeable increase in the use of psychotropic drugs prescribed by doctors.

Specification (2) highlights associations between the observable variables and the outcome. According to these results, workers belonging to households with a monthly income of more than €2,120 per consumption unit have lower psychotropic drug consumption, as compared with the lower income brackets. This result may reflect a better mental health status amongst the highest income class. Prescription rates are substantially lower for males as compared with females (-4.5 percentage points), which is in line with the literature showing indicators of a higher healthcare use amongst women as compared with men. Part-time workers show a higher consumption rate as compared with full-time workers (+4.5 percentage points); this may in part reflect the fact that some workers work part time in order to cope with bad health conditions. Lastly, results indicate that couples without children, single people, and single-parent families have a higher consumption rate as compared with couples with children.

The outcome in all estimations is the consumption of psychotropic drugs, including a large scope of treatments for a wide variety of clinical conditions—anxiety, insomnia, depression, acute alcohol withdrawal, and so on. In order to examine whether the effects differ according to the type of medication, we measured effects separately for anxiolytics and hypnotic drugs—the most frequently consumed psychotropic drugs—and for antidepressants. These estimates confirm a significant increase in the use of anxiolytics and hypnotics after mass layoffs; we also find an increase in antidepressant use, but the estimated effect is not statistically significant. It was not possible to conduct more detailed analyses due to the small sample size in the treated group.

[Table 2]

4.2 Robustness and sensitivity

As explained in Section 3, we examine the hypothesis of common time trends between groups. To that end, we conduct tests that consist of estimating DiD around different cut-off dates during the period preceding mass layoffs reported by workers (i.e. before May 2011). Thus, we restrict the sample to this pre-event period and re-estimated Equation (1), in which we substitute the variable *After* with a dummy taking the value 1 for time t superior to a cut-off date between

January 2010 and April 2011. We test several cut-off dates in order to test for the sensitivity of the results to the choice of this cut-off. The results of these tests (presented in Table 3) confirm that there were no significant differences in trends between the two groups during the period preceding mass layoffs. These results indicate that the hypothesis of common time trends is not refuted in the period preceding mass layoffs reported by workers.

As presented in Table 1 (descriptive statistics for the two groups), there is a clear imbalance in covariates between treated and controls: employees in the treated group are more likely to belong to the highest socio-economic groups, as compared with the controls. We examine the sensitivity of our results to control group change, by building a new control group having socioeconomic characteristics more similar to those of the treated group. To this aim, we use the nonparametric coarsened exact matching approach (Iacus et al., 2011); this method enables us to build an alternative control group, obtained by matching individuals in the treated group with controls having the same observed characteristics as the treated; weightings are then calculated so that they minimise the imbalance in covariates between treated and this new set of controls. Table 4 presents the regression results based on this matching. We arrive at estimates that are very close to the baseline results.

Lastly, we examine the extent to which the estimates may reflect the effects of the local context on the mental health outcome. As explained in Section 3, we isolate the effect of mass layoffs on psychotropic drug use by introducing dummies for the *départements* interacted with year dummies in the models (Equation 2), to control for the evolution of the local labor market at the *département* level. Table 5 presents results of these estimations. Note that, in this specification, standard errors are clustered at the *département* level. We find a significant positive effect of mass layoffs on psychotropic drug use; the magnitude of this effect is slightly higher than the one obtained through the baseline specification. These results suggest that, in our design, the effect of mass layoffs on remaining workers' mental health is to a large extent directly driven by the effect of the context within the downsizing firm rather than a local context effect.

[Table 3]

[Table 4]

[Table 5]

4.3 Heterogeneity in effects

We examined the existence of heterogeneous effects by subgroups (though these examinations remained limited due to the small sample size in the treated group). We found different magnitudes in effects according to gender (*see* Table 5); females are more affected by mass layoffs than males: the coefficient measured for females is higher than the one obtained for the male population. This finding may reflect a lower propensity of men to use healthcare and medication as compared with women, or may indicate a wider effect of mass layoffs on the mental health of female workers, or both.

Then, we examined the hypothesis whereby workers' mental health may be differently affected by mass layoffs according to socio-economic groups, using the following variables to identify socio-economic groups: the professional category, the net household income per consumption unit that reflects individuals' standard of living, and the feeling of job insecurity. A first hypothesis is that workers belonging to the lowest socio-economic groups may be more affected by mass layoffs, insofar as they may experience a higher feeling of job insecurity during the implementation of mass layoffs. The highest socio-economic groups may be less affected by mass layoffs, as this feeling would be more moderate: they can find new employment more easily in the event of job loss and may benefit from a higher human and social capital, facilitating their professional mobility in the event of job loss, which, in turn, may allow them to secure and maintain their standard of living. However, this socio-economic gradient is not ascertained. An alternative mechanism related to adaptive preferences may dominate, as debated in normative literature on poverty and inequality (see Elster, 1983, Sen 1985, and Nussbaum, 2000, for example). Processes of downward adaptation amongst disadvantaged individuals are discussed, in particular. According to the adaptation mechanism, disadvantaged individuals adapt their aspirations and preferences to their material and financial constraints. They achieve this by comparing themselves with others who are in the same precarious situation or even worse off. As a result, they lower their expectations. Following this adaptation hypothesis, workers belonging to the lowest socio-economic groups would be used to coping with a permanent job insecurity and would thus be less affected by the occurrence of mass layoffs in their plant than workers belonging to the highest socio-economic groups; the latter may face a greater threat to their standard of living and may experience higher stress and perceived job insecurity, which in turn may have a higher detrimental effect on their mental health.

Table 5 shows results for two income categories: household income below the income median (calculated in our sample, corresponding to €1,600 per consumption unit) and household

income above this median. We chose to divide the sample into these two groups in order to ensure sufficient subsample sizes; these analyses were indeed limited by the sample size. Findings show that magnitudes in effects differ between the two groups: the implementation of mass layoffs particularly harms workers in the lowest income class. Furthermore, we found that non-white-collar workers are more affected by the implementation of a mass layoff. Generally, these occupations are closely connected to the core activity of a company, so that in the event of a decline in activity remaining blue-collar workers may be particularly worried that they may be the next ones to be laid off.

Overall, these results are coherent with the socio-economic gradient hypothesis mentioned above, suggesting that this mechanism dominates the adaptation mechanism. The socio-economic gradient hypothesis is not, nevertheless, the only plausible mechanism; another explanation relies on the fact that the highest economic groups cope with mental health troubles through alternative treatments: they may have better access to psychological therapies than the lowest socio-economic groups, who are more likely to be treated with psychotropic drugs prescribed by frontline general practitioners.

[Table 6]

5. Conclusion

Using French survey data matched with administrative health insurance data, we found evidence that episodes of mass layoffs induce a significant increase in prescribed psychotropic drug consumption rates on workers remaining in a plant after a mass layoff. We measure an increase of 41% in psychotropic drug prescription rates amongst remaining workers during the period of displacement and the following years, as compared with the pre-displacement period. Since prescription medication medically objectifies mental health problems, these results show that, for remaining employees, the experience of a mass layoff yields significant negative effects on their mental health. This may be explained by an increase in job insecurity experienced by workers, the fear that they may be the next ones to be laid off, which would result from a future job loss, and the fear of consequences for them and for their family; this may be partly explained also by an intensification of workload borne by remaining workers in the aftermath of layoffs. These findings are observed after the economic crisis of 2008, during a period of time when unemployment rates, notably long-term unemployment rates, were

persistently high in France. The effects of mass layoffs on mental health may be heightened by this context of job insecurity.

Furthermore, we highlight categories of employees who are most at risk of a deterioration of mental health (though these analyses remained limited due to the small sample size in the treated group). Our results indicate that workers belonging to the lowest socio-economic groups are more affected by mass layoffs than those belonging to the highest socio-economic groups. A possible interpretation is that the lowest socio-economic groups experience higher job insecurity and work stress during the implementation of mass layoffs. Another explanation is that these groups use psychotropic drugs prescribed by frontline general practitioners and have little access to alternative resources or alternative treatments, namely psychotherapies that may be a substitute for psychotropic drugs, while the highest socio-economic groups may have better access to psychological therapies or, more generally, may have higher social resources to cope with job insecurity and detrimental effects in a context of mass layoffs.

Labor market policies should take into account the adverse effects of downsizings on workers' mental health. Employees' follow-up during the phase of mass layoffs and access to social support or evidence-based psychotherapies for workers experiencing stress in the context of downsizings should be considered amongst actions that can be undertaken. The consumption of psychotropic drugs, if taken over a too long period or without a proper medical monitoring, particularly anxiolytics and hypnotic drugs, can induce negative side effects such as addiction, reduction in vigilance and in memory. It may also affect individuals' work productivity and social functioning. Evidence-based psychotherapies would be a means to avoid the use of psychotropic drugs and thus the risk of negative side effects caused by these medications. As shown in the literature, evidence-based psychological therapies are effective forms of treatment for improving mental health and helping distressed people to stay at work, but only a small proportion of people suffering from depression or anxiety receive these therapies (Layard, 2017).

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Figure 1: Unemployment rates from 2000 to 2018 in France
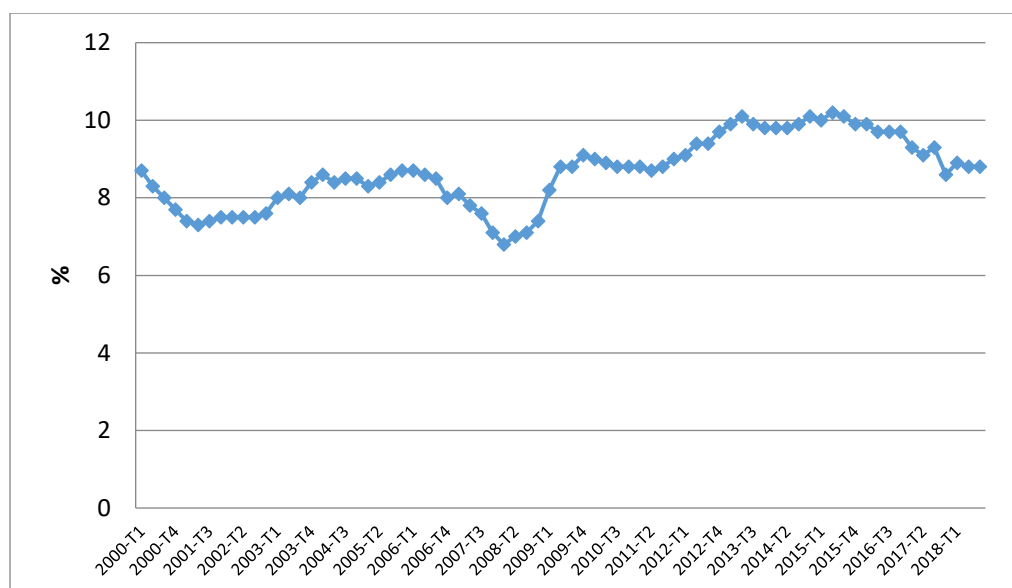
Source: French Labor Force Survey (LFS).

Scope: France with the unemployment rate (according to ILO methodology – https://www.ilo.org/ilostat-files/Documents/description_UR_EN.pdf) as a percentage of the unemployed in the labor force aged 15 to 65.

Table 1: Descriptive statistics

	Treated group	Control group
	Mass layoff during the last 12 months	**No mass layoff during the last 12 months**
Observation	186	1,531
Male (%)	54.3	52.6
Age		
Average	42.3(sd=9.3)	42.8(sd=10.4)
20–25 (%)	3.8	4.6
26–35 (%)	19.4	22.9
36–45 (%)	28.1	30.8
46–55 (%)	30.6	29.7
56–65 (%)	8.1	13.0
Education		
No education (%)	5.4	8.8
Low education (%)	26.9	35.6
Middle and higher education (%)	67.7	53.6
Monthly Household net income/consumption unit (a)		
Less than €1,264 (%)	16.7	22.2
€1,264 to €1,600 (%)	18.8	18.5
€1,600 to €2,120 (%)	16.7	24.8
More than €2,120 (%)	38.7	24.5

Not documented (%)	9.1	10.0
Socio-professional category		
White collar (%)	32.3	19.7
Clerks (%)	49.4	53.0
Blue collar (%)	18.3	27.3
Part-time job (%)	15.1	14.8
Family composition		
Single (%)	11.8	14.4
Couple without child (%)	18.3	20.8
Couple with children (%)	61.8	58.1
Single-parent family (%)	8.1	6.7
Firm's size		
Less than 10 employees (%)	8.6	19.9
10–49 employees (%)	13.4	19.0
50–99 employees (%)	5.5	8.8
100–499 employees (%)	25.3	18.7
500 employees or more (%)	47.3	33.6
Individuals with an administratively recognised chronic disease in the year 2010 (%)	6.0	8.7
Night work (%)	21.0	13.8
Working with the fear of losing one's job (b)		
1: Never (%)	27.4	58.2
2: Sometimes (%)	47.3	35.6
3: Often (%)	16.1	3.9
4: Always (%)	9.1	2.3
Being obliged to hurry to perform one's job (c)		
1: Never (%)	3.6	10.3
2: Sometimes (%)	35.1	39.6
3: Often (%)	39.2	33.8
4: Always (%)	22.2	16.3

Source: The 2012 French Health and Social Protection Survey (*ESPS*).

Scope: Private-sector employees with an open-ended labor contract, aged between 20 and 65 in 2012.

Notes: sd: standard deviation

(a) We use the OECD scale based on the following weighting of household members: 1 CU for the first adult in the household; 0.5 CU for any other person aged 14 or over; and 0.3 CU per child below 14.

(b) The fear of losing one's job, as reported in Table 1, is assessed through workers' answers to the statement 'I work with the fear of losing my job', consisting of four answer options: 1: never; 2: sometimes; 3: often; and 4: always.

(c) Surveyed employees reported their answers to the statement 'I am obliged to hurry to perform my job', with four answer options: 1: never; 2: sometimes; 3: often; and 4: always.

Figure 2: Psychotropic drug consumption amongst workers who reported a mass layoff and those who did not report a mass layoff
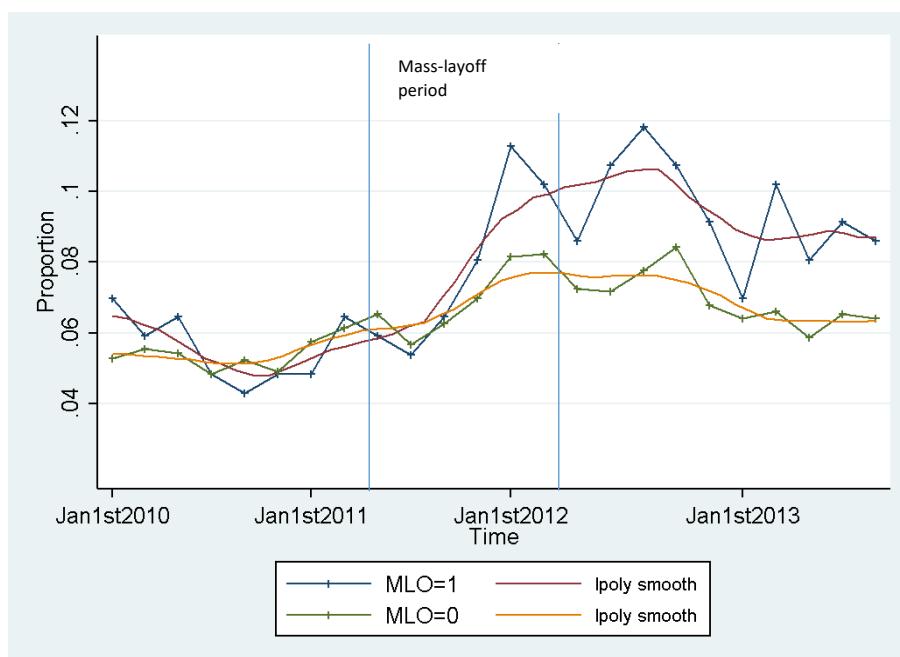

Source: The 2012 French Health and Social Protection Survey (*ESPS*).

Scope: Private-sector employees with an open-ended labor contract, aged between 20 and 65 in 2012.

Note: The group MLO=1 refers to the group of individuals affected by a mass layoff during the twelve months preceding the survey date; the group MLO=0 refers to unaffected individuals. The figure reports smoothed trends obtained by using local polynomials.

Table 2: The effect of mass layoffs on workers' psychotropic drug consumption: baseline results

	(1)	(2)	(3)
Dummy Mass Layoff (*MLO*)	0.000136	0.00820	
	(0.0146)	(0.0149)	
Dummy After	0.0153***	0.0143***	0.0164***
	(0.00251)	(0.00266)	(0.00273)
Dummy Mass Layoff*After	0.0232**	0.0228**	0.0234**
	(0.0111)	(0.0111)	(0.0111)
Male		-0.0448***	
		(0.00966)	
Age: 20 to 25		-0.0227**	0.00141
		(0.00953)	(0.0119)
Age: 26 to 35		-0.0130**	0.00294
		(0.00526)	(0.00636)
Age: 46 to 55		0.00765	-0.00467
		(0.00617)	(0.00712)
Age: 56 to 65		0.000644	-0.0219*
		(0.0108)	(0.0128)
Monthly household net income/consumption unit: Less than €1,264		-0.0135	
		(0.0163)	
Monthly household net income/consumption unit: €1,264 to €1,600		-0.0224	
		(0.0145)	
Monthly household net income/consumption unit: More than €2,120		-0.0241*	
		(0.0137)	
Monthly household net income/consumption unit: not documented		-0.0150	
		(0.0185)	
White collar		-0.00729	
		(0.0109)	
Blue collar		0.00577	
		(0.0125)	
No education		0.00756	
		(0.0187)	
Low education		0.0123	
		(0.0118)	
Part-time work		0.0453**	
		(0.0186)	
Night work		-0.0154	
		(0.0109)	
Single		0.0432***	
		(0.0154)	

Childless couple		0.0232*	
		(0.0129)	
Single-parent family		0.0434*	
		(0.0256)	
Firm's size: less than 10 employees		-0.00353	
		(0.0205)	
Firm's size: 10 to 49 employees		-0.0105	
		(0.0193)	
Firm's size: 100 to 499 employees		-0.0112	
		(0.0186)	
Firm's size: 500 employees or more		-0.00478	
		(0.0180)	
Constant	0.0556***	0.0792***	0.0580***
	(0.00489)	(0.0201)	(0.00362)
Individual fixed effects	NO	NO	YES
Observations	41,208	41,208	41,208
Number of workers	1,717	1,717	1,717

Source: The 2012 French Health and Social Protection Survey.

Scope: Private-sector employees with an open-ended labor contract, aged between 20 and 65 in 2012.

Note: The table reports the results of linear probability models. The dependent variable is a dummy taking the value 1 if the individual has taken medication; 0 otherwise. In the first specification, we estimate a linear probability model without control variables and without individual fixed effects (1); then we introduce control variables (2); in the third specification, we estimate a model with time-varying control variables and individual fixed effects (3). Estimated robust standard errors (in brackets), allowing for within-individual correlation of the error term.

* Statistically significant at the 10% level. ** Statistically significant at the 5% level. *** Statistically significant at the 1% level.

Table 3: DiD Estimates for the period preceding mass layoffs (from January 2010 to April 2011)

	(1)	(2)	(3)
Dummy Mass Layoff *Dummy (Time > = 1 July 2010)	-0.0116	-0.01184	-0.0115
	(0.0088)	(0.00882)	(0.0087)
Dummy Mass Layoff *Dummy (Time > = 1 September 2010)	0.0014	0.000830	-0.0063
	(0.0149)	(0.01504)	(0.0092)
Dummy Mass Layoff *Dummy (Time > = 1 November 2010)	-0.0065	-0.00679	-0.0061
	(0.0121)	(0.01217)	(0.0121)
Dummy Mass Layoff *Dummy (Time > = 1 January 2011)	0.0014	0.0008	0.0023
	(0.0149)	(0.0150)	(0.0150)
X	NO	YES	YES
Individual fixed effects	NO	NO	YES
Observations	13,736	13,736	13,736
Number of workers	1,717	1,717	1,717

Source: The 2012 French Health and Social Protection Survey.

Scope: Private-sector employees with an open-ended labor contract, aged between 20 and 65 in 2012.

Note: The table reports the results of linear probability models, for each date. The dependent variable is a dummy taking the value 1 if the individual has taken medication; 0 otherwise. In the first specification, we estimate a linear probability model without control variables and without individual fixed effects (1); then we introduce control variables (2); in the third specification, we estimate a model with time-varying control variables and individual fixed effects (3).

Estimated robust standard errors (in brackets), allowing for within-individual correlation of the error term.

* Statistically significant at the 10% level.** Statistically significant at the 5% level.*** Statistically significant at the 1% level.

Table 4: Estimation results using Coarsened Exact Matching

		(1)	(2)	(3)
Baseline results (from Table 2)	**Dummy Mass Layoff*After**	0.0232**	0.0228**	0.0234**
		(0.0111)	(0.0111)	(0.0111)
Estimations using coarsened exact matching	**Dummy Mass Layoff*After**	0.0228**	0.0216**	0.0238**
		(0.01130)	(0.0113429)	(0.01110)
	X	NO	YES	YES
	Individual fixed effects	NO	NO	YES
	CEM weighting	YES	YES	YES
	Observations	37,416	37,416	37,416
	Number of workers	1,559	1,559	1,559

Source: The 2012 French Health and Social Protection Survey.

Scope: Private-sector employees with an open-ended labor contract, aged between 20 and 65 in 2012.

Note: The table reports the results of linear probability models. The dependent variable is a dummy taking the value 1 if the individual has taken medication; 0 otherwise.

The first line shows the baseline results as presented in Table 2.

The second line presents the results of estimations using coarsened exact matching, following the methodology presented in Iacus et al. (2011). The proportion of matched individuals in the treated group is 100%; the proportion of matched individuals in the control group is 89.7%.

Estimated robust standard errors (in brackets), allowing for within-individual correlation of the error term.

* Statistically significant at the 10% level.** Statistically significant at the 5% level.*** Statistically significant at the 1% level.

Table 5: Regression results controlling for dummies *départements* interacted with year dummies

		(1)	*(2)*	*(3)*
Baseline results (from Table 2)	**Dummy Mass Layoff*After**	0.0232**	0.0228**	0.0234**
		(0.0111)	(0.0111)	(0.0111)
Estimations including dummies for the *départements* interacted with year dummies	**Dummy Mass Layoff*After**	0.0259**	0.0255**	0.0260**
		(0.0117)	(0.0117)	(0.01165)
	X	NO	YES	YES
	Individual fixed effects	NO	NO	YES
	Observations	41,208	41,208	41,208
	Number of workers	1,717	1,717	1,717

Source: The 2012 French Health and Social Protection Survey.

Scope: Private-sector employees with an open-ended labor contract, aged between 20 and 65 in 2012.

Note: The table reports the results of linear probability models. The dependent variable is a dummy taking the value 1 if the individual has taken medication; 0 otherwise.

The first line shows the baseline results as presented in Table 2. Estimated robust standard errors (in brackets), allowing for within-individual correlation of the error term.

The second line presents estimations of the models with dummies for the *départements* interacted with year dummies. In these estimations, standard errors are robust to heteroskedasticity and clustered at the *département* level.

* Statistically significant at the 10% level.** Statistically significant at the 5% level.*** Statistically significant at the 1% level.

Table 6: Heterogeneity in effects

	Subgroup		(1)	(2)	(3)
By gender	Male	Dummy Mass Layoff*After	0.0177	0.0177	0.0181
			(0.0137)	(0.0132)	(0.0137)
	Female	Dummy Mass Layoff*After	0.0298*	0.0288	0.0296*
			(0.0179)	(0.0180)	(0.0179)
By monthly household net income/consumption unit (median value = €1,600)	More than €1,600	Dummy Mass Layoff*After	0.0088	0.0088	0.0100
			(0.0115)	(0.0116)	(0.0115)
	Less than €1,600	Dummy Mass Layoff*After	0.0383*	0.0379*	0.0377*
			(0.0207)	(0.0205)	(0.0204)
By socio-professional category	White-collars	Dummy Mass Layoff*After	0.0126	0.0124	0.0129
			(0.0176)	(0.0178)	(0.0177)
	Blue-collars and clerks	Dummy Mass Layoff*After	0.0291**	0.0289**	0.0289**
			(0.0140)	(0.0141)	(0.0140)
Fear of losing one's job	Never	Dummy Mass Layoff*After	0.0118	0.0110	0.0122
			(0.0192)	(0.0194)	(0.0193)
	Sometimes, often or always	Dummy Mass Layoff*After	0.0248*	0.0250*	0.0252*
			(0.0138)	(0.0139)	(0.0139)
	X		NO	YES	YES
	Individual fixed effects		NO	NO	YES

Source: The 2012 French Health and Social Protection Survey.

Scope: Private-sector employees with an open-ended labor contract, aged between 20 and 65 in 2012.

Note: The table reports the results of linear probability models, estimated for each subgroup. The dependent variable is a dummy taking the value 1 if the individual has taken medication; 0 otherwise.

Estimated robust standard errors (in brackets), allowing for within-individual correlation of the error term.

* Statistically significant at the 10% level.** Statistically significant at the 5% level.*** Statistically significant at the 1% level.