Diciembre 2020

ART5_A1_2020_1
N° de serie

Artículo Científico

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COLOMBIA CIENTÍFICA
Conocimiento Global para el Desarrollo

ALIANZAEFI
Economía Formal e Inclusiva

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► Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/tobaccocontrol-2019-055186).

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Received 30 May 2019
Revised 16 December 2019
Accepted 17 December 2019
Published Online First 11 February 2020

ABSTRACT

Background Tobacco prevalence in Colombia is small compared with other Latin America despite the nation's tobacco taxes being among the lowest in the region. However, tobacco taxes have increased several times during the last decade, and large increases in 2010 and 2016 impacted consumer prices.

Objective This paper aims to estimate the price smoking participation elasticity (PPE) in Colombia, with specific reference to regional increases in consumer prices after 2010 tax policy changes.

Methods The PPE is computed using logistic regression based on individual-level data from the National Psychoactive Substances Consumption Survey for 2008 and 2013. Our specific focus is state-level variation in Colombian cigarette prices between 2008 and 2013 induced by the tax hike in 2010.

Results The estimated PPE in Colombia is around −0.66 (p value=0.046). We find almost no differences across socioeconomic level, but price sensitivity was greater for women than men, and for relatively older individuals (ages 51–64).

Conclusions PPE for Colombia is above estimates for comparable middle-income countries such as Mexico. As a result, current estimates for health gains of tax policies are likely to be underestimated. Moreover, in contrast with the literature, we find that the PPE for the youth (≤25 years) is lower than older age groups, and there is no evidence of a prominent socio-economic status (SES) gradient.

INTRODUCTION

Tobacco consumption is a leading cause of ill-health globally, and although the prevalence of smoking in Colombia is among the lowest in the region, associated morbidity nevertheless is significant.[1] In recent decades, the government of Colombia has implemented policies to prevent, discourage and reduce smoking. Particularly, increases in tobacco taxes have increased consumer prices.[2] Tobacco consumption is an important public health issue, and preventive regulatory actions can substantially influence aggregate smoking in the long-term.[3–6] Despite a diverse range of tobacco control policies as the MPOWER measures recommended by the WHO, excise taxes remain the most effective strategy to discourage tobacco consumption but not at the recommended rates.[7 8] However, excise taxes may affect different populations differently.[9]

Promotion of the tobacco control agenda in public policy requires tools that simulate the impact of tax hikes. However, current exercises are based on estimates of the number of cigarettes consumed per day (intensive margin) for the total population.[1 10] While such estimates are appropriate in a general sense, it is impossible to provide specific-group impacts that are desirable for inequality analysis and projections. Moreover, current national estimates are restricted to the intensity of consumption, namely the reduction in total cigarette consumption in response to price changes. This limits the ability of researchers to assess potential impacts on the prevalence of tobacco use (extensive margin).

The goal of this paper is to estimate of the cigarette price smoking participation elasticities (PPEs) for Colombia by age, income and gender groups, using household data from 2008 and 2013, while simultaneously exploiting state-level price variations driven by a tax hike in 2010. For this research, we use the National Psychoactive Substances Consumption Survey 2008 and 2013 (NPSCS) and average annual cigarette prices at the state level from the National Department of Statistics. Tobacco price elasticity is computed using average marginal effects from logistic regression.

Franks *et al* explored how tax impacts on tobacco consumption in the USA included both cessation and reduced intensity.[11] Moreover, the impact on low-income populations was found to be less than expected, and some studies found low-income populations to be relatively insensitive. This study opened questions on the importance of separately studying the impact on smoking prevalence, and on doing so across population groups. In the same country, differences in PPE across populations are still relevant: Yao *et al* estimates such differences as being −0.26 for whites, −0.10 for African–Americans, −0.42 for Asians and −0.11 for Hispanics.[12] Wilson *et al* reviewed impacts for several countries and found figures ranging from −0.45 to 0.1 for adults and −1.41 to −0.1 for youth.[13] The higher responsiveness of youth is well known in the literature: in the USA estimates of PPE estimates for the USA range from −0.145 to −1.51.[14–17] This is important because delayed initiation of smoking correlates with early cessation.[3 4]

For middle-income countries, while there are figures on the responsiveness of smoking participation to price for countries such as Russia and South Africa, actual estimates of PPE are scarce.[18–20] An estimate of the PPE of −0.06 was obtained for China.[21] A similar pattern occurs for Latin America (LA): there are several cigarette consumption price-elasticity estimates,[22] but few exist for PPE. This is mainly because current estimates are based on supply-side information due to the lack of periodic household surveys that include information on individual smoking patterns. The closest references for us are two exercises for Mexico using household expenditure surveys. First, Miera-Juárez and

To cite: Gallego JM, Otálvaro-Ramírez S, Rodriguez-Lesmes PA. *Tob Control* 2021;**30**:36–41.

Iglesias estimated PPE of −0.17, while Jiménez-Ruiz *et al* estimated PPE at around −0.06.[23 24] An important caveat is that if one is interested in individual smoking choices, it is important to consider that household-based PPE estimates underestimate individual sensitiveness. For instance, if in a household, there are two smokers and only one-stop smoking as a result of the price increase, this would not be taken into account in the calculation of the estimate. As a local reference, total elasticities for the Colombian case haven been estimated on −0.36 by Santa María and Rozo, on −0.44 by James *et al* and on −0.78 by Maldonado *et al*.[1 25 26] For Colombia, Santa María and Rozo estimate an elasticity of −0.36 using data from NIELSEN for the period between 2000 and 2007 for 15 cities, combined with price variation at brand-quarter level from 2000 to 2007.[25] Maldonado *et al* estimated the same figure to be −0.78 using tax office sales records, and yearly national prices from the statistics department between 1994 and 2014.[26] Using household data and the tobacco consumer price index (CPI), James *et al* estimate price elasticity on −0.44.[1] Generally, sensitivity of cigarette consumption in LA mainly lies within 0 and −0.5.[22]

Context

To curb the tobacco epidemic, the Colombian government has implemented diverse control mechanisms, which have contributed significantly to decreasing tobacco use. Taxation is known to be the most cost-efficient policy, and the country undertook several tax reforms between 1997 and 2016. Several limited tax increases occurred under different regimes after 1995, taking such forms as specific-contributions to sports' budget, custom tariffs and VAT and other consumption taxes. In 2006, as part of the WHO Framework for Tobacco Control, Law 1111 unified ad-valorem consumption tax, earmarked part of it towards sports promotion and created a specific tax that depended on the final consumer price: cheaper and expensive brands division, using a reference price for the entire country. In 2010 a major reform occurred when specific taxes for cheaper and expensive brands were unified. These legislative changes increased the tax burden on cheaper cigarettes, which historically have dominated the market, and simultaneously slightly reduced the tax burden on high-end tobacco products.[27] Other antitobacco policies, such as advertising bans and smoke-free environments, were implemented between 2009 and 2011.

Data

The NPSCS is a cross-sectional study conducted by the Ministries of Health and Justice, focused on consumption of alcohol, tobacco and illicit drugs among individuals aged 12–65 years of age, living in either metropolitan areas or urban areas with populations exceeding 30 000. The results are representative of 27 administrative areas (*departamentos*) which are equivalent to states. We consider the 2008 and 2013 waves, which follow a standard structure defined by the Organization of American States. The *Sistema Interamericano De Datos Uniformes Sobre Consumo De Drogas* is a protocol for household surveys on legal and illegal drug consumption inLA. An individual is considered a tobacco user if they have consumed more than 100 cigarettes in their life, and the data further records age of initiation, as well as frequency and intensity of use during the last 12 months and the last 30 days.

As shown in table 1, by 2008 the prevalence of tobacco consumption during the last 30 days among the population was 17.3% (24.3% for men, 11.2% for women) with substantial state-level differences. The average age of initiation of tobacco use was 16.83 years. In terms of the analysis we consider socioeconomic groups using the variable *estrato*, which classifies the quality of life of different locations in the country, as a proxy of SES, according to six levels (ranging from 1 to 6, with 1 indicating the lowest SES and 6 the highest) to assign cross-subsidies in costs for public utilities. We group this variable into three categories corresponding to low, middle and upper SES.

Figure 1 presents the average smoking prevalence and age of initiation for 2008 and 2013 by state. In terms of prevalence, large decreases occur in Bogotá, Caldas, Nariño and Valle, while the age of initiation remains constant.

Table 1 Descriptive statistics

Variable	Average for year 2008	2013
Panel A: smoking		
Current smoker (last 30 days)	17.3%	13.5%
Age of starting smoking	16.83	16.77
Years smoking	19.44	20.93
Panel B: individual characteristics		
Age	33.54	34.91
Age group		
Young (10–25)	35.8%	33.2%
Adult (26–50)	48.9%	48.3%
Middle-age (51–65)	15.4%	18.5%
Gender (female=1)	46.8%	48.4%
Household head	38.0%	58.7%
Education level		
Less than primary	8.2%	17.0%
Primary	37.7%	48.2%
Secondary	25.6%	4.7%
Tertiary and above	28.5%	30.1%
Marital status		
Single	52.2%	52.9%
Married or living with a partner	47.8%	47.1%
Current consumption of alcohol (last 30 days)	34.8%	36.4%
Ever tried Marijuana	8.4%	12.5%
Panel C: household characteristics		
Socioeconomic proxy: estrato		
Estrato 1–2	52.0%	60.6%
Estrato 3	31.4%	25.3%
Estrato 4–6	16.6%	14.0%
State (Departmento)		
Antioquia	17.1%	17.7%
Atlantico	8.2%	7.9%
Bogotá D.C.	32.2%	29.8%
Bolivar	4.9%	4.9%
Caldas	2.3%	2.2%
Córdoba	2.5%	3.5%
Huila	1.7%	2.1%
Meta	2.1%	2.2%
Nariño	2.2%	2.9%
Norte de Santander	3.7%	3.7%
Risaralda	2.9%	3.0%
Santander	5.3%	5.0%
Valle	15.0%	15.0%

Source: Own calculations based on the National Psychoactive Substances Consumption Survey.