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# Tobacco control campaign in Uruguay: Impact on smoking cessation during pregnancy and birth weight

Jeffrey E. Harris[a,*], Ana Inés Balsa[b], Patricia Triunfo[c]

[a] Department of Economics, Massachusetts Institute of Technology, Cambridge, MA 02139, USA
[b] Departamento de Economía, Facultad de Ciencias Empresariales y Economía, Universidad de Montevideo, Montevideo 11500, Uruguay
[c] Departamento de Economía, Facultad de Ciencias Sociales, Universidad de la República, Montevideo 11200, Uruguay

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ABSTRACT

We analyzed a nationwide registry of all pregnancies in Uruguay during 2007–2013 to assess the impact of three types of tobacco control policies: (1) provider-level interventions aimed at the treatment of nicotine dependence, (2) national-level increases in cigarette taxes, and (3) national-level non-price regulation of cigarette packaging and marketing. We estimated models of smoking cessation during pregnancy at the individual, provider and national levels. The rate of smoking cessation during pregnancy increased from 15.4% in 2007 to 42.7% in 2013. National-level non-price policies had the largest estimated impact on cessation. The price response of the tobacco industry attenuated the effects of tax increases. While provider-level interventions had a significant effect, they were adopted by relatively few health centers. Quitting during pregnancy increased birth weight by an estimated 188 g. Tobacco control measures had no effect on the birth weight of newborns of non-smoking women.



## 1. Introduction

The tobacco epidemic continues to represent a serious public health threat throughout the world. By one recent estimate, the worldwide annual mortality burden has already reached 5 million deaths from direct tobacco smoking and another 600,000 deaths attributable to the effects of environmental smoke (World Health Organization, 2012). Within the next 20 years, annual deaths from tobacco are projected to continue to rise to 8 million, of which more than 80% will occur in low- and middle-income countries (Mathers et al., 2008).

Beginning in 2005, Uruguay instituted a series of aggressive anti-smoking measures that placed this small South American country of 3.3 million inhabitants in the forefront of tobacco control policy worldwide. By 2012, the Uruguayan government had prohibited smoking in enclosed public spaces and workspaces, banned nearly all advertising and promotion of tobacco products, mandated that pictograms with warnings cover 80% of the front and back of every pack, banned misleading marketing terms such as "light" and "mild," and outlawed multiple versions of the same brand such as Silver or Blue. Tobacco taxes were increased, and all healthcare providers were required to offer treatment for nicotine dependence.

In a previous report, two of us (JH and PT) found that Uruguay's comprehensive nationwide antismoking campaign was associated with a substantial, unprecedented decrease in tobacco use (Abascal et al., 2012). During 2005–2011, per capita cigarette consumption decreased by 4.3% per year, while the 30-day prevalence of cigarette use among students aged 13–17 years and the overall population prevalence of current tobacco use declined at annual rates of 8.0% and 3.3%, respectively. The observed declines in each of these three indicators of tobacco use were significantly larger than those seen in neighboring Argentina, a culturally similar country that had not conducted a comprehensive antismoking campaign and served as a control.

While our previous study contributed to the evaluation of the overall impact of Uruguay's tobacco control campaign, it did

* Corresponding author. Tel.: +1 617 253 2677; fax: +1 617 253 6915.
*E-mail addresses:* jeffrey@mit.edu (J.E. Harris), abalsa@um.edu.uy (A.I. Balsa), patricia.triunfo@cienciassociales.edu.uy (P. Triunfo).

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not address the quantitative contributions of individual campaign components. Pursuing that objective here, we classify the interventions implemented in Uruguay during 2007–2013 into three categories: (1) provider-level interventions aimed at the treatment of nicotine dependence, (2) national-level increases in cigarette taxes, and (3) national-level non-price regulation of cigarette packaging and marketing. We study the effects of these individual campaign components on a critical target population – pregnant women.

Studying the population of pregnant women is important not only for the well-recognized adverse health consequences of smoking during pregnancy (Permutt and Hebel, 1989; da Veiga and Wilder, 2008; McCowan et al., 2009), but also for the narrow nine-month window during which pregnant women have heightened susceptibility to health-related interventions. We take advantage of a continuous nationwide registry of all live pregnancies from 2007 to 2013 to study the effects of the campaign on two main outcomes: the probability that a pregnant smoker will quit smoking by her third trimester and her infant's birth weight.

To identify the effect of the provider-level interventions, we use a difference-in-differences (DID) approach, exploiting the fact that these policies were implemented at different health centers at different times. To assess the effect of taxes, we rely upon a series of discrete tax increases during our study period. Finally, to assess the effects of non-price regulation of packaging and marketing, we take advantage of the fact that these nationwide measures went into effect at different times. As an additional control, we compare the effect of these interventions on the birth weight of children whose mothers smoked during pregnancy with the corresponding effect, if any, on the offspring of mothers who did not smoke.

Our study contributes to an extensive literature evaluating the impact of such tobacco control policies as tax increases, control of environmental tobacco smoke, cigarette pack warnings, restrictions on cigarette marketing, regulation of tobacco constituents, mass media anti-smoking campaigns, and the treatment of addiction (Saffer and Chaloupka, 2000; Wakefield and Chaloupka, 2000; Powell et al., 2005; Blecher, 2008; Carpenter and Cook, 2008; DeCicca et al., 2008; Anger et al., 2011; Hammond, 2011; Hoek et al., 2011; Chaloupka et al., 2012; Emery et al., 2012; Mons et al., 2013). Our work is distinguishable in that we exploit an extensive micro database to evaluate the relative impacts of multiple types of interventions in the context of a nationwide tobacco control campaign conducted in a developing country.

We find persuasive evidence on the impact of each of the three policy categories analyzed – provider-level interventions, taxes, and non-price policies – on the likelihood of quitting smoking during pregnancy and on birth weight. In terms of the relative contributions of each of these policies to the observed increase in quit rates, the regulation of marketing and packaging had the strongest effect, accounting for 71% of the total observed variation in quit rates during 2007–2013. While interventions to treat nicotine dependence had a strong effect at the level of the individual provider, relatively few prenatal care centers adopted these interventions during the study period, thus contributing little to the overall increase in the quit rate. Tax increases, on the other hand, explained an estimated 25% of the variation in quit rates during 2007–2013. While real taxes increased 122% during that time, the tobacco-industry passed on only a fraction of the tax increases to consumers, so that real cigarette price increased by only 17%. Finally, we find that smoking cessation was associated with a significant increase in birth weight. By contrast, the tobacco control policies under study had no effect on the birth weight of offspring of mothers who did not smoke.

## 2. Background and data

### 2.1. Nationwide anti-smoking policies

In 2005, one year after the legislature had ratified the Framework Convention on Tobacco Control, Uruguay's newly elected administration launched a National Program for Tobacco Control that formed the basis for a succession of progressively more stringent tobacco control policies (Abascal et al., 2012). In March 2006, all enclosed public spaces and all public and private workspaces were declared 100% smoke-free. In June 2008, the scope of tobacco-free spaces was extended to taxis, buses, airplanes and other public transport.

These curbs on environmental tobacco smoke were paralleled by a series of advertising restrictions on tobacco products. In May 2005 the government banned cigarette advertising on television during children's viewing hours (before 9:30 pm) and prohibited advertising, promotion or sponsorship by tobacco companies of all sporting events. These restrictions were subsequently codified in March 2008, when comprehensive tobacco control legislation (Law 18.256) prohibited all advertising and promotion of tobacco products except at point of sale. In October 2008, logos, trademarks and other tobacco-related symbols were banned on non-tobacco products. In May 2014, all advertising was prohibited, even at the point of sale.

In addition, the Uruguayan government promulgated warning requirements on cigarette packages and imposed restrictions on manufacturers' branding practices. A May 2005 ministerial decree banned all references to "light," "ultra light," "mild," "low tar" and other descriptors that might misleadingly imply reduced harm. The decree also mandated a series of rotating warnings with images covering 50% of the front and back of each cigarette pack. The deadline for compliance with the first round of these rotating warnings was April 2006. Subsequent rounds had respective deadlines of December 2007, February 2009, February 2010, January 2012, and April 2013. A "single presentation rule," issued as a ministerial decree along with the third round of warnings, barred the marketing of multiple versions of the same brand, such as Silver or Blue. Finally, a 2009 decree mandated that the size of the warnings be increased to 80% of the front and back of each pack. This requirement was implemented with the fourth round of warnings and became effective by February 2010.[1]

Fig. 1 shows a timeline summarizing the major nationwide non-price regulatory measures from 2005 to 2013. The blue text describes each of the six rounds of package warnings, while the boldface red text describes regulatory measures other than the mandated warnings. The black lines point to the compliance deadlines for each regulatory measure.[2]

Fig. 2 further describes the six rounds of rotating package warnings. In each round, we show only one of several mandated images. The relative sizes of the images in the figure correspond to their relative sizes on each pack, with the last three rounds reflecting the required increase from 50% to 80% of the front and back surfaces.

### 2.2. Smoking cessation programs directed at healthcare providers

In 2008, the comprehensive tobacco control law mandated that every primary care provider, whether public or private, incorporate

[1] This "80% rule" was promulgated 3 months before the issuance of the fourth round of images. However, we have no evidence of significant compliance with the 80% rule before the deadline for compliance with the fourth round of images.

[2] With the exception of the comprehensive tobacco control law, all measures provided for a 180-day compliance period. By specifying the end of the compliance period as the effective date of each measure, we assumed that tobacco manufacturers waited until each deadline to comply.