

Company organisational changes and long term sickness absence and injury leave: results from a difference in difference approach

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**Technological innovation and organisational
changes: the potential impacts on prevention
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Introduction

- Standard models in economics assume that employers make adjustments to the production process to maximise profits, rather than employee wellbeing (Bloom and Van Reenen, 2007; Freeman and Kleiner, 2005)
 - However, more and more employers do not share the simplistic view of Friedman saying that “The social responsibility of business is to increase its profit”
- Indeed, from the society point of view, the social consequences of poorly managed changes at work appear as quite serious
 - economic losses created by work accidents and occupational diseases: 4% of GDP (ILO)
 - lost working days because of work accidents and work related health problems: in Europe in 2009, between 1,3 and 2,1 (European Commission)
 - average daily benefits for work accidents and occupational diseases: in France in 2010, 3000 euros, 24000 euros for cumulative trauma disorders.
- If organisational changes are not optimised from the point of view of employee well-being, what are their consequences on health at work issues?

Organisational changes and health at work (1)

- There is uncertainty about the impact organisational changes are likely to have on employees' health
 - If they enrich employees' working lives, this is likely to improve their mental and physical health
 - If they are simply a means of intensifying worker effort, this may lead to a higher incidence of illness, injury, absence and stress
 - Even if organisational changes enhance workers' control over their job, the process of their introduction can generate uncertainty leading to increased anxiety among workers
- An additional question is about the length of this alleged effect of organisational changes on employees' health
 - These effects on long-term sickness absence are likely not to persist since those worst affected could choose to leave the organisation while the remainder are liable to adapt over time (Kahneman et al., 1999)

Organisational changes and health at work (2)

- Different studies using survey data have identified consequences of organisational changes on employees' health, they are most of the time negative
 - Green (2004), Cottini and Lucifora (2010): the introduction of new organisational practices tends to increase working intensity and consequently deteriorates health
 - Bordia et al. (2004): the process of change and innovation generates stress and anxiety
 - Pollard (2001), Osthus (2007): workplace reorganisations cause different work-related mental and physical health problems
 - Euzénat et al. (2013): obtaining ISO9001 standard decreases work accidents in firms with more than 200 employees, whereas adopting goods and services labelling increases work accidents
- Social support can help workers cope with workplace innovation
 - Bryson, Dale-Olsen and Barth (2014) find supportive evidence for the buffering effect of unionisation in mitigating the negative impact of workplace innovation on job anxiety

Objectives of the paper

- Identify the consequences of organisational changes on long term sickness absence and injury leave
 - Using a linked employer-employee data base
 - Data on organisational changes are provided by employers (COI survey)
 - Data on long term sickness absence and injury leave are extracted from an administrative data source (HYGIE data base)
 - Employers and employees are followed up in time
 - Using a difference in difference approach, that is comparing
 - A treatment group: employees facing organisational change in their workplace
 - A control group: employees in inert companies
 - Before and after the period of changes
 - Looking at whether effects are different according to gender

Data

- **The COI Survey**

- The sample is representative of companies with more than 10 employees in the competitive sector in 2006, stratified random sample
- 13697 companies in total
- Very precise set of information about the use in 2006 and 2003 of a large set of information technologies and management tools which diffusion within the population of companies was large enough to justify a question in a national wide survey: just in time, ISO certification, traceability, ERP etc.

- **The Hygie data base**

- Results from the merging two French administrative files : National retirement pension fund (CNAV) and National Health Insurance Fund (CNAM-TS)
- The HYGIE panel data base, with 538,870 beneficiaries from 2005 to 2010, records
 - individual information about socio-demographic characteristics, medical consumption, sick leaves
 - information about the identity of employers
 - complete retrospective career information including data about periods of long term sickness absence and injury leave before 2005.

Timing of changes

We compare the absence behaviour of employees before, during and after the changes have been implemented by their company



- Experimental period: 2003 to 2008
- Before organisational changes period: 2000 to 2002
- During organisational changes period: 2003 to 2005
- After organisational changes period: 2006 to 2008

Selection of the sample

- After matching the COI survey with the Hygie data base, we obtain a sample of 26 321 individuals
- The **treatment group** is composed of employees having worked in the same changing firm over the experimental period: 5 745 employees
- For the **control group**, we impose the same condition within inert companies: 8 875 employees
- We have **14 620** individuals working in **4 030** companies in our working sample

Measurement of employer Changes

- We build **two synthetic indicators** to measure changes in the uses of two families of tools often described as complementary from the point of view of economic performance
 - Information and Communication Technologies: **equip the information system**
 - Management tools: **equip the production system**
 - Between beginning 2003 and beginning 2006 (in 2003, 2004 or 2005)
- For each type of change, we define a threshold beyond which we consider that the change is negligible. We build a dummy indicating a change for each family of tool. By combining them, we define four types of change
 - **ICT changes only**
 - **Management changes only**
 - **ICT and management changes**
 - Inertia
- According to the type of the change implemented by their employer, employees belong to one of the three treatment groups or to the control group (inert companies)

Long term sickness absence and injury leave

- The outcome we examine is the occurrence of a long term sickness absence or injury leave.
- For the National pension fund, a private sector worker will validate for his pension a period equivalent to a working period when he has experienced 60 consecutive days of absence from work compensated by the National Health Insurance System.
- Every year of the professional career of the individuals from the HYGIE database, we identify if they experienced such a long term absence.
- The National Health Insurance System identifies four different causes for this long term absence:
 - ✓ severe illness,
 - ✓ work accidents,
 - ✓ occupational disease,
 - ✓ maternity.

Difference in difference estimator

We include, in the regression:

- Dummies indicating the time period to identify the trend in long term absence within companies
- Dummies indicating the type of change implemented by companies between 2003 and 2006 to control the time invariant characteristics of changing firms to which treated individuals are affiliated

To identify the causal effect of each type of change, we interact the change dummies with the time period dummies

$$\begin{aligned} S_{it} = & \alpha + \beta 1. (t = \text{during ou } t = \text{after})_{it} + \gamma_1 1. (i \in CC_j = 1 \cap MC_j = 0)_{it} \\ & + \gamma_2 1. (i \in CC_j = 0 \cap MC_j = 1)_{it} + \gamma_3 1. (i \in CC_j = 1 \cap MC_j = 1)_{it} \\ + \delta_1 & 1. (t = \text{during ou } t = \text{after})_{it} \cdot 1. (i \in CC_j = 1 \cap MC_j = 0)_{it} \\ & + \delta_2 1. (t = \text{during ou } t = \text{after})_{it} \cdot 1. (i \in CC_j = 0 \cap MC_j = 1)_{it} \\ & + \delta_3 1. (t = \text{during ou } t = \text{after})_{it} \cdot 1. (i \in CC_j = 1 \cap MC_j = 1)_{it} \\ & + X_{it} \varepsilon + Y_{it} \lambda + u_{it} \end{aligned}$$

Controls:

- Employee: gender, age, occupation, entry wage on the labour market, chronic disease before 2003, ratio of long term absence before 2003
- Employer: size and industry

Sample average effects of organisational changes on long-term sickness absences of treated employees **during** and **after** the period of changes (Coi-Hygie)

Model specification	Time and treatment dummies (1)	+ individual characteristics Model (2)	+ firm level variables Model (3)	Model 3 with coarsened exact matching Model (4)
DD before (2000-2002) vs during (2003-2005) organisational changes				
ICT changes	-0,006 (0,004)	-0,006 (0,004)	-0,006 (0,004)	-0,007* (0,004)
Managerial changes	-0,009* (0,005)	-0,009* (0,005)	-0,009* (0,005)	-0,011** (0,005)
Both changes	0,020** (0,008)	0,020** (0,008)	0,020** (0,008)	0,026*** (0,008)
N / R ²	86 918 / 0,001	86 918 / 0,037	86 918 / 0,038	83 914 / 0,036

DD before (2000-2002) vs after (2006-2008) organisational changes				
ICT changes	-0,009* (0,005)	-0,008 (0,005)	-0,009* (0,005)	-0,008 (0,005)
Managerial changes	-0,005 (0,007)	-0,005 (0,007)	-0,005 (0,007)	-0,017** (0,006)
Both changes	0,019* (0,011)	0,020* (0,011)	0,020** (0,011)	0,030*** (0,010)
N / R ²	51 195 / 0,001	51 195 / 0,029	51 195 / 0,029	48 690 / 0,028

Discussion of results (1)

- **In all regressions we observe the same core result:**
 - Negative impact of changes in one dimension only on long term absence
 - Positive impact of joint changes in ICT and management tools
- **Possible explanation :**
 - Cumulative changes are a bigger shock on work organisation and create more disorder that prevents employees from using health preserving strategies because of the related increase in work intensity , there are less hazards associated with a change in one dimension only which is more likely to be mastered by the organisation
 - the literature on the complementarities between the two families of change stress the fact the performance return is higher when both families of changes are implemented together
 - during the observed period, the most frequent configuration of changes is ICT changes only

Sample average effects of organisational changes on long-term sickness absences of treated **men during** and **after** the period of changes (Coi-Hygie)

Model specification	Time and treatment dummies (1)	+ individual characteristics Model (2)	+ firm level variables Model (3)	Model 3 with coarsened exact matching Model (4)
DD before (2000-2002) vs during (2003-2005) organisational changes				
ICT changes	-0,006 (0,004)	-0,006 (0,004)	-0,006 (0,004)	-0,009** (0,004)
Managerial changes	-0,002 (0,005)	-0,002 (0,005)	-0,001 (0,005)	-0,002 (0,005)
Both changes	0,003 (0,008)	0,003 (0,008)	0,003 (0,008)	0,008 (0,008)
N / R ²	58 418 / 0,001	58 418 / 0,037	58418 / 0,038	56 818 / 0,040
DD before (2000-2002) vs after (2006-2008) organisational changes				
ICT changes	-0,010* (0,006)	-0,010* (0,006)	-0,009* (0,006)	-0,011** (0,005)
Managerial changes	-0,00 (0,007)	-0,004 (0,007)	-0,004 (0,007)	-0,005 (0,007)
Both changes	0,032*** (0,011)	0,033*** (0,011)	0,032*** (0,011)	0,031*** (0,010)
N / R ²	33 146 / 0,003	35 146 / 0,030	35146 / 0,030	33 838 / 0,028

Sample average effects of organisational changes on long-term sickness absences of treated **women during** and **after** the period of changes (Coi-Hygie)

Model specification	Time and treatment dummies (1)	+ individual characteristics Model (2)	+ firm level variables Model (3)	Model 3 with coarsened exact matching Model (4)
DD before (2000-2002) vs during (2003-2005) organisational changes				
ICT changes	-0,006 (0,009)	-0,006 (0,009)	-0,006 (0,009)	-0,004 (0,009)
Managerial changes	-0,025** (0,012)	-0,024** (0,012)	-0,025* (0,012)	-0,022** (0,011)
Both changes	0,053*** (0,018)	0,052*** (0,018)	0,053** (0,018)	0,051*** (0,017)
N / R ²	28 500 / 0,002	28 500 / 0,027	27 369 / 0,028	27 369 / 0,026
DD before (2000-2002) vs after (2006-2008) organisational changes				
ICT changes	-0,006 (0,011)	-0,003 (0,011)	-0,007 (0,011)	-0,014 (0,011)
Managerial changes	-0,006 (0,015)	-0,005 (0,015)	-0,007 (0,015)	-0,029** (0,015)
Both changes	-0,0004 (0,024)	-0,008 (0,023)	-0,007 (0,023)	0,025 (0,023)
N / R ²	16 049 / 0,001	16 049 / 0,026	16 049 / 0,028	15 275 / 0,028

Discussion of results (2)

- **There are gendered differences in the timing and strength of impacts**
 - Women are mainly impacted during the period when changes are implemented and impacts (positive and negative) are stronger
 - Men are impacted after the period of change
- **Possible explanations:**
 - Men have on average more voice than women in workplaces, they are better able to influence the content of changes and to adapt them to their needs. This effect goes partly through part time work which is negatively associated with voice
 - References: Green, 2012; Howel et al., 2015
 - we checked that gendered differences are not related to maternity leave as younger women are not more absent than older ones
 - Health behaviour of men and women differ: facing similar health problems, women are more likely to contact earlier their physician
 - Reference: Courtenay, 2000

Discussion of results (3)

- **There are gendered differences in the forms of change that are negatively associated with long term absence**
 - Women are positively impacted by managerial changes only. This impact is the only one that seems to persist and to become stronger after the period when the changes are implemented.
 - Men are positively impacted by ICT changes only and this impact is the only one that starts to show up during the period when the changes are implemented
- **Possible explanation :**
 - existence of a digital gender divide, men are in a better position than women to reap the benefits of new technologies.
 - Reference: Erickson et al., 2004
 - In search of an explanation for the positive impact of management changes...

Conclusion

- 1. Joint changes in ICT and managerial tools increase long term absence when changes in one dimension only tend to reduce it**
 - More intense and complex changes would generate a disequilibrium within the organisation which increases occupational risks
- 2. There are gendered differences in how changes impact long term absence**
 - Change impacts are stronger for women than for men and are more likely to occur during the period of change, when for men they are more likely to occur after the period of change
 - Managerial changes only reduce women's long term absence when ICT changes only reduce men's long term absence
 - Need to better understand the gendered construction of health behaviours as well as that of technology and managerial tools in devising occupational safety and health policies in contexts of organisational change

Selected tools

ICTs

1. Web site
2. Local area network
3. Intranet
4. Extranet
5. Electronic data interchange system
6. Database(s) on the management of human resources
7. Database(s) for R&D
8. Tools for data analysis
9. Tools for interfacing databases
10. Tools for automated data archiving
11. ERP
12. Software or firmware for the management of human resources
13. Software or firmware for R&D
14. Groupware
15. Workflow software

Management

1. Quality certification
2. Environmental and ethical certification
3. Methods of problems solving
4. Tools for labelling goods and services
5. Satisfaction surveys of customers
6. Management of production just in time
7. Tools for tracing goods and services
8. Contractual commitment to provide a product or a customer service within a limited time
9. Requirement for suppliers to meet tight deadlines
10. Long term relationships with suppliers
11. Call and contact Centres
12. Teams or autonomous work groups
13. Customer relationship management

Sample and descriptive statistics

Original population : 14620 individuals
in 4030 firms

TREATED

Individuals working for three consecutive years in a single firm with at least one significant organizational change.

5745 individuals (39,30%)
1368 changing firms (33,95%)

CONTROL

Individuals working for three consecutive years in a single firm with no significant organizational change.

8875 individuals (60.70%)
2662 inert firms (66.05%)

Individuals working with the same firm before the 2003-2005 treatment period

13054 individuals (89,29%)

Individus newly hired in the firm in 2003

1566 individus (10.71%)

Sample and descriptive statistics

Variables	All Firms	Changing Firms
Occurrence of Long term absence in 2005	5,72 %	5,55 %
women	32,9 %	33,6 %
≤35	29,5 %	38,2 %
[36-45]	33,2 %	38,3 %
[46-55]	29,0 %	19,8 %
≥56	8,3 %	3,7 %
Entry wage	5950 €	6080 €
chronic disease before 2003	4,56 %	4,21 %
ratio of long term absence before 2003	1 %	0,95 %
Managers and professionals	23,6 %	24,8 %
Technicians and associate professionals	16,1 %	17,5 %
Clerical, services and sales workers	12,8 %	13,2 %
Blue collar workers	36,1 %	34,7 %
Percentage of firms Size<20	6,2 %	3,5 %
[20-50[21,0 %	15,3 %
[50,249[38,5 %	38,4 %
[250,499[15,6 %	18,6 %
>500	18,7 %	24,2%
ICT Changes (CC)		20,0 %
Management Changes (MC)		10,9 %
Both types of Changes (CC&MC)		8,4 %

Selection of workers in changing firms

- The selection of employees who stay in changing firms is treated by comparing them to employees in inert firms with highly comparable profiles in terms of ...
 - labour market history
 - health history
 - individual characteristics
- We match the treated and control individuals using the Coarsened exact matching method proposed by Iacus, King and Porro (2008)
 - The rate of matching between treated and control individuals is very high, superior to 90%
 - Matching involves pruning observations that have no close matches on pre-treatment covariates in both the treated and control groups
 - This matching allows to assume the choice of working in changing firms as random
- Once the coarsened exact matching algorithm is completed, we use the output from it and run estimation of the sample average treatment effect for the treated using classic difference in differences estimator.