

Workplace smoking ban effects in an heterogenous smoking population

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Workshop IRDES

June 2010

The 2010 IRDES Workshop on Applied Health Economics and Policy Evaluation
24-25 June 2010 - Paris - France

www.irdes.fr/Workshop2010

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Voluntary bans & smoking: correlation or causality ?

- Along positive effects on passive smoking, workplace smoking bans credited for a drop in smoking prevalence. Meta-analysis found that they reduce smoking prevalence by 3.8 percentage points (Fichtenberg and Glantz, 2002).
- But those studies consider only voluntary bans i.e. bans voluntarily implemented in one workplace but not in others.
- => endogeneity issues:
 - simple **political economy** considerations suggest that bans are most likely to be passed in workplaces with a small proportion of smokers.
 - **assortative matching** between firms and workers.
- Some attempts to circumvent such issues. Evans et al. (1999) use company size as an IV for smoking ban. However, exogeneity of their instrument is questionable: employees in larger firms differ from those in smaller ones.

Mixed evidence from compulsory bans studies

- Compulsory ban (i.e. ban imposed legally) is exogenous, insofar as it is not anticipated and that firm compliance to the regulatory change is high.
- Recent meta-analysis (Callinan et al., 2010) included 15 studies considering the impact of legislative bans on smoking. Mixed evidence: 9 studies found a significantly negative impact of the ban either on smoking prevalence, daily cigarettes smoked or quit attempts. 6 studies found no impact.
- However, most of them suffer from various limitations:
 - Majority of these studies considered comprehensive bans (bans in all public places) => impossible to attribute what is specifically due to the workplace ban.
 - All of them are before-after studies but few had a control group, and few controlled for pre-existing temporal trends in smoking prevalence.

The French workplace smoking ban

- 1991-1992: loi Evin. Employers must ban smoking from collective areas (meeting rooms...) & set up some specific areas where smoking is allowed. Law frequently violated especially by heavy smokers (Health Barometer 1995-1996).
- 15th of November 2006: décret Bertrand promulgated. Employers must ban smoking from all areas in workplaces, and no longer obliged to set up specific areas where smoking is allowed. If they want to do so, those areas must respect several restrictive criteria (automatically closing doors...) => costly to implement. Applicable since 1st of February 2007.
- French workplace smoking ban = natural experiment. Clear cutoff date and a natural control group (the non working population), which remained unaffected by the law => difference in differences (DID) estimation strategy.

Did the ban change something ?

- % of workers working in a smoke free environment rose from 44% to 82% between January and June 2007:

% of workers working in a smoke free environment

	All patients	P-value (N vs. N-1)	Office work	P-value (N vs. N-1)	Health sector	P-value (N vs. N-1)	Other type of job	P-value (N vs. N-1)
January 2007	44.4%		54.4%		46.2%		35.2%	
February 2007	73.0%	0.00	78.6%	0.00	71.8%	0.00	67.0%	0.00
March 2007	81.5%	0.00	87.6%	0.00	84.1%	0.00	75.5%	0.00
April 2007	80.8%	0.73	87.7%	0.48	85.9%	0.31	73.4%	0.87
May 2007	81.6%	0.26	89.5%	0.13	87.1%	0.28	74.3%	0.33
June 2007	81.7%	0.48	89.6%	0.46	88.7%	0.34	73.6%	0.63
N	12810		5432		1018		6199	

- % already high in January 2007. Firms implemented the ban between November and January 2007, or a long time ago ? No data available to answer this question.

Heterogenous impacts of the ban in an heterogenous population of smokers

- General population survey analysis (ESPS survey): the French ban had no impact on overall smoking prevalence.
- We also investigate the impact of the ban in a specific subset of the French population of smokers: those consulting cessation services (hardcore addicts: 37% of them suffer from tobacco related diseases and they smoke 21 cigarettes per day on average).
- Strong impact: the ban increased the number of patients consulting those centers by 30% and the rate of successful quits by 18%.

The French ban had no impact on overall smoking prevalence

Data

- 6 waves (1998 to 2008) of ESPS survey carried out every two years by IRDES, focusing on 2006 and 2008 waves.
- Each wave = 8 000 households (~ 22 000 individuals) randomly drawn from administrative files of the main sickness funds to which over 90% of the population living in France belong (Allonier et al., 2008).
- 42 084 individuals interviewed in 2006 and 2008. Sample selection:

	Nb. of respondents
Initial sample	42 084
Observations withdrawn	
<i>Missing values</i>	
Below 16 years old	8 459
Did not send back their preliminary questionnaire	8 595
Did not answer the smoking status question	1 106
<i>Construction of treatment and control groups</i>	
Employed respondents on leave	522
Employed respondents likely to work outdoor	5 490
Employed respondents working less than 20 hours per week	590
Non-employed respondents who stopped working less than one year before the survey	769
Final sample	16 553

The French ban had no impact on overall smoking prevalence

Descriptive statistics

Descriptive statistics ESPS 2006-2008

	Whole sample		Employed respondents			Retired respondents			DID: 2006 vs. 2008 & employed vs. retired		
	(1)		(2)			(3)			DID	P-value	
	2006	2008	P-value	2006	2008	P-value	2006	2008			P-value
<i>Socio demographic profile</i>											
% males	44.1%	43.6%	0.50	43.8%	42.6%	0.31	51.7%	50.9%	0.51	-0.3%	0.81
Age	48.3	49.8	0.00	40.7	41.5	0.00	70.5	70.5	0.93	0.75	0.06
% with higher education	34.7%	29.4%	0.00	54.0%	52.0%	0.10	13.3%	13.5%	0.82	-2.2%	0.19
Income per consumption unit (def OCDE)	1523€	1604€	0.00	1784€	1845€	0.00	1425€	1554€	0.00	-68€	0.06
% of households who own their homes	22.1%	21.8%	0.62	36.4%	36.4%	0.94	5.1%	4.9%	0.76	0.3%	0.86
% married	56.3%	57.4%	0.15	62.4%	62.3%	0.90	72.9%	71.7%	0.30	1.1%	0.56
<i>Employment status</i>											
Employed	41.2%	40.8%	0.60								
Retired	31.0%	34.7%	0.00								
Unemployed	4.2%	3.5%	0.03								
Inactive	9.8%	8.7%	0.01								
Student	13.8%	12.3%	0.00								
N	8504	8049		3502	3282		2634	2792			

- More retired and less students in the non employed group in 2008.
- Placebo DID on observable characteristics validate our DID approach.

The French ban had no impact on overall smoking prevalence

DID on % smoking and daily cigarettes smoked

Control group: non working respondents								
Smoking Status				Daily Cigarettes smoked				
No Controls		Controls ¹		No Controls		Controls ¹		
(1)		(2)		(3)		(4)		
Coeff.	P-value ²	Coeff.	P-value ²	Coeff.	P-value ²	Coeff.	P-value ²	
Diff-in-Diff	0.028*	0.04	0.022	0.10	-0.425	0.47	-0.515	0.35
R-squared	0.020		0.104		0.001		0.128	
N	16553		16546		3285		3284	

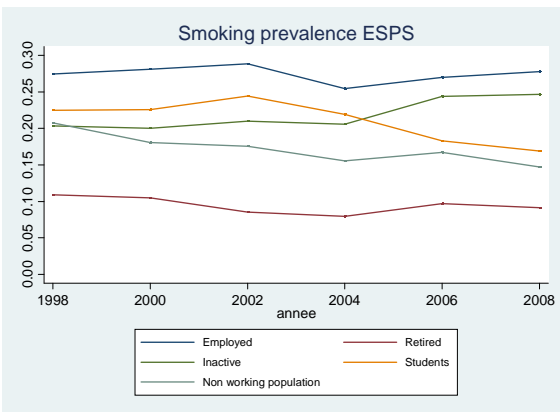
Control group: retired respondents								
Smoking Status				Daily Cigarettes smoked				
No Controls		Controls ¹		No Controls		Controls ¹		
(5)		(6)		(7)		(8)		
Coeff.	P-value ²	Coeff.	P-value ²	Coeff.	P-value ²	Coeff.	P-value ²	
Diff-in-Diff	0.014	0.34	0.014	0.31	-1.146	0.22	-1.262	0.16
R-squared	0.051		0.104		0.007		0.100	
N	12210		12205		2288		2287	

Control group: inactive respondents								
Smoking Status				Daily Cigarettes smoked				
No Controls		Controls ¹		No Controls		Controls ¹		
(9)		(10)		(11)		(12)		
Coeff.	P-value ²	Coeff.	P-value ²	Coeff.	P-value ²	Coeff.	P-value ²	
Diff-in-Diff	0.005	0.85	0.015	0.52	0.487	0.61	0.633	0.53
R-squared	0.001		0.076		0.026		0.113	
N	8322		8317		2181		2180	

Control group: students respondents								
Smoking Status				Daily Cigarettes smoked				
No Controls		Controls ¹		No Controls		Controls ¹		
(13)		(14)		(15)		(16)		
Coeff.	P-value ²	Coeff.	P-value ²	Coeff.	P-value ²	Coeff.	P-value ²	
Diff-in-Diff	0.022	0.28	0.031	0.12	-0.507	0.42	-0.107	0.87
R-squared	0.009		0.063		0.037		0.126	
N	8948		8941		2191		2190	

The French ban had no impact on overall smoking prevalence

The common trend assumption



- Graphical impression confirmed statistically: trends in smoking prevalence previous to the ban = more or less the same (only 1 placebo DID / 16 is significant).

Are estimates from the “voluntary ban” literature biased ?

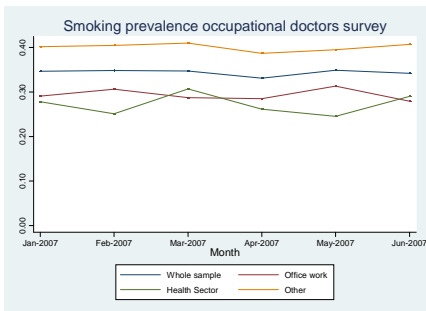
Data

- We use a data set collected by 148 French occupational health doctors under the coordination of the French Office for the Prevention of Tobacco (OFT).
- From January to June 2007, doctors asked the 20 first patients they consulted each month to fill in a short questionnaire:
 - smoking banned in their workplace ?
 - current smoking status
 - age, sex and a rough classification of their occupation in five categories was also collected
- Sample of 12 810 patients.

Are estimates from the “voluntary ban” literature biased ?

Results

- 44% of employees already working in a smoke free environment in Jan 2007. Jan 2007 bans = “voluntary” (legal cut-off date anticipated by at least one month). In January 2007, smoking prevalence = 11.9 points lower in firms with a ban than in firms without a ban (P-value=0.00).
- From January to June 2007, 37.3 points increase in the percentage of employees working in a smoke free environment. Should result in a $0.373 \times 0.119 = 4.4$ percentage points decrease in smoking prevalence.
- This is not what happened => “voluntary ban” estimates are biased.



The CDT program

- Data base of French cessation services which participate in the “Consultation Dépendance Tabagique” program (referred to as CDT)
- During patients' first visit, smoking status evaluated according to:
 - daily cigarettes smoked
 - Fagerström Test for Nicotine Dependence [FTND]
 - Expired carbon monoxide (CO) which is a biomarker for tobacco use.
- Hospital Anxiety Depression (HAD) scale, scored from 0 to 21, is used to identify individuals with anxio-depressive disorders, with a threshold score of 11 (Zigmond and Snaith, 1983).
- At the end of this first visit, treatments may be prescribed to the patient (nicotine replacement therapies, bupropion, varenicline, cognitive and behavioral therapies. . .).
- Follow-up visits are offered. Supplementary CO measures are usually made during those follow-up visits to validate tobacco abstinence.

CDT patients are hardcore addicts

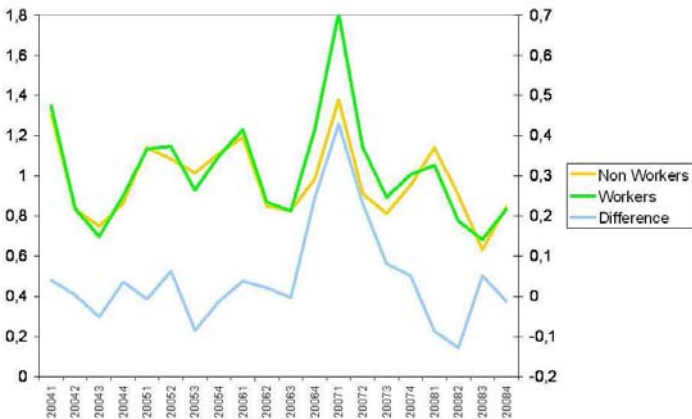
	Whole sample			Selected sample ⁴		
	Not Employed	Employed	P-value	Not Employed	Employed	P-value
% Males	45%	45%	0.72	47%	44%	0.03
Age	43.94	40.95	0.00	48.16	41.85	0.00
% with no degree	24%	12%	0.00	22%	11%	0.00
Daily cigarettes smoked	22.06	20.95	0.00	22.57	21.10	0.00
FTND ¹	6.02	5.66	0.00	6.16	5.80	0.00
% with AHAD ² >=11	45%	38%	0.00	46%	40%	0.00
% with DHAD ³ >=11	17%	9%	0.00	18%	9%	0.00
% employed	0%	100%	.	0%	100%	.
<i>N</i>	6490	13778		1479	3389	

Data and methods

- Time series analysis of the number of new patients recorded in the data base per month from January 2004 to December 2008.
- 29 services included in the analysis (criterion: continuous participation to the program over the period, to avoid that fluctuations in attendance are due to opening or closing of new centers).
- Dependant variable is $Z_t = \frac{Y_t}{\bar{Y}} - \frac{X_t}{\bar{X}}$ where X_t = number of new non employed patients consulting a cessation center in month t , Y_t = corresponding figure for employed patients, \bar{X} and \bar{Y} are the corresponding averages (normalizers).
- Regression: $Z_t = \alpha + \beta 1_{\{t \in Ban\}} + \varepsilon_t$, where $1_{\{t \in Ban\}}$ is a dummy variable equal to 1 from October 2006 to June 2007 (around the period of the ban).
- $\Rightarrow \beta$ is a measure of the percentage by which Y_t departed of its average level over the period of the ban with respect minus the same percentage for X_t .

Impact of the ban on cessation attempts

Graphical results



Regression results

- Regression results: $\hat{\beta} = 0.3$, P-value = 0.00. \Rightarrow the ban entailed a rise by 30% in the number of new patients attending those services from October 2006 to June 2007.
- We split our sample of 29 centers into two groups depending on whether average temperatures (resp. rainfalls) from October 2006 to June 2007 = below or above the mean in the sample. We construct two series: Z_t^{High} and Z_t^{Low} run the same regression than above.
- Temperatures: $\hat{\beta}^{High} = 0.24$ and $\hat{\beta}^{Low} = 0.59$. \Rightarrow in cold areas, the ban entailed a rise in centers attendance of 59% against only 24% in warmer areas. Difference = marginally insignificant (P-value = 0.06).
- Rainfalls: $\hat{\beta}^{High} = 0.53$ and $\hat{\beta}^{Low} = 0.32$. \Rightarrow in rainy areas, the ban entailed a rise in centers attendance of 53% against only 32% in warmer areas. However, difference = insignificant (P-value = 0.28).
- Two results above consistent with a rough cost benefit analysis of the consequences of the ban for smokers.

Data and methods

- We base smoking status assessment on CO measures made during follow-up visits. Hence the selection process described below.

	Nb. of respondents
Initial sample	20 168
Observations withdrawn	
No follow-up visit	9 021
No follow-up visit more than 57 days after the first visit	5 388
No follow-up visit less than 365 days after the first visit	8 595
No CO measure made during follow-up visits	279
	612
Final sample	4 868

- Cessation = 1 if last CO measure made during follow-up visits below 5 ppm (standard in the literature).
- Methods: DID on cessation rate. Period 0 = August 2005-January 2007. Period 1 = February 2007-August 2008. Treatment group: employed patients. Control group: non employed patients.

Impact of the ban on the rate of successful quits

Smoking ban increased the rate of successful quits by 18%

	Without controls (1)	P-value	With controls ¹ (2)	P-value	Selection & controls ¹ (3)	P-value
DID ²	0.099*	0.03	0.090*	0.04	0.091*	0.04
R-squared	0.013		0.184			
N ³	2215		2149		8007	

- DID without controls = +9.9 percentage points.
- According to the DID regression without controls, cessation rate would have been equal to 54% without the ban.
- => +9.9 pp represents an 18% increase in cessation rates.

Common trend assumption

- To “test” the common trend assumption, we compute 3 placebo DID (2004-2005, 2005-2006 and 2007-2008).
- None is significant => gives some credit to our identification strategy.

	Diff in diff	P-value	N
2004-2005	0.001	0.99	1849
2005-2006	-0.061	0.19	2070
2006-2007	0.099**	0.03	2215
2007-2008	0.030	0.54	1990

Summary of results

- No impact of the ban on French prevalence rate.
- “Voluntary bans” analysis probably biased due to endogeneity / reverse causality issues.
- Strong impact of the ban among a population of hardcore addicts: increased the number of cessation attempts by 30% and the rate of successful quits by 18%.

Contradictory findings ?

- Bernheim-Rangel (2004) model of cue-triggered mistakes.
- Main consequence of a workplace smoking ban is to reduce the amount of environmental cues to which smokers are faced while at work.
- This results in a drop in the probability of entering what Bernheim and Rangel refer to as “the hot mode”, a psychological mode into which an addict systematically smokes even though, had she been in “the cold mode”, she would have chosen not to smoke.
- Bernheim Rangel proposition 2: such a drop, which corresponds to a decrease in the addictiveness of cigarettes, has opposite effects among weakly addicted smokers and hardcore addicts:
 - it encourages use among new users since cigarettes appear more innocuous.
 - it encourages hardcore addicts to make cessation attempts: because of the drop in cigarettes' addictiveness, such attempts are no longer bound to fail.