Partial bans on smoking in public places fail, only a total tobacco ban work: inferring the causal impact on cigarette sales using an interrupted time series analysis

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Content

2004

TC ONLINE

The Tobacco Control Scale: a new scale to measure country activity

L Joossens and M Raw

Tob. Control 2006;15;247-253
doi:10.1136/tc.2005.015347

Table 4 European countries ranked by total Tobacco Control Scale score

Country	Price (30)	Public place bans (22)	Public info campaign spending (15)	Advertising bans (13)	Health warnings (10)	Treatment (10)	Total (100)
Ireland	23	21	3	12	6	9	74
UK	30	1	15	11	6	10	73
Norway	26	17	5	13	6	4	71
Iceland	25	11	13	13	6	2	70
Malta	19	17	3	9	7	7	62
Sweden	19	15	2	13	6	5	60
Finland	18	12	1	13	7	7	58
Italy	16	17	2	10	6	6	57
France	23	6	4	11	6	6	56
Netherlands	16	9	4	12	6	5	52
Cyprus	21	6	1	12	6	5	51
Poland	16	10	0	12	6	6	50
Belgium	16	8	2	12	7	5	50
Slovakia	18	8	0	11	6	6	49
Hungary	17	6	1	10	6	7	47
Bulgaria *	19	6	0	9	6	6	46
Estonia	14	9	2	11	1	8	45
Denmark	17	3	2	10	6	7	45
Portugal	17	5	–	10	6	1	39
Greece	17	7	0	4	6	4	38
Czech Republic	12	6	0	9	6	5	38
Germany	20	2	0	4	6	4	36
Slovenia	13	6	0	7	6	4	36
Switzerland	15	5	4	4	3	4	35
Lithuania	11	6	1	9	6	1	34
Spain	12	3	3	3	6	4	31
Austria	14	4	0	4	6	3	31
Latvia	9	6	1	6	6	1	29
Romania*	13	6	0	0	3	5	27
Luxembourg	7	4	0	5	7	3	26

Bold countries are EU members; *accepted to join EU; other, non-EU; – no data. The 10 countries which joined the EU in 2004 are: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia.

Year	Price (30)	Public place bans (22)	Public info campaign spending (15)	Advertising Bans (13)	Health warnings (10)	Treatment (10)	Total (100)	Ranking EU-30
2004	12	3	3	3	6	4	31	26
2007*	12	15	5	12	6	5	55	12

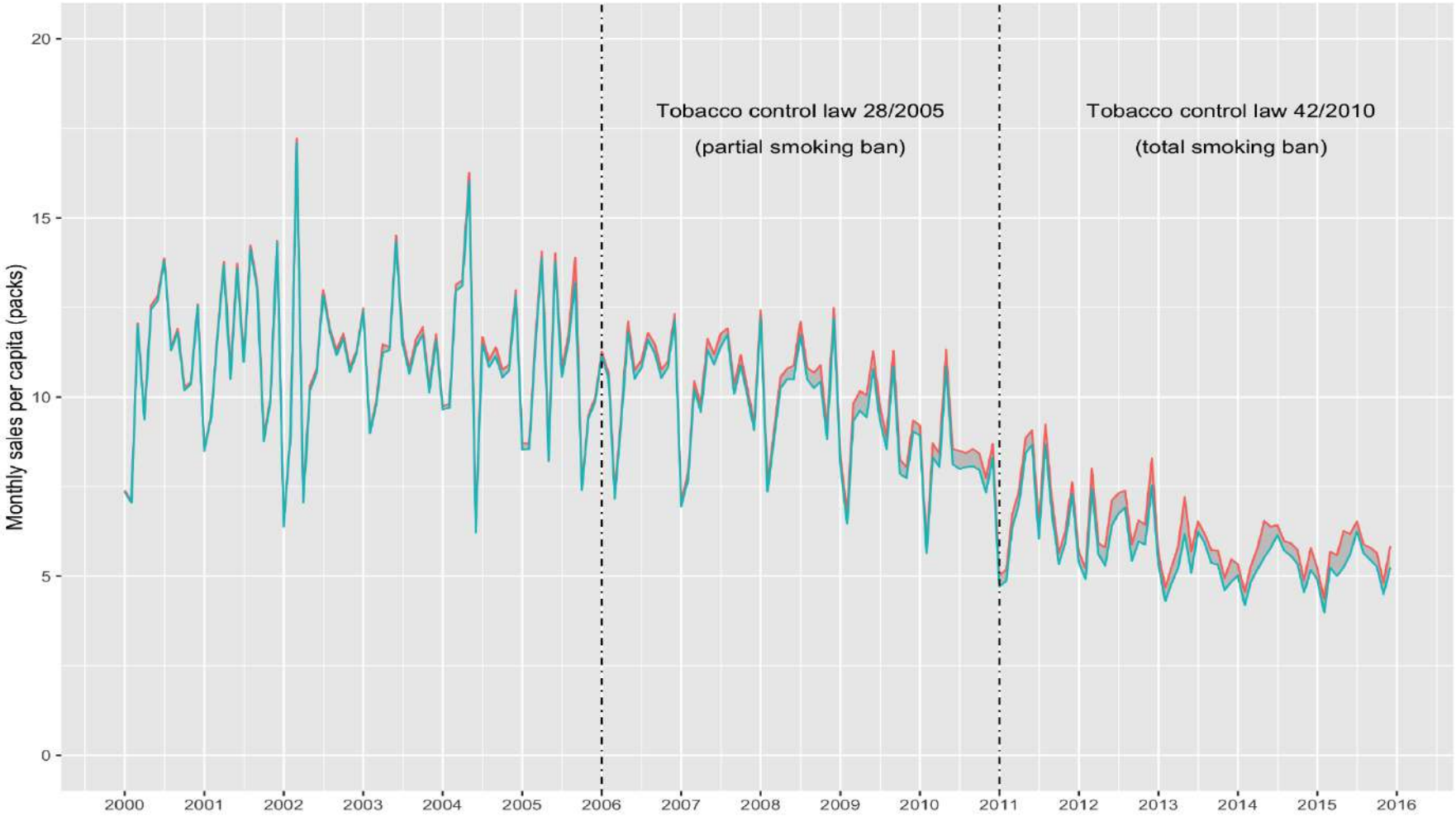
*On January 1st, 2006, Spain introduced its first national, comprehensive smoke-free legislation, law 28/2005;

The law banned smoking in all public and work places, with **some exceptions** in hospitality venues (no ban in premises measuring less than 100 m^2, and "smoking areas" allowed in larger ones). This approach became known as the **"Spanish Model".**

Year	Price (30)	Public place bans (22)	Public info campaign spending (15)	Advertising Bans (13)	Health warnings (10)	Treatment (10)	Total (100)	Ranking EU-30
2004	12	3	3	3	6	4	31	26
2007	12	15	5	12	6	5	55	12
2010	14	15	1	9	3	4	46	13
2013*	15	21	1	9	4	6	56	7

Five years later, on January 2nd 2011, the law 28/2005 was substantially amended by law 42/2010, which mandated a* **total ban *on smoking in indoor public places, indoor workplaces and public places.*

- *Official sales of tobacco in Spain published by the Tobacco market Commission and Spanish Tax Agency;*
- *Monthly series of per-capita manufactured cigarettes and hand rolling tobacco sales (packs), from Jan. 2000 to Dec. 2015 (mainland and Balearic Islands);*
- *We use the sum of both types of tobacco products. A 30 gr of hand rolling tobacco was considered as the equivalent of one pack of 20 cigarettes.*


Tobacco control law 28/2005
(partial smoking ban)
Tobacco control law 42/2010
(total smoking ban)
Monthly sales per capita (packs)
0
5
10
15
20
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016

- *Outcome variable*
  Log-transformed monthly per-capita cigarette sales in packs.

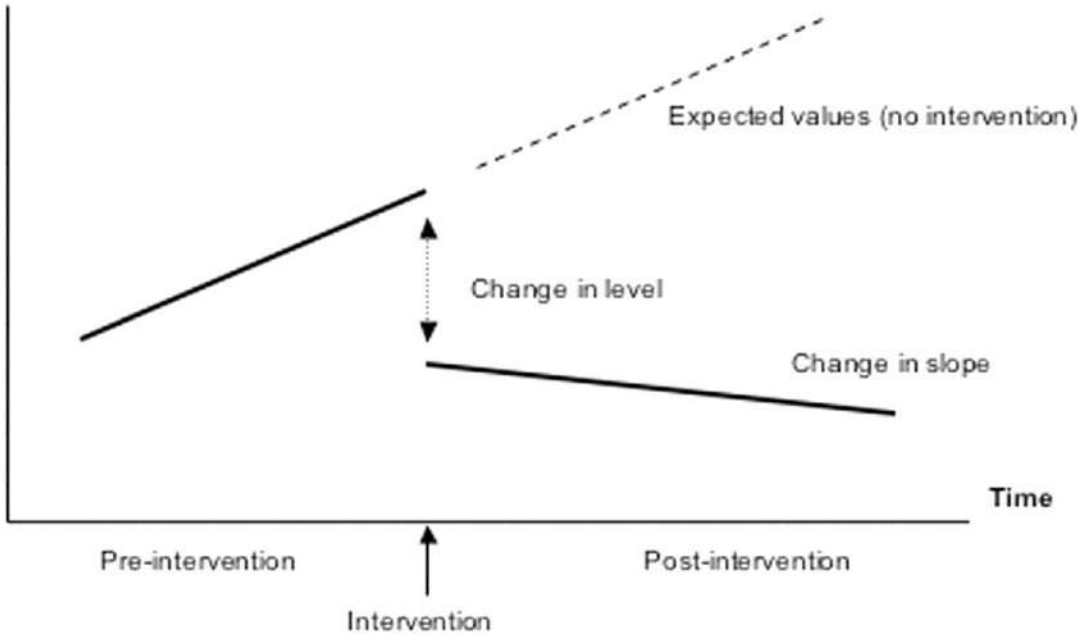
- *Potential confounders*
  - *Average minimum excise tax for manufactured and HR cigarettes.*
  - *Log-transformed household disposable income at 2000 prices*

- *Time variables*
  - *The two interventions are coded as dummies equal to 0 pre-law and 1 post-law each one.*
  - *Time trend was measured throughout the study period.*
  - *To control for seasonality, month-of-year effects, a dummy for each month within the year 'calendar month' was created, leaving January as reference.*

Interrupted time series analysis (ITSA)

ITSA is maybe the strongest quasi-experimental design to assess the impact of an intervention when a randomized controlled trial is not feasible.

In an ITSA a time series of a particular outcome of interest is used to establish an underlying secular trend, which is interrupted by an intervention at a known point in time.



Interrupted time series analysis (ITSA)

There are two general approaches historically used in ITSA:

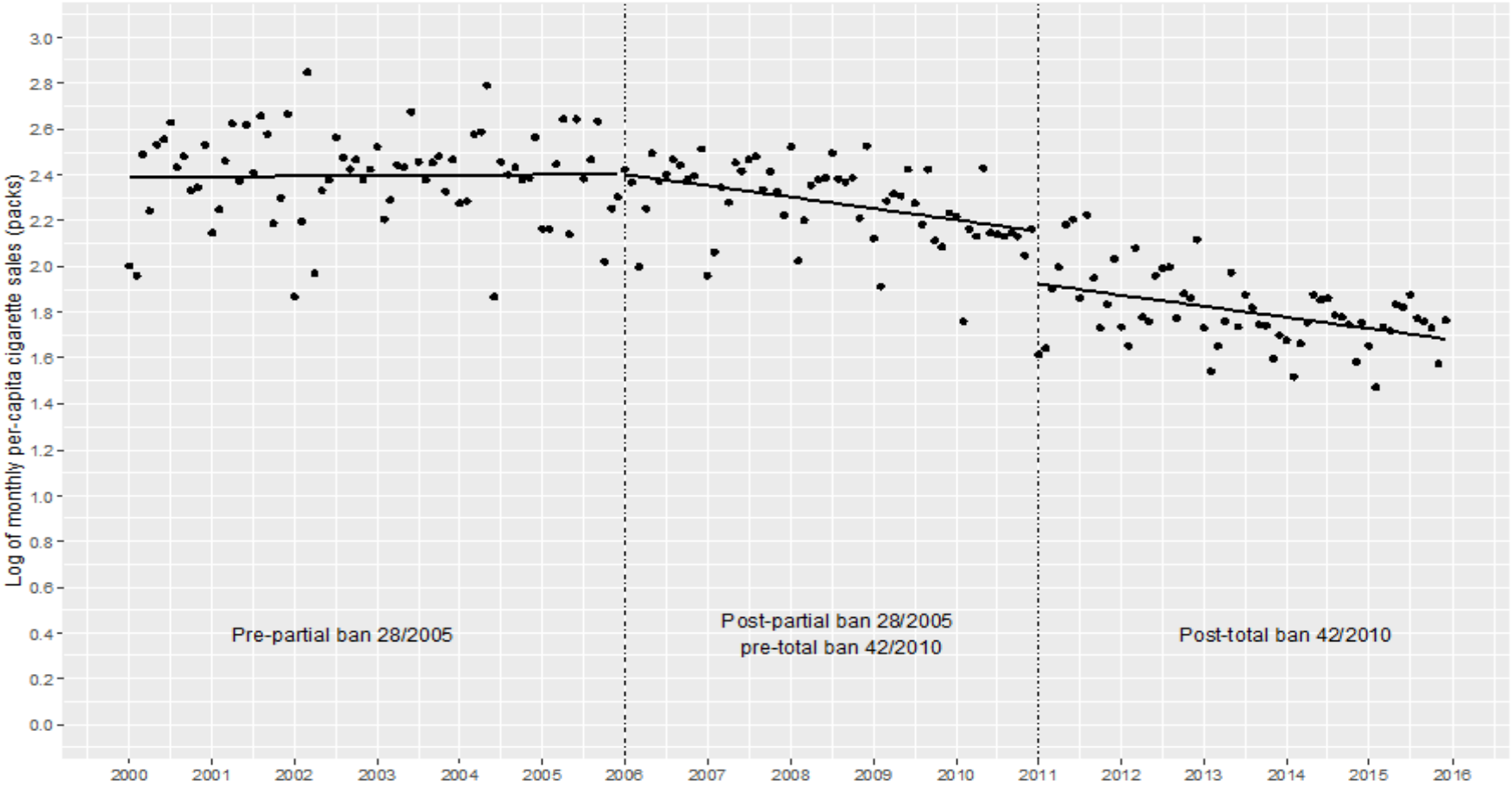
- *Autoregressive integrated moving-average (ARIMA) models*
- *Linear regression models designed to adjust for auto-correlation*

Our paper relies on Prais-Winsten regression using the generalized least-squares method to estimate the parameters in a linear model in which the errors are serially correlated.

$$Y_t = \beta_0 + \beta_1 T_t + \beta_2 X_{28/05} + \beta_3 X_{28/05} T_t + \beta_4 X_{42/10} + \beta_5 X_{42/10} T_t + \beta_k Z_t + \epsilon_t$$

$$\epsilon_t = \rho \epsilon_{t-1} + u_t \qquad |\rho| \leq 1$$

Observed and unadjusted model fitted trend of log per-capita cigarette sales. Prais-Winsten regression



Adjusted model	Coefficient	Semi-robust Std. Err.	[95% Conf. Interval (CI)]
T	-0.0049*	0.0021	-0.0091; -0.0006
$X_{28/05}$	0.1396	0.0819	-0.0219; 0.3012
$X_{28/05}$.T	-0.0012	0.0020	-0.0027; 0.0051
$X_{42/10}$	-0.0941*	0.0436	-0.1802; -0.0081
$X_{42/10}$.T	0.0018	0.0014	-0.0010; 0.0045
January (Ref.)			
February	-0.0876	0.0652	-0.2163; 0.0412
March	0.1740**	0.0648	0.0462; 0.3018
April	0.1597*	0.0633	0.0348; 0.2846
May	0.2532**	0.0643	0.1263; 0.3801
June	0.2461**	0.0658	0.1163; 0.3758
July	0.2597**	0.0532	0.1547; 0.3646
August	0.2583**	0.0530	0.1540; 0.3626
September	0.2407**	0.0527	0.1367; 0.3447
October	0.1440*	0.0559	0.0337; 0.2543
November	0.1122*	0.0516	0.0104; 0.2141
December	0.2748**	0.0598	0.1567; 0.3928
MET[(a)]	-0.1615**	0.0526	-0.2654; -0.0577
Log(HDI)[(b)]	1.0733*	0.4611	0.1631; 1.9835
Intercept	-7.6534	4.2392	-16.021; 0.7137
Rh	-0.1999		
Post-intervention linear trends			
T+$X_{28/05}$.T	-0.0037**	0.0013	-0.0062;-0.0012
T+$X_{28/05}$.T+$X_{42/10}$.T	-0.0020**	0.0009	-0.0037;-0.0002
Nº observation = 192			
F (18,173)=158.26	Prob>F= 0.0000		
R-squared= 0.87			
* Statistical significance at 5% level, and ** at 1% level			

The implementation of a total smoke-free law in Spain was associated with an immediate step change in cigarette sales, indicating that the total removal of exposure to tobacco smoke was effective in the quitting process of the smoking population. In contrast, in period immediately following the partial ban intervention, law 28/2005, no cigarette sales reductions were detected, beyond the gradual trends effects. Our results indicate that, in Spain, partial bans on smoking in public places fail, only a total tobacco ban works.

Some references

- *World Health Organization. WHO report on the global tobacco epidemic, 2015: Raising taxes on tobacco—Executive summary. Available online: http://apps.who.int/iris/bitstream/10665/178577/1/WHO_NMH_PND_15.5_eng.pdf?ua=1&ua=1&ua=1, accessed on Jul 28, 2015.*
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