Job destruction, disability and mortality

Pascale Lengagne[1]

February 2022

Preliminary draft, please do not circulate

Abstract: This paper evaluates the effects of large plant downsizings on workers' labor market outcomes, disability pension recipiency and the death risk in midlife. It uses French employee-employer register data over the period 2000 to 2015. Estimates indicate negative average effects of downizing events on annual wage earnings and highlight non-monotonous effects on the wage earnings growth distribution; results suggest that downsizing events trigger mainly downward earnings mobilities but also upward mobilities for around 10% of workers. Furthermore downsizing events induce a significant increase in the probability to have unemployment spells, but do not increase the probability to enter in the disability pension program. Findings show an excess mortality risk whithin the four years after downsizing. These effects are concentrated on individuals aged between 40 to 60 years old.

Key words: Job loss, plant downsizing, disability, health, mortality
JEL Codes: I12, J63, J23

---

[1]lengagne@irdes.fr, Institute for Research and Information in Health Economics, Paris, France. The author thanks Christine Le Clainche, Alexandra Roulet, Eve Caroli and participants to the 2021 Workshop JobSustain, for valuable comments. This research paper is part of a workpackage of the ANR project Jobsustain (Grant number: ANR-19-CE-0017-04).

1 Introduction

The Great Recession led to the destruction of a large number of jobs, predominently in routine occupations, accelerating the job polarization observed since the 1980's (Jaimovich and Siu, 2020). An important question is to know to what extent job destruction yields negative effects on the health of individuals who lose their job. The literature finds that employment losses has negative effects on mental health of those who lose their job (Cygan-Rehm et al., 2016; Schaller and Stevens, 2015; Zimmer, 2021) and may affect also mental health of retained workers after layoffs (e.g., Le Clainche and Lengagne, 2022). But do employment losses induce an increase in the probability of disabling diseases, rising the probability of disability pension entry (Rege et al. 2009), and an increase in the death probability? A consequence of job loss is its negative impact on the future income and employment trajectory of individuals who lose their job; estimations from a large literature suggest a persistent drop in the employment and earnings outcomes (Jacobson et al., 1993; Couch and Placzek, 2010; Hijzen et al., 2010; Deelen et al., 2018). The drop in income of individuals who lose their job and the loss of social protection attached to employment (in particular the loss of employer-provided health insurance; see, e.g., Shaller and Stevens, 2015) can induce a decrease in healthcare utilization and preventive care, thus reducing the chances for individuals to be cared early. Beyond the income nexus, employment loss may entail important non-pecuniary consequences, including a loss of social ties, a loss of life structure, a loss of social role, a deterioration of job quality (for reallocated workers) and a chronical financial stress due to economic insecurity. These psychosocial risk factors are correlated with adverse health behaviors, a higher probability of diseases, particularly cardiovascular diseases and mental health troubles, and are predictive of a risk of premature death (Alcaraz et al., 2019; Santosa et al., 2021).

This paper evaluates the effects of large plant downsizings on individuals' labor market outcomes, disability pension recipiency and the death risk of individuals in midlife, using longitudinal French register career data matched with employer data, for the period 2000 to 2015. Career data enable to follow individuals' employment trajectory and disability outcomes and vital status; employer register data provide information on the evolution of plants' characteristics enabling to identify employment variations at the plant level. The empirical strategy consists in comparing labor market outcomes, disability entry and the death risk of high-tenure workers at downsizing plants, to the outcomes of similar workers at non-downsizing plants.

First I evaluate the effects of downsizing events on individuals' future annual wage earnings, unemployment and disability recipiency, within four years after events. For the purpose of further understanding the health effects of the employment shock, I extent this investigation by studying the hypothesis of heterogeneous and non-monotonous effects of downsizing events on wage earnings. It assumes that downsizings may trigger both downward and upward earnings mobilities. Then, I estimate the effects of downsizing events on the death risk. Theoretically downsizing may induce positive and negative effects on health, if upward mobilities may trigger a better health and downward mobilities may trigger a worse health. However, the opposite relationship is plausible, according to the rationale whereby downward earnings mobilities could be associated with more time available for health investment (because of job loss or lower work intensity), and a lower exposition to deleterious or stressful work conditions, which would also improve health; and reduced income can limit adverse health behaviors (through a lower consumption of alcohol and cigarettes). Empirical findings highlighting a reduction in adverse health behaviors and a diminution of mortality rates associated with unemployment rise support this rationale (Ruhm, 2000, 2005; Strumpf et al., 2017). These studies find that all-cause mortality is procyclical but find a contracyclical relationship for deaths caused by suicides, overdoses and alcohol-related death.

This paper contributes to the literature in several respects. It adds to the literature studying the effects of job displacement as part of large plant downsizings and plant closures on labor market and health outcomes, based on large longitudinal register microdata enabling to focus on effects measured several years after a shock. Few studies have focused on the effects of plant downsizings on health-related work disability and mortality risk. Sullivan and von Watcher (2009) show persistent higher mortality rates after displacement for high-tenure male workers, using longitudinal register data from Pennsylvania for the period from the 1980s to 2006. Kuhn et al. (2009) focus on the short-run effects of job loss induced by plant closures on healthcare expenditures, with Austrian data for years 1998-2002, and find an increase in expenditures for antidepressants, a higher probability of hospitalizations due to mental health problems and a large increase in sickness benefits due to job loss. Bloemen et al. (2018), using Dutch register data from 1999 to 2010, show an increase in mortality rates within five years after job loss due to plant closings, for men aged 45 to 59 years-old, and suggest that these effects are driven by stress and changes in life style. Rege et al. (2009), using Norway data for 1995-2000, and Bratsberg et al. (2013), based on Norway data for 1992-2007, show that plant downsizings increase disability pension utilization and the death mortality risk. Furthermore, the literature shows a higher death probability within five years amongst unemployed individuals compared to those who are employed (Sermet and Khlat, 2004, for the case of France). The socioeconomic gradient in mortality is well-established. Unraveling mechanisms explaining these relationships is however challenging. This question remains debated and must be further investigated (Chetty et al., 2016). The present paper adds findings to this literature by exploring the mortality effects of a shock on employment opportunities realted to large plant downsizings.

The main findings are as follows. Estimates show negative average effects on annual wage earnings, and heterogeneous and non-monotonous effects. Results suggest that downsizing events trigger mainly downward earnings mobilities, but it triggers also upward mobilities for around 10% of workers at downsizing plants. Estimates indicate that downsizings induce a large increase in the probability to have unemployment spells within four years but does not induce simultaneously a rise in the probability to enter in the disability pension scheme. Thus, although the previous literature for other countries points to a rise in the probability of disability entry in response to an exogeneous shock on job loss, I do not find such an effect for France. Findings show a significant excess mortality risk within four years after downsizings, estimated to +0.252 percentage point for workers at downsizing plants relative to workers at non-downsizing plants. It corresponds to an increase by 35% of the death risk, for workers aged 25-60. The estimations show that these effects are concentrated on individuals aged between 40 to 60 years old. For these workers, results indicate an excess mortality risk estimated to +0.401 percentage point (+40%), which is consistent with findings of the previous literature for other countries. Thus, these results suggest that, although employment reductions may have harmful and beneficial effects on individuals' mobilities and have potentially negative and positive effects on health, a substantial overall negative effect of employment reductions is a net excess mortality risk in midlife.

2 Empirical strategy

2.1 Data

The data consist of a large representative sample of private-sector wage earners, issued from the career data of the French National Pension Insurance, which record yearly activity periods and career information of private-sector wage earners. The dataset contains information records for the period 2000 to 2015 (HYGIE data). For the purpose of this study, I select individuals with a status of private-sector wage earners at a year b, with b comprised between 2005 and 2011, and aged between 25 and 60 years old at year b. The career data enable to follow individuals' employment and annual wage earnings for four years before and four years after the year b. I define a relative year, denoted as t, taking the value 0 for the year b and ranged between –4 and 4. The data provide information on age, gender and the vital status of individuals. The career variables used for this study include employment status, annual wage earnings from private-sector employers, a binary unemployment benefit receipt variable (having or not having at least 50 days of unemployment benefits during a year), and a binary variable for disability pension recipiency.

The *disability recipiency* status corresponds to receiving a disability pension for a long-lasting loss of work ability of at least two thirds (resulting from the assessment by a doctor of the statutory health insurance fund). The amount of the disability pension ranges between 30% and 50% (depending on the degree of disability) of the mean annual wage earnings in the best past 10 years of individuals' working life. As regards unemployment benefits, the net replacement rates represent 67% of previous wage earnings for an individual with a median previous wage earnings (Dhont-Peltrault, 2017). The maximum compensation period is 24 months for workers aged less than

53, 30 months for workers aged 53 and 54 years old and 36 months for older workers.[2]

2.2 Definition of downsizing events, treatment and control groups

The study sample is composed of individuals having an employment status with the same employer for three years, during the relative years -2,-1 and 0, without unemployment spell during these three years. For the purpose of identifying downsizing events at the plant level, I use plant level characteristics merged to the sample of employees through the unique identifier of the plant.[3] Based on this plant-level data, I select the sample of employees at plants with at least 20 employees at t=0, t=-1 and t=-2 and that did not implement a downsizing of more than 25% during these three years.

The treatment and control groups are defined as follows. The treatment is defined as a downsizing of more than 25% of the workforce between the two consecutive years t=0 and t=1.[4]. For the baseline results, the treatment and control groups are defined as follows. The treament group consists of individuals at plants that experience a mass downsizing of more than 25% of their workforce between the relative years t=0 and t=1. This treatment group is composed of 16,273 employees. The control group includes workers at plants not concerned by a mass downsizing of more than 25% of their

[2]To qualify for unemployment benefits, the claimant must be engaged in a search for employment. Unemployment benefits can be stopped if claimants fail to meet their obligations by being unable to document their job searches, rejecting a reasonable job offer on two occasions, missing required appointments scheduled by *Pôle emploi*, or refusing to enter a training program.

[3]These data are issued from two data sources: *Déclaration Annuelle des Données Sociales* and *Déclaration des mouvements de main-d'œuvre*

[4]This definition includes different types of situation of the plant, including mass economic layoffs, closures due to bankruptcy, but also sell-outs, take-overs or transfers to other plants within the same firm. In the literature, authors usually apply different definitions. I present robustness tests to study different definitions in the subsection *3.3 Robustness tests*

workforce over the pre and post period (i.e. over the relative year from -4 to 4). The control group includes 464,707 base-year-employees at plants that did not implement mass downsizing in the post period; note that such a construction implies that some individuals serve as controls for more than one base year.

Table 1 displays summary statistics for the two groups. Individuals are 42 years old on average in the two groups. The proportion of men is lower in the treated group (55.16%) than in the control group (57.80%). Some variables provide proxies of the health status and temporary disability during the pre-period: having a diagnosed longlasting disease (binary variable) and long sickness absence spell (receiving or not receiving sickness benefits for at least 60 days of sickness benefits during the year). These variables suggest that health status of individuals in the treatment group is slightly better than in the control group. Annual wage earnings of individuals are similar on average between the two groups: approximatively 30K Euros (current Euros) in the years t=0, t=-1 and t=-2. On average, the plant size is 434 employees at year t=0 in the treatment group, and 391 employees in the control group.

The average plant size variation rate between t=0 and t=1 is -44% in the treatment group, indicating large downsizings in this group. Furthermore, in this group, the average plant size variation rate between t=0 and t=4 is -58%; the average workforce size is thus persistently reduced over the post-period. In the control group, the average plant size variation rate is 0% between t=0 and t=1 and +1% between t=0 and t=4.

[Insert Table 1]

2.3 Estimation

The treatment variable is denoted as D, with D=1 for downsizing events; 0 otherwise. The outcome variables used for this study are the death status of individuals, annual wage earnings, unemployment benefit receipt and disability benefit receipt. All outcome variables are binary variables except the annual wage earnings variable, which is continuous.

The variable outcome is denoted as Y_i for worker i. For the death outcome variable, it takes the value 1 for individuals who die between years t=1 and 4; 0 otherwise. The counterfactuals are denoted as Y_1 and Y_0 respectively for the two treatment status. We aim at estimating the average treatment effect on treated (ATET), expressed as follows:

$$ATET = E(Y_1|X, D = 1) - E(Y_0|X, D = 1) \tag{1}$$

The vector X is a set of predetermined variables used as control variables. The identification relies on the validity of the *Conditional Independance Assumption* (CIA) and the *Stable unit treatment value assumption* (SUTVA). I estimate the following linear probability model:

$$Y_i = \alpha + \beta D_i + \delta X_i + \epsilon_i \tag{2}$$

The vector X includes gender, age (in class of 5 years), a dummy for having a diagnosed longlasting disease at year t=0, dummies for having long sickness absences (at t=0, t=-1, t=-2), annual wage earnings (in quartiles), activity sectors, plant size at t=0 (in size categories), workplace sickness absence days at the plant level; it includes also fixed effects for commuting-zone interacted with base year to capture unobserved differentiated economic conditions at the commuting zone level for each base year b. Standard errors are clustered at the commuting-zone level, to account for common economic shocks at this level. Effects are estimated for all individuals and separately for men and women, and for the subset of senior workers (aged 40-60 years), for whom previous studies have estimated the largest effects of job displacement on the death risk.

Since the death does not occur during the pre-period, because individuals are alive at year t=0, it precludes thus to realize the usual test of parallel trends in the pre-period. I return to this issue in Subsection *3.3 Robustness tests*.

Linear regression models are estimated for all variable outcomes. Additionally, for annual wage earnings, I estimate quantile regression models, allowing to estimate effects on the evolution of the distribution of earnings, by contrast with the previous literature that focused on average treatment effect. The hypothesis is that a large downsizing shock may impact individuals differently according to unobserved individual characteristics such as personality traits, such as the individual capacity to bounce back, individuals' social capital and social contexts providing better job opportunities than the current job. It implies that a downsizing event does not trigger monotonous negative effects on employment outcomes; an individual may be a loser after a downsizing event (negative effect on her earnings) or a winner (positive effect on her earnings), since events may trigger upward mobilities for some individuals. An implication of this non-monotonicity is that the effects of downsizings on health outcomes, are also potentially not monotonous. Thus the estimated average effects of downsizing shocks on these outcomes reflect an average effect of positive and negative effects, and the overall net impact is not predicted. As an outcome in the quantile regressions, I retain the individual variation of annual wage earnings between the period post (mean annual wage earnings over the years t=2,3 and 4) and the period pre (mean annual wage earnings over the years t=0,-1 and

-2), calculated as follows:

$$\Delta Wage_i = (Wage_{iPost} - Wage_{iPre})/Wage_{iPre} \quad (3)$$

The conditional quantile function (CQF) for this variable is:

$$Q_\tau(\Delta Wage_i|D_i, X_i) = F^{-1}_{\Delta Wage}(\tau|D_i, X_i) \quad (4)$$

for the quantile τ (τ=0.05, 0.1, 0.15...0.95), with F the conditional distribution function.

3 Results

3.1 Estimated effects of downsizings on labor market outcomes and disability recipiency

Table 2 displays the estimated effects of downsizings on wage earnings, unemployment and disability pension recipiency. Figure 1 presents the results of the quantile regressions for the earnings outcome. Two specifications are presented: the first specification (1) does not include control variables and does not include commuting zone and activity sector fixed effects; the second specification (2) includes control variables, commuting zone and activity sector fixed effects. The point estimates from these two specifications are similar in magnitude.

Results indicate a significant drop in wage earnings and a substantial increase in the probability of having unemployment spells after downsizings events, compared to workers at non-downsizing plants. Estimates indicate that downsizing events induce a large increase in the probability to have unemployment spells within four years, by +10 percentage point, i.e. more than doubling the probability estimated for workers at non-downsizing plants. On average, the negative effect of downsizings on wage earnings variation is estimated to -7%. The estimated effects of downsizings on the distribution of wage earnings growth, based on quantile regressions, show a significant shock on this distribution between the pre and post periods. Quantile regressions suggest that downsizings induce substantial effects combining positive effects on the 90th and 95th quantiles and negative effects on all quantiles below the 75th quantiles. The negative effects are particularly large on the lowest quantiles. These results are coherent with the prediction that downsizings do not trigger monotonous negative effects on employment outcomes, but have negative and positive effects on earnings, since they trigger upward earnings mobilities for some individuals.

Further estimations suggest a negative effects of downsizings on the probability to be private-sector wage earner during the period of four years following the event. At the same time, downsizings can increase the mobilities to other employment sectors or increase the probability to become self-employed; further findings suggest this as we find a positive effect of downsizings on the probability to have activity periods as non private-sector wage earners.[5]

The estimation shows small negative effects of downsizings on disability benefit recipiency, which suggest that a negative shock on employment opportunities lowers the probability of entering into the disability program. Thus this result is the opposite of the result found in the previous literature. Rege et al. (2009) and Bratsberg et al. (2013) show that an adverse shock to employment opportunities increases substantially the entry into the disability program in Norway. An interpretation of this opposite result for France might be that workers with a disabling health condition are more likely to claim unemployment benefits than disability benefits due to the higher replacement rates of unemployment insurance compared with disability insurance.

[5]These activity periods correspond to being self-employed, employed in the public sector or agricultural sectors. The data do not provide detailed information by type of employment.

[Insert Table 2]

[Insert Figure 1]

3.2 Estimated effects of downsizings on the death risk

In the control group, the probability to die within four years after downsizings is estimated to 0.0071. It is estimated to 0.0086 for men and 0.0048 for women, and 0.0101 for the subset of individuals aged 40 to 60. Figure 2 presents the probability to die within four years after downsizings along with the age of individuals at year t=0, for the treated and control groups. The probability to die within four years is below 0.005 for individuals aged less than 40 years old, with similar patterns between the two groups. For older workers, aged 40 to 60, the death risk gap between treated and controls is apparent, particularly for men. These descriptive results suggest thus an increased death risk in the treated group (downsizing plants) relative to the control group (workers at non downsizing plants) mainly for workers aged more than 40 years old.

[Insert Figure 2]

Table 3 reports the estimated effects of downsizings on the probability to die within four years, with two specifications: a first specification (1) without controls and fixed effects and specification (2) including control variables and fixed effects. Results show that point estimates are robust to this addition of potentially confounding factors captured by these observed variables and fixed effects.

Point estimates indicate a significant increase in the death risk by 0.252*** percentage point in the treated group as compared to the control group. For men, the point estimate indicates an increase in the death risk by 0.328*** percentage point. For women, the point estimate indicates an increase by 0.140 percentage point (non statistically significant at the 10% threshold). For individuals aged between 40 and 60 years old, estimations indicate an increase by 0.401*** percentage point. Overall, the results suggest therefore a significant rise in the probability to die within four years after downsizings, mainly amongst men and individuals aged more than 40 years old. This result is in line with findings from previous studies. The magnitude in effect for the population of senior workers is lower than the effect measured by Bloemen et al. (2018), who use Dutch register data and find an effect of job loss due to firm closure on the death probability within four years estimated to 0.547***.

[Insert Table 3]

3.3 Robustness tests

In this research design, identification relies on the assumption that no unobservable factors related to downsizings are correlated with the outcomes. I conduct several robustness tests. First, I assess the effects of downsizings on the death probability within 1 year, 2 years, 3 years and 4 years with linear probability regression models. Table 4 presents the results obtained from these estimations, for the whole sample and for the subset of individuals aged 40 to 60 years old.[6] The point estimate for year t=1 enables to make a test of whether the control and treated groups have pre-existing difference in terms of death risk, for this first year for which we can assume that downsizings do not affect individuals immediately. Result suggests that the treated and control groups have similar death risk at year t=1. The result indicates a non significant effect of downsizings on the death risk of the year t=1; the point estimate is -0.01. Table 4 shows also that, the probability to die increases after the year t=1 in the treated group as compared with the control group.

[Insert Table 4]

I apply a different approach considering now the effect of the treatment intensity on the death risk within four years. It is expected that the effect on the death risk is concentrated on workers at plants that operate the largest downsizings, because the negative effects on employment outomes are concentrated on these workers. Therefore, instead of considering the binary treatment with downsizings of more than 25% *versus* downsizings of less than 25%, I estimate the effect of plant size variations between t=0 and t=1 on the death outcome. Table 5 presents results; plant size variations are categorized into seven categories and results present estimated effects on the probability to die within four years for different categories of plant size variations (positive or negative); the reference category includes plants where size variation is comprised between 0% and 5%. Point estimates are non significant and close to zero for all categories except for plants that ex-

[6] In this table, the choice made is to present only results for the whole sample and the subset of individuals aged 40 to 60 years old, and not for men and women separately, because of the low yearly occurence of death amongst women

perience the largest downsizings. This result thus confirm that the increase in the death risk is driven by the loss of employment opportunities due to large downsizings. In addition, based on employer register, I examine the type of separations at the plant level and the type of events (plant closures, economic layoffs, employee transfers, workforce reduction through the reducing the volume of temporary or permanent labor contracts, or through *Ruptures conventionnelles*, etc.) and I consider different definitions of the treatment based on these information. Findings confirm the robustness of the baseline estimations.

[Insert Table 5]

A key assumption is the validity of the paralell trend hypothesis, which supposes that in the absence of treatment, individuals have the same patterns as those in the control group. This hypothesis is not testable. Furthermore, the design does not enable to make a pre-trend test as individuals in the treated and control groups are alive during the period pre. However a similar test can be conducted. I consider the following two groups: a treatment group of individuals working at plants that downsize after the post period t=1 to t=4, i.e., a downsizing between t=4 and t=5 and not before; and a control group of individuals working at plants that do not downsize between t=4 and t=5 neither before. Comparing the death risk of these two groups enable to test whether there is a particular selection into treatement that biased the estimation, due to unobserved different characteristics of individuals in the treatment compared to the control group. Table 6 presents the results of this test. Results do not detect different patterns in the death risk between the two groups. Thus individuals in the downsizing treatment do not have a different death risk compared to the control group.

[Insert Table 6]

Another possible threat to the estimation of effects would be the non validity of the SUTVA. This assumption requires that the response of an individual to her treatment status depends only on the treatment assignment, not on the treatment status of other individuals. It assumes the absence of spillover effects between individuals in the treatment group and the control group. In the present study, the treatment is defined at the plant level, which corresponds to a workplace unit in a geographical localisation in a commuting zone. For instance, locally downsizing firms between t=0 and t=1 may lower the employment opportunities of workers in the control group. In this case, if lowering employment opportunities of individuals increase the death risk, the estimated effects ignoring spillovers would underestimate the true effect. In order to study the presence of spillovers at the commuting zone level [7] that would bias results, I evaluate the effects of the intensity of downsizings at the commuting zone level on the death risk of individual in the control group. Figure 3 presents the results. Point estimates for the intensity of downsizing are close to zero and non significant. This result suggests that there is no spillover effect of the treatment on the control group.

[Insert Figure 3]

[7] This geographic decoupage includes 348 commuting zones.

4 Concluding remarks

This paper evaluates the effects of large downsizings at the plant level on the entry in the disability insurance program of workers and their death risk within four years after the shock, using French register employee-employer data for the period 2000 to 2015. First the study assesses the extent to which downsizing events is a negative shock on individuals' employment oportunities. It documents that downsizings are associated with large negative effects on the annual wage earnings distribution but also trigger positive effects on the highest quantiles. Furthermore estimates indicate that downsizing events induce an increase in the probability to have unemployment spells within four years, by +10 percentage points (i.e., more than doubling the probability estimated for workers at non-downsizing firms), but do not increase the probability to enter in the disability pension program, by contrast with the previous literature for other countries that have found a rise in the probability of disability entry in response to an exogeneous shock on job loss. Findings show an excess mortality risk in the four years after downsizing shock estimated to +0.252 percentage point. This excess mortality risk is mainly concentrated on workers aged between 40 to 60 years old. The estimates indicate an excess mortality risk of +0.401 percentage point for these workers. It corresponds to an increase by 40% of the death risk of workers aged 40 to 60 years old.

This study finds negative effect of employment reductions at the plant level on heath, through an increase in the death risk in midlife associated with employment reductions. Strengthening prevention, access to health services and joint health and labor policies, during and after firms' employment reductions, could be effective policies to counteract these adverse effects.

5 References

Aghion, P., Akcigit, U., Deaton, A., & Roulet, A. (2016). Creative destruction and subjective well-being. American Economic Review, 106(12), 3869-97.

Alcaraz, K. I., Eddens, K. S., Blase, J. L., Diver, W. R., Patel, A. V., Teras, L. R., ... & Gapstur, S. M. (2019). Social isolation and mortality in US black and white men and women. American journal of epidemiology, 188(1), 102-109.

Black, S. E., Devereux, P. J., Salvanes, K. G. (2015). Losing Heart? The Effect of Job Displacement on Health. ILR Review. 68(4), 833–861.

Bloemen, H., Hochguertel, S., & Zweerink, J. (2018). Job loss, firm-level heterogeneity and mortality: Evidence from administrative data. Journal of Health Economics. 59, 78-90.

Bratsberg, B., Fevang, E., & Røed, K. (2013). Job loss and disability insurance. Labour Economics, 24, 137-150.

Browning, M., Heinesen, E. (2012), Effect of Job Loss Due to Plant Closure on Mortality and Hospitalization, Journal of Health Economics. Vol. 31, Issue 4: 599–616.

Case, A., & Deaton, A. (2021). The great divide: education, despair, and death. Annual Review of Economics, 14.

Chetty, R., Stepner, M., Abraham, S., Lin, S., Scuderi, B., Turner, N., ... & Cutler, D. (2016). The association between income and life expectancy in the United States, 2001-2014. Jama, 315(16), 1750-1766.

Couch, K. A., & Placzek, D. W. (2010). Earnings Losses of Displaced Workers Revisited, American Economic Review, 100 (1): 572–89.

Cygan-Rehm, K., Kuehnle, D., & Oberfichtner, M. (2017). Bounding the causal effect of unemployment on mental health: Nonparametric evidence from four countries. Health Economics, 26(12), 1844-1861.

Deelen, A., de Graaf-Zijl, M., van den Berge, W. (2018). Labour Market Effects of Job Displacement for Prime-Age and Older Workers. IZA Journal of Labor Economics, 7(1), 3.

Dhont-Peltrault, E. (2017). L'indemnisation du chômage en France au regard des pratiques européennes. Economie prevision, (1), 137-146.

Eliason, M., Storrie D., (2009). Does job loss shorten life?. Journal of Human Resources 44(2): 277-302.

Hijzen, A., Upward, R., & Wright, P. W. (2010). 'The Income Losses of Displaced Workers'. Journal of Human Resources, 45(1), 243–269.

Jacobson, L. S., LaLonde, R. J., & Sullivan, D. G. (1993). Earnings losses of displaced workers. The American economic review, 685-709.

Jaimovich, N., & Siu, H. E. (2020). Job polarization and jobless recoveries. Review of Economics and Statistics, 102(1), 129-147.

Kuhn A, Lalive R, Zweimüller J (2009). The public health costs of job loss. Journal of Health Economics. 28(6):1099–1115.

Le Clainche C. & Lengagne P. (2022). Economic layoffs and mental health: Evidence from French register-survey data. *Mimeo.*

Rege, M., Telle, K., & Votruba, M. (2009). The effect of plant downsizing on disability pension utilization. Journal of the European Economic Association, 7(4), 754-785.

Ruhm, C. J. (2000). Are recessions good for your health?. The Quarterly journal of economics, 115(2), 617-650.

Ruhm, C. J. (2005). Healthy living in hard times. Journal of health economics, 24(2), 341-363.

Santosa, A., Rosengren, A., Ramasundarahettige, C., Rangarajan, S., Chifamba, J., Lear, S. A., ... & Yusuf, S. (2021). Psychosocial risk factors and cardiovascular disease and death in a population-based cohort from 21 low-, middle-, and high-income countries. JAMA network open, 4(12), e2138920-e2138920.

Schaller, J., Stevens, A.H. (2015). Short-run effects of job loss on health conditions, health insurance, and health care utilization. Journal of Health Economics. Vol. 43, pp. 190–203.

Sermet, C., & Khlat, M. (2004). La santé des chômeurs en France: revue de la littérature. Revue d'épidemiologie et de santé publique, 52(5), 465-474.

Sullivan, D., von Wachter, T. (2009). Job Displacement and Mortality: An Analysis Using Administrative Data. Quarterly Journal of Economics. Vol. 124 (no. 3):1265–1306.

Zimmer, D. M. (2021), The effect of job displacement on mental health, when mental health feeds back to future job displacement, The Quarterly Review of Economics and Finance, 79, 360-366.

Table 1: Summary statistics

	D=1	D=0	Diff.
Age (t=0) (mean)	42.49	42.55	-0.06
Men (%)	55.16	57.80	-2.63***
Health proxy			
Diagnosed longlasting illness at t=0 (%)	5.18	5.29	-0.10
Long sickness absence at t=0 (%)	5.15	5.50	-0.35**
Long sickness absence at t=-1 (%)	5.05	5.50	-0.45**
Long sickness absence at t=-2 (%)	4.87	5.48	-0.61***
Annual wage earnings			
t=0 (mean)	30,691	30,972	-280
t=-1 (mean)	30,006	29,968	38
t=-2 (mean)	28,977	28,885	91
Plant size			
Plant size at t=0	434	391	43
Plant size variation rate			
between t=0 and 1	-0.44	0.00	-0.44***
between t=0 and 4	-0.58	0.01	-0.59***
Activity sector (%)			
Industries	24.96	33.88	-8.91**
Construction	6.28	5.91	0.37
Services	68.74	60.19	8.54***
# Obs.	16,273	464,707	

Note: * $p<0.100$; ** $p<0.050$; *** $p<0.001$

Table 2: Estimated effect of downsizings on labor market outcomes and disability recipiency

	All		Men		Women		40-60	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Wage earnings growth $\Delta Wage$ between Pre and Post								
Treatment D	-0.062***	-0.070***	-0.068***	-0.074***	-0.054***	-0.064***	-0.068***	-0.075***
	(0.008)	(0.007)	(0.009)	(0.008)	(0.010)	(0.008)	(0.007)	(0.007)
Mean outcome|D=0	0.008		0.015		0.001		-0.036	
Unemployment								
Treatment D	0.103***	0.102***	0.115***	0.110***	0.088***	0.090***	0.106***	0.106***
	(0.009)	(0.009)	(0.011)	(0.011)	(0.008)	(0.008)	(0.010)	(0.010)
Mean outcome|D=0	0.078		0.075		0.084		0.068	
Disability pension recipiency								
Treatment D	-0.005***	-0.005***	-0.001	-0.000	-0.012***	-0.007***	-0.008***	-0.007***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Mean outcome|D=0	0.069		0.061		0.073		0.106	
Control variables	No	Yes	No	Yes	No	Yes	No	Yes
# Obs.	480,980	480,980	480,980	480,980	480,980	480,980	480,980	480,980
# Obs. D=0	464,707	464,707	464,707	464,707	464,707	464,707	464,707	464,707
# Obs. D=1	16,273	16,273	16,273	16,273	16,273	16,273	16,273	16,273

Notes: Regression results are displayed for all individuals, for men and women, and for the subset of workers aged 40-60 years. (i) Individuals with dianosed long illness or long sickness spell at t=0.
Specification (1): linear probability model without control variables; Specification (2): linear probability model with control variables. Robust standard errors in brackets.
* p<0.100; ** p<0.050; *** p<0.001

Table 3: Estimated effects of downsizings on the probability to die within four years after the shock

	All		Men		Women		40-60	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Treatment D	0.00248***	0.00252***	0.00323***	0.00328***	0.00177**	0.0014	0.00411***	0.00401***
	(0.00071)	(0.00070)	(0.00095)	(0.00095)	(0.00085)	(0.00089)	(0.00119)	(0.00114)
Control variables	No	Yes	No	Yes	No	Yes	No	Yes
Mean outcome |D=0	0.0070		0.0086		0.0048		0.0101	
# Obs.	480,980	480,980	277,583	277,583	203,397	203,397	291,604	291,604
# Obs. D=0	464,707	464,707	268,606	268,606	196,101	196,101	281,792	281,792
# Obs. D=1	16,273	16,273	8,977	8,977	7,296	7,296	9,812	9,812

Notes: Regression results are displayed for all individuals, for men and women, and for the subset of workers aged 40-60 years. Specification (1): linear probability model without control variables; Specification (2): linear probability model with control variables. Robust standard errors in brackets.

* $p<0.100$; ** $p<0.050$; *** $p<0.001$

Table 4: Estimated effects of downsizings on the death risk by year

	All		40-60	
	(1)	(2)	(1)	(2)
Outcome: Prob. to die at t=1				
D	-0.0001	-0.0001	-0.0001	-0.0001
	(0.0002)	(0.0003)	(0.0004)	(0.0004)
Mean outcome|D=0	0.0015		0.0022	
Outcome: Prob. to die within 2 years				
D	0.0008	0.0008	0.0013	0.0013
	(0.0005)	(0.0005)	(0.00085)	(0.00085)
Mean outcome|D=0	0.003		0.005	
Outcome: Prob. to die within 3 years				
D	0.0014**	0.0014**	0.0023**	0.0021**
	(0.0005)	(0.0005)	(0.0009)	(0.0009)
Mean outcome|D=0	0.0051		0.0073	
Outcome: Prob. to die within 4 years				
D	0.0025***	0.0025***	0.0041***	0.0040***
	(0.0007)	(0.0007)	(0.0011)	(0.0011)
Death probability |D=0	0.0070		0.010	
Control variables	No	Yes	No	Yes
# Obs.	480,980	480,980	291,604	291,604
# Obs. D=0	464,707	464,707	281,792	281,792
# Obs. D=1	16,273	16,273	9,812	9,812

Notes: Specification (1): linear probability model without control variables; Specification (2): linear probability model with control variables. Robust standard errors in brackets.
p<0.100; ** p<0.050; *** p<0.001

Table 5: Estimated effects of plant size variations on the death risk within four years

	All		40-60	
	(1)	(2)	(1)	(2)
$[1; -0.35]$	0.00331***	0.00355***	0.00582***	0.00592***
	(0.00113)	(0.00111)	(0.00203)	(0.00194)
$]-0.35; -0.25]$	0.00148	0.00103	0.00241	0.00165
	(0.00112)	(0.00108)	(0.00177)	(0.00171)
$]-0.25; -0.05]$	0.00033	-0.00016	0.00033	-0.00039
	(0.00035)	(0.00033)	(0.00052)	(0.00049)
$]-0.05; 0[$	0.00048	0.00016	0.00067	0.00041
	(0.00036)	(0.00034)	(0.00054)	(0.00053)
$[0; 0.05]$: Ref.				
$]0.05; 0.25]$	-0.00058*	-0.00013	-0.00027	0.00086
	(0.00035)	(0.00034)	(0.00055)	(0.00056)
$]0.25; 1]$	-0.00027	0.00005	0.00120	0.00086
	(0.00106)	(0.00114)	(0.00174)	(0.00179)
Control variables	No	Yes	No	Yes
# Obs.	480,980	480,980	291,604	291,604
# Obs. D=0	464,707	464,707	281,792	281,792
# Obs. D=1	16,273	16,273	9,812	9,812

Notes: Specification (1): linear probability model without control variables; Specification (2): linear probability model with control variables. Robust standard errors in brackets. * p<0.100; ** p<0.050; *** p<0.001

Table 6: Test for a selection into treatment

	All		40-60 years old	
	(1)	(2)	(1)	(2)
Probability to die at t=1				
Treatment D	-0.0001	-0.0001	-0.0005	-0.0004
	(0.0004)	(0.0004)	(0.0006)	(0.0006)
Mean outcome|D=0	0.0016		0.0022	
Probability to die within 2 years				
Treatment D	0.0005	0.0005	0.0013	0.0013
	(0.0007)	(0.0007)	(0.00051)	(0.00053)
Mean outcome|D=0	0.0032		0.0047	
Probability to die within 3 years				
Treatment D	0.0002	0.0002	-0.0000	-0.0000
	(0.0008)	(0.0008)	(0.0011)	(0.0011)
Mean outcome|D=0	0.0051		0.0074	
Probability to die within 4 years				
Treatment D	0.0004	0.0005	0.0006	0.0006
	(0.0071)	(0.0008)	(0.0012)	(0.0013)
Death probability|D=0	0.0071		0.010	
Control variables	No	Yes	No	Yes
# Obs.	445,253	445,253	270,177	270,177
# Obs. D=0	464,707	464,707	281,792	281,792
# Obs. D=1	8,627	8,627	5,403	5,403

Notes: The table estimates the difference in death risk between two groups: a treatment group of individuals working at plants that downsize after the post period t=1 to t=4, a downsizing between t=4 and t=5; and a control group of individuals working at plants that do not downsize between t=4 and t=5 neither before.
Specification (1): linear probability model without control variables; Specification (2): linear probability model with control variables. Robust standard errors in brackets. * p<0.100; ** p<0.050; *** p<0.001.

Figure 1: Estimated effects of downsizings on annual wage earnings: Quantile regression results

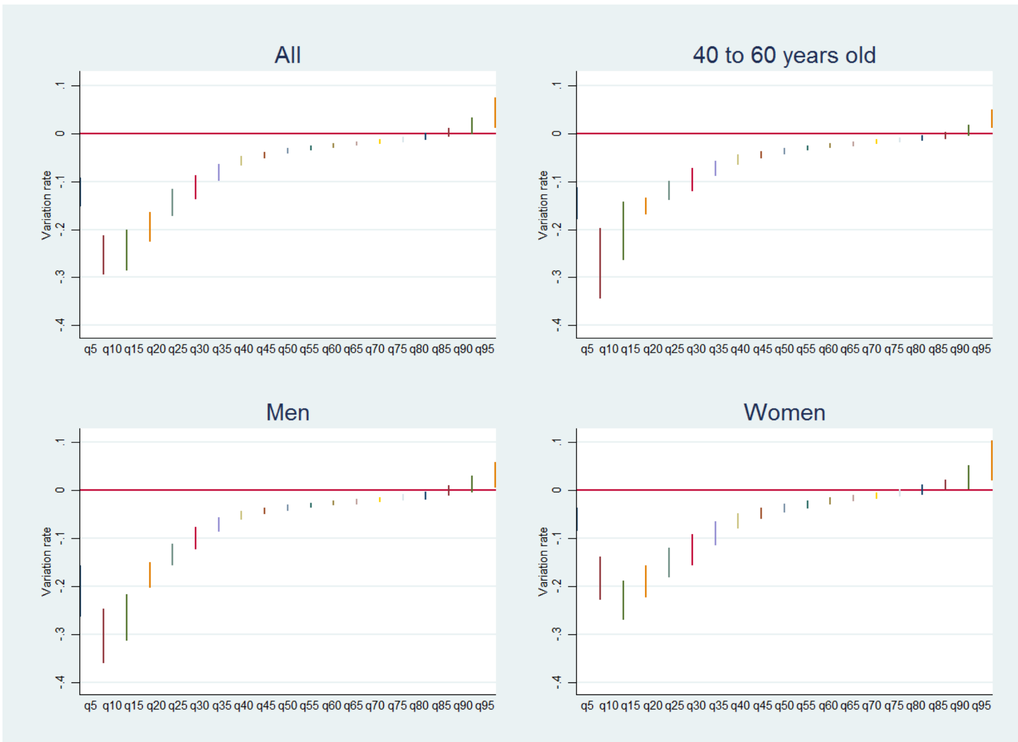
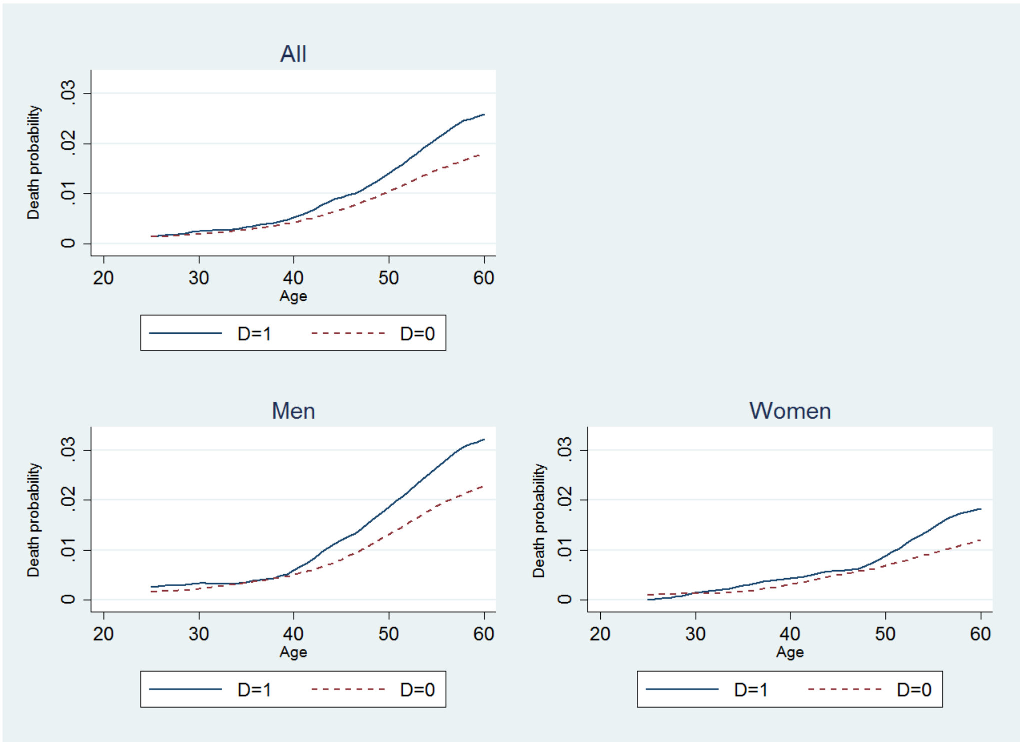
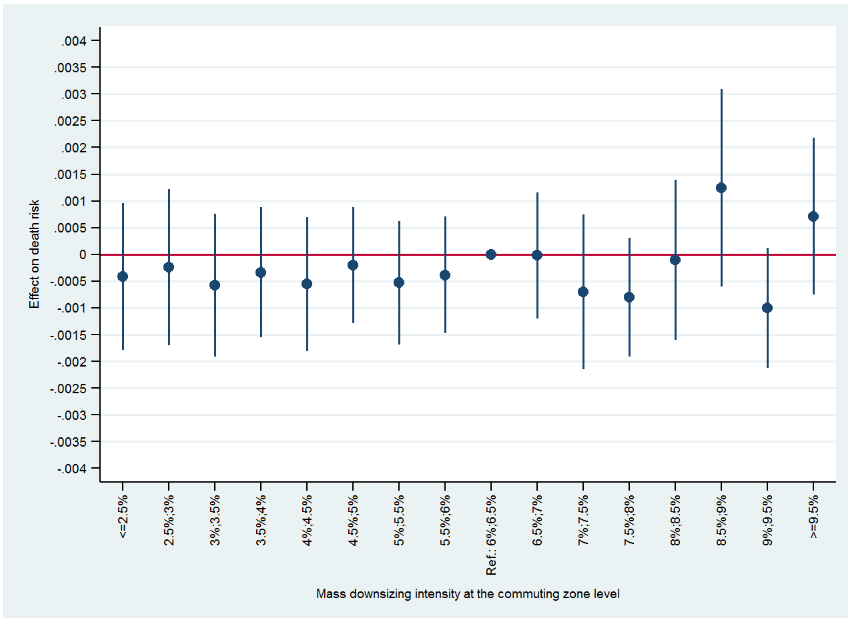


Figure 2: Probability to die within four years after downsizings



Notes: Treatement group : D=1; Control group: D=0.

Figure 3: Estimated effect of the local downsizing intensity on the death risk in the control group



Notes: The Figure presents the results of a linear probability model with the death risk within four year as the dependent variable, and the downsizing intensity at the commuting zone level as the explanatory variable.
The downsizing intensity of the commuting zones is ranged into categories: from "less than 2.5%" (meaning that, in these commuting zones, less than 2.5% of employees are working at downsizing plants) to "more than 9.5%".
The regression controls for covariates. Robust standard errors. The Figure plots the 95% confidence intervals for each intensity category.