

Analysis of Cigarette Tax Structure as a Requirement for an Effective Tax Policy: Evaluation and Simulation for Argentinaⁱ

Frank Chaloupka¹, Martin Gonzalez-Rozada², German Rodriguez-Iglesias³ and Veronica Schoj⁴

January 20, 2014

Objective This study describes the cigarette demand and the tobacco tax structure in Argentina in order to identify which type of consumption tax can be increased by the government to reduce tobacco use in the short run. Based on the elasticity estimates and the cigarette tax structure, we analyze the possibility of implementing a tax increase government policy to reduce cigarette consumption.

Method An analysis of each tobacco consumption tax is provided, with the twofold purpose of describe the variety of taxes affecting the consumption of cigarettes and to determine the impact of tobacco tax hikes. Public monthly data from January 1996 to June 2012 were used to estimate the demand function for cigarettes using a vector error correction model. This allowed us to capture the long-term effects and to capture the short-term dynamics of the variables. Simulation exercises are presented to analyze the impact of different tax increases on prices, consumption and tax revenues.

Results The cigarette tax structure in Argentina is very complex. Three excise duties plus VAT levied cigarettes consumption. Tobacco taxes have a dissimilar, vague origin, their bases differ significantly and are not applied similarly for cigarette and the other tobacco products. Additional Emergency Tax (a permanent emergency tax) and Special Tobacco Fund (that works as a subsidy to the tobacco production) are applied only to cigarettes; meanwhile internal tax rate is 60% for cigarettes but 16% or 20% to other tobacco products. *Ad valorem* taxes account for most of the tobacco tax structure in Argentina. The exception is a little component of the FET tax, which is a specific tax. The long-run cigarette consumption elasticity with respect to retail prices is -0.299, while the long-run income elasticity is 0.411. With these figures, a 10% increase in real prices will reduce long-run total cigarette consumption by 2.99%, and a 10% increase in real income will raise long-run consumption by 4.11%. Simulation exercises shows that increasing the price of cigarettes will increase government revenues, as well as a large decrease in cigarette consumption.

Conclusion Empirical evidence suggests that is feasible to raise internal taxes and the additional emergency tax to reduce cigarette consumption, as well as increase revenues that the government collects from these taxes.

¹ University of Illinois at Chicago

² Universidad Torcuato Di Tella

³ Fundación Interamericana del Corazón (Argentina)

⁴ Fundación Interamericana del Corazón (Argentina)

1. INTRODUCTION

A large and growing literature shows that the overall demand for tobacco products is significantly affected by changes in tobacco prices. (Bader, Boisclair, & Ferrence, 2011; F. Chaloupka, 1998; F. J. Chaloupka, Cummings, Morley, & Horan, 2002; Frank J Chaloupka, Straif, & Leon, 2011; Farrelly & Bray, 1998; Farrelly, Nonnemaker, & Watson, 2012). These studies show that price affects all aspects of tobacco consumption, with higher prices preventing initiation among potential users, inducing cessation among current users, and reducing the frequency of consumption and amount consumed by continuing users. Most of these studies are for high-income countries and have estimated a demand price elasticity in the range of -0.25 to -0.50 (Jha & Chaloupka, 2000), nevertheless in the last years there has been evidence from low- and middle-income countries, at least as responsive, and often more responsive, to price than it is in high income countries (Alcaraz, 2006; Debrott, 2006; González-Rozada, 2006; Nikaj & Chaloupka, 2013; A Ramos & Curti, 2005; Alejandro Ramos & Curti, 2006).

Based on the accumulated empirical evidence and published literature, Frank J Chaloupka, Yurekli, and Fong (2012) describe several 'best practices' in tobacco taxation. However, these guidelines are general and require an explicit analysis for each constitutional, legal and tax structure.

According the Global Adults Tobacco Survey (GATS 2012), 22 % of Argentinean population smoke (Konfino et al., 2013) and cigarette smoking contributes to as many as 40,591 deaths per year which represents that 13,5% of all death are attributable to tobacco (Pichon-Riviere A, 2013). Argentina is a federal country composed by 24 provinces (seven of which are tobacco growers). Argentina is a middle income country and the 7th worldwide tobacco leaf producer (2nd in Latin America). Despite Argentina signed the World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC) on September 25, 2003, until December 2013, has not ratified it as a result of tobacco industry influence, mostly throw tobacco growers.(Mejia, Schoj, Barnoya, Flores, & Perez-Stable, 2008).

In June 2011, National Congress approves the National Tobacco Control Act (Law 26687) which made great strides as the implementation of 100% smoke-free environments, a comprehensive ban on advertising, promotion and sponsorship of Tobacco and pictorial warning labels on cigarette packs. Nevertheless, it does not stipulate anything about cigarettes taxes and prices.

Argentina has one of the cheapest cigarettes around the world. On the last ten years price increases barely offset the effect of inflation. Since 2004 the increase in selling price of cigarettes was more than offset by increased revenue, i.e. cigarettes have become twice as much affordable in 2013 as compare with 2004. (Rodriguez-Iglesias &

Schoj, 2013) These facts have reduced the potential impact of the other tobacco control measurements that entered into force.

González-Rozada (2006) and Martinez, Mejia, and Pérez-Stable (2013) have found, using a similar methodology but different datasets, Argentina's demand price elasticity ranging from -0.26 to -0.31. However, there are no research studies that have analyzed the tobacco tax structure in Argentina, which is essential to adapt and implement locally "best practices" in tobacco taxation in order to increment tobacco prices. We also updated the analysis of the share of the price that Gonzalez-Rozada developed in 2006 and have changed in the last years. The aims of this study are to describe and analyze the complex tax structure, to describe the tobacco demand in Argentina and to develop several simulation exercises to investigate the impact of price changes on consumption and government revenues, in order to identify which type of consumption tax can be increased by the government to reduce tobacco use in the short run.

2. DATA AND METHODOLOGY

Economic analysis estimated the price elasticity of demand for cigarettes in Argentina, cigarettes are the main tobacco product consumed in Argentina (Konfino et al., 2013). The tobacco tax structure analysis focuses on taxes applied to the tobacco consumption.

To analyze the tobacco tax structure we developed a comprehensive review of the past and present legal framework (federal laws and administrative resolutions) that determine the tax components, ad valorem and specific taxes on tobacco consumption and the relationship between the tax bases. With this information we calculated the tax as a share of the price.

For the demand analysis we used the available monthly economic data from Argentina from January 1996 to June 2012. Data related to tobacco consumption and economic indicators were obtained from various departments of the government of Argentina. These included the Ministry of Agriculture (MINAGRI), Argentina's National Institute of Statistics and Census – INDEC, Ministry of Economics (MECON). Data related to inflation and price index in Argentina was obtained from INDEC and National Congress reports (private consultants)

Since direct data about monthly cigarette consumption is not available, total cigarette sales in packs of 20, was used as a proxy for cigarette consumption⁵. Cigarette price data used for estimation was the average price of a pack published by the Secretaría de Agricultura, Ganaderia, Pesca y Alimentos de la Nacion (SAGPyA) in its Statistical Yearbooks from January 1996 to February 2004. Since March 2004, the cigarette price series was updated using the variation in the monthly weighted average of the different

⁵ Hereafter, we will refer to sales as "consumption."

retail prices published by MINAGRI in its web page. Income data used was the average nominal income of the private sector, used as a proxy for the nominal income of the population. Variables are presented in real terms. Both the consumption and average retail price series were taken from statistics of MINAGRI, while data on the average nominal income of the private sector are taken from statistics published by MECON in its web page.

We established the functional form of the demand for cigarettes in Argentina through the determination of the statistical properties of the individual series. The order of integration of each series was determined by means of the augmented Dickey-Fuller (ADF) test (see Dickey and Fuller, 1979). For the real income series we test for unit root in the presence of a structural break, with the formal procedure proposed by Perron (1989)⁶.

Engle-Granger test (Engle & Granger, 1987) and Johansen cointegration test (Johansen, 1991) results suggests cointegration among the variables in levels; hence, the cigarette demand function can be specified in terms of short- and long-run elasticities by mean of an Error Correction Model (ECM).

The long-run equilibrium relationship among cigarette total consumption, their real price, and the real income of the population taken in their natural logarithms:

$$c_t = k_i + \lambda_1 p_t + \lambda_2 y_t + u_t \quad (1)$$

where c_t is the natural logarithm of cigarette consumption, p_t is the natural logarithm of the real average retail price, and y_t is the natural logarithm of the real income of the population at time t . The terms k_i , λ_1 and λ_2 are parameters, and u_t is a stationary error term with zero mean. The term k_i includes coefficients on the control variables, λ_1 can be interpreted as the long-run price elasticity, and λ_2 is the long-run income elasticity.

The general model with r lags (months) for the short-run dynamics,

$$\begin{aligned} \Delta c_t = & \delta + (\alpha - 1) \left\{ c_{t-1} - \frac{k_i^*}{1-\alpha} - \frac{\beta}{1-\alpha} p_{t-1} - \frac{\gamma}{1-\alpha} y_{t-1} \right\} + \sum_{j=1}^{r-1} \alpha_j^* \Delta c_{t-j} \\ & + \beta_0 \Delta p_t + \sum_{j=1}^{r-1} \beta_j^* \Delta p_{t-j} + \gamma_0 \Delta y_t + \sum_{j=1}^{r-1} \gamma_j^* \Delta y_{t-j} + \varepsilon_t \end{aligned} \quad (2)$$

where δ , α , β , γ , α_j^* , β_0 , β_j^* , γ_0 , γ_j^* and k_i^* are the parameters of the model, and ε_t is a stationary error term. The value of r determines the number of months involved in the

⁶ In 2001 and 2002 there was a huge economic and political crisis in Argentina. Before March 2002, when inflation began to accelerate, there seems to be a clear structural break in the process generating income data. When there is evidence that a structural break has occurred, as is our case, special care must be taken when performing unit root tests.

long-run concept of the model, and is assessed empirically with the estimation of equation (2). The term in levels in the curly brackets represents the long-run equilibrium solution (1), while all the variables in first differences measure the short-run dynamics of the model.

3. ESTIMATION RESULTS

The short- and long-run elasticities of cigarette consumption with respect to real retail price and real income are obtained from estimating the error correction model (2).

Table 1 shows the results of the long-run and short-run dynamics estimates. As it can be seen, the long-run cigarette consumption elasticity with respect to retail prices is -0.299, while the long-run cigarette consumption elasticity with respect to real income is 0.411. With these figures, a 10% increase in real prices will reduce long-run total cigarette consumption by 2.99%, and a 10% increase in real income will raise long-run consumption by 4.11%. These estimates are statistically significant at conventional levels. In absolute value, income elasticity is about 37.4% greater than the price elasticity of demand. This means that to offset a 10% increase in income and bring about a fall in consumption, the real price should be raised by 13.74%.

The short-run price elasticity of demand —the coefficient associated with $\Delta(\text{Log}(\text{real retail price}_t), \beta_0$ — and the short-run income elasticity —the coefficient associated with $\Delta(\text{Log}(\text{real income}_t), \gamma_0$, in equation (2)— are not statistically significant. This means that a change in real price or real income does not result in an instantaneous change (in the same month) in total cigarette consumption. The coefficient associated with the error correction term — $(\alpha-1)$ in equation (2)— is negative and statistically significant, which means that the model is stable.

The long run is defined by estimating coefficient r in equation (2). In this case, the Johansen test, which shows the presence of cointegration among the cigarette demand function variables, states that the value of $r-1$ is equal to 2. This implies that, in the model, the long run is three months (a quarter).

To sum up, empirical evidence in this section suggests that the effect of the long-run price (income) elasticity of demand makes cigarette consumption drop (grow) by approximately 3% (4%) over a period of three months. The combination of these results indicates that for each 10%-increase in real income, prices should rise by almost 14% to cause a fall in consumption in a quarter.

Table 1. Long-Run and Short-Run Elasticity Estimates

Dependent Variable: Log (Total Cigarette Consumption)				
Estimation Method: Least Squares				
Sample: 1996:01 2012:06				
Long-run elasticities				
Variable	Coefficient	Standard Error	t-Statistic	p-Value
Log (Average Real Retail Price)	-0.2999	0.0490	-61.174	0.0000
Log (Real Income)	0.4108	0.0623	65.946	0.0000
D	0.0750	0.0107	70.023	0.0000
13th Month Pay – June Half	-0.0214	0.0187	-11.485	0.2522
13th Month Pay – December Half	0.1898	0.0189	100.543	0.0000
Constant	92.555	0.4207	219.998	0.0000
Adjusted R-squared	0.5104			
F-statistic	420.734			
p-Value	0.0000			
Short-run elasticities				
Variable	Coefficient	Standard Error	t-Statistic	p-Value
Error Correction Term	-0.4028	0.1237	-32.554	0.0013
$\Delta(\text{Log}(\text{real retail price}_t))$	0.1185	0.2350	0.5040	0.6148
$\Delta(\text{Log}(\text{real income}_t))$	-0.1967	0.2009	-0.9792	0.3287
$\Delta(\text{Log}(\text{real retail price}_{t-1}))$	0.0129	0.2398	0.0537	0.9573
$\Delta(\text{Log}(\text{real retail price}_{t-2}))$	-0.0156	0.2340	-0.0668	0.9468
$\Delta(\text{Log}(\text{real income}_{t-1}))$	0.0418	0.2189	0.1911	0.8486
$\Delta(\text{Log}(\text{real income}_{t-2}))$	0.2667	0.2050	13.007	0.1950
$\Delta(\text{Log}(\text{total cigarette consumption})_{t-1})$	-0.6050	0.0865	-69.940	0.0000
$\Delta(\text{Log}(\text{total cigarette consumption})_{t-2})$	-0.3732	0.0700	-53.332	0.0000
Constant	0.0008	0.0064	0.1275	0.8987
Adjusted R-squared	0.4669			
F-statistic	198.804			
p-Value	0.0000			

Source: Authors' estimations.

Notes: 13th Month Pay – June Half and 13th Month Pay – December Half are dummy variables that take on the value 1 for June and December, respectively, to capture the effect of the split 13th month pay and any seasonal effects.

D captures the March 2002 structural break.

Short-run lags are determined by the Johansen test. Δ is the finite difference operator.

Log denotes the natural logarithm.

4. CIGARETTE TAX STRUCTURE

Taxes levied on tobacco products are general consumption taxes (Value Added Tax) and excises (Additional Emergency Tax, Special Tobacco Fund and Internal tax). Federal consumption taxes in Argentina are shared according the Federal Revenue-Sharing Regime (Coparticipación), which deliver the revenues collected The **Value Added Tax (VAT)** is a Coparticipable⁷ Ad valorem tax levied on the consumption of goods and services. Its rate for cigarettes, r_{VAT} , is 21.0%. The base of VAT is the selling price net of excises, FET, and IAE taxes:

In this case, it is necessary to divide the VAT rate by $1 + r_{VAT}$ because the selling price already contains the VAT amount. Value Added Tax amount is calculated by applying this rate to the retail price net of Additional Emergency Tax, Special Tobacco Fund and Internal tax

The **Additional Emergency Tax** (Impuesto Adicional de Emergencia, **AET** hereafter) is a Coparticipable ad valorem tobacco excise. Its rate is defined by law in a range between the 7% and the 21% of each pack of cigarettes sold in the national territory. It is an additional emergency tax which means Federal Congress should renew and extend annually. Since June 2001, its rate has been renewed with a rate of 7.0%.

The **Special Tobacco Fund – FET** (*Fondo Especial del Tabaco*) is a tax which non coparticipable revenues are allocated to the tobacco-growing provinces and the tobacco producers as a subsidy to tobacco production. Revised several times, FET is composed by an 8.35% ad valorem rate (7.0% for the FET, 1.0% for payment of the usual — wholesale and retail— marketing percentage throughout the country, and 0.35% to finance the welfare and health care institutions managed by trade unions of the sector – obras sociales-). The Ad valorem FET component amount is calculated by multiplying the FET tax rate by the retail net price (i.e. retail price minus Additional Emergency Tax and the Value Added Tax). The FET also have a specific component: a lump sum of AR\$ 0.277 (AR\$0.2536 for the FET and AR\$0.0234 for the distribution sector), which in practice works as a variable rate set according to the price at the beginning of each half-year period.

The main purpose of the FET is to guide, coordinate, and monitor the actions intended to achieve the modernization, restructuring, and diversification of the tobacco-growing areas in terms of both primary production and the associated agribusiness chain. The FET receipts are allocated to the tobacco-growing provinces on the basis of the value of their production. In other words, Argentina tobacco production is partially subsidized by

⁷ Coparticipable means revenues are shared according to the Federal Revenue-Sharing Regime between the Federal Government and the Provinces

the government through a payment to the producer. This payment is financed by the FET tax.

The **Internal Tax (IT)** is a Coparticipable ad valorem tobacco excise. The **Internal Tax** is calculated by multiplying a nominal rate by the retail net price (i.e. retail price minus VAT, AET and FET taxes). In the case of cigarette the nominal rate is 60.0%. However, the minimum internal tax revenue per pack may not be less than 75 % of the tax levied on the most popular brand; this implies minimum Internal Tax revenue for the cheaper brands

In case of cigars, cigarillos, little cigars and other manufactured tobacco products the internal tax nominal rate is 16 %. The Roll-Your-Own tobacco, Dipping tobacco, chewing tobacco, snuff and other tobacco products pay a 20% internal tax on the same taxable base. The Additional Emergency Tax and the Special Tobacco Fund levy on cigarettes but no on other tobacco products.

Tax as the share of the Prices

To understand the impact of these taxes on cigarette prices, the following system of equations must be solved due to the overlapping of taxes and their bases:

$$\begin{aligned}
 AET &= 0.07 P \\
 VAT &= \frac{0.21}{1.21} P - AET - IT - FET ; \\
 FET &= 0.277 + 0.0835 P - AET - VAT \\
 IT &= 0.6 P - AET - VAT - FET \\
 FET_{NT} &= 0,0234 + 0.01 P - AET - VAT
 \end{aligned}$$

In November 2013⁸, the average price of an average pack of cigarettes published by MINAGRI was AR\$10.52, and the federal tax percentage collected on each pack was 69.51%. Actually, AR\$7.31 of the selling price are federal taxes, but as we do not count distribution components as part of the tax amount, they are excluded from its calculation⁹. The total tax burden (Excise duty plus VAT) accounts for 68.38% of the price of the average price of a pack of cigarettes in the Argentina (AR\$7.19 / AR\$10.52 x 100 = 68.34%). Considering best practices for tobacco tax policy (WHO, 2010), tobacco excise tax levels (or other taxes uniquely applied to tobacco products) should count for at least 70% of retail prices. The Value Added Tax is a tax applied on all consumer goods and services. Excluding VAT, table 1 shows the percentage of price

⁸ It is the latest cigarette price available

⁹ Note that the FET definition includes both the taxable FET and the nontaxable FET (FET_{NT}). Since in computing the proportion of price accounted for by taxes only the taxable FET is used (FET – FET_{NT}), this equation includes the definition of FET_{NT}.

accounted for by taxes by component, with the last column reporting the tax ratio of each tax on the retail price.

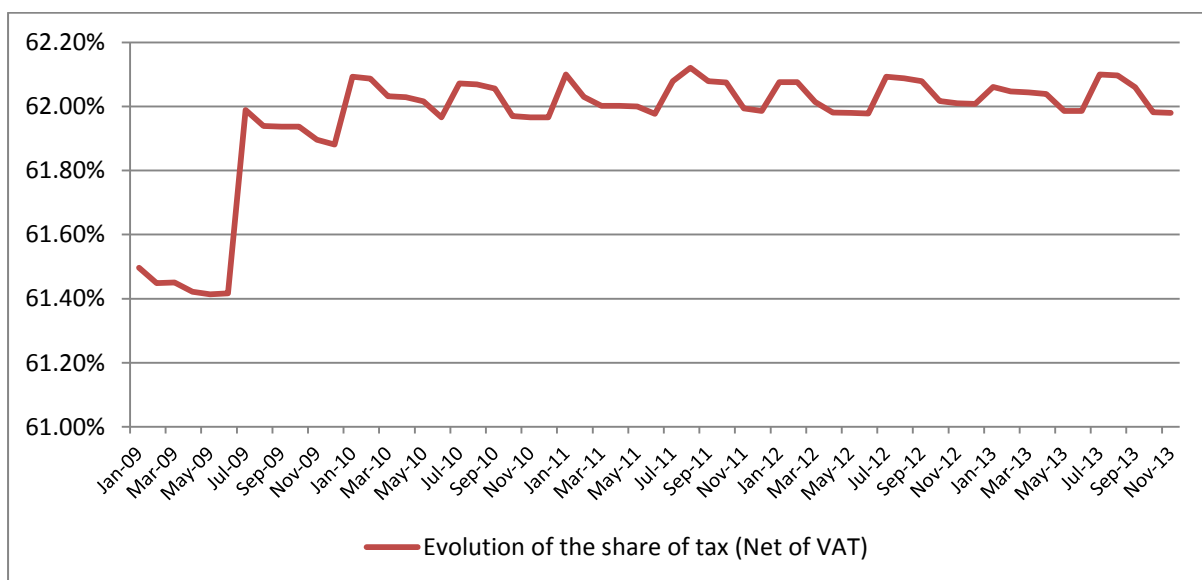
Table 1. Components of price of a packet of cigarettes, November 2013

Component	Amount	% of overall price
Retail price	10.52	100%
AET	0.736	7.00%
FET	1.092	10.38%
Taxable FET	0.973	9.25%
Nontaxable FET	0.119	1.13%
Internal tax	4.811	45.73%
Tax as share of price	6.520	61.98%

Source: Authors' estimations.

If we consider effects of the changes in FET specific tax component along time (figure 1) we observe a stepwise increase in tax as share of the tax (taxes uniquely applied to tobacco products).

Figure 1: Evolution of price to tax as share of price (Pack of cigarettes)



Source: Authors' estimations.

In case of the other tobacco products, the federal tax percentage collected on each pack of cigars, cigarillos, little cigars and other manufactured tobacco products was 22.51% (Internal tax plus VAT). Excluding VAT, percentage of the price collected as taxes represents 6.24%. Considering the Roll-Your-Own tobacco, Dipping tobacco, chewing tobacco, snuff and other tobacco products, the total tax burden accounts for 26.20% of

the price. Taking into consideration taxes uniquely applied to tobacco products, tax as share of price represent 10.70%.¹⁰

Using the estimated price and income elasticities along with the cigarette tax structure, we conducted a simulation exercise in order to analyze the impact on federal tax revenue and cigarette consumption of different federal rates of taxation levied for cigarette-smoking reduction purposes.

Simulation of The Impact of a Cigarette Tax Increase in the Short Run

The simulation exercise was based on the November 2013 values: annual Cigarette sales: 2,101,590,888 packs¹¹; average retail price: AR\$10.53 per pack; Total tax on cigarettes (Excise duty plus VAT) AR\$7.19; Cigarette tax: AR\$6.52 per pack; Federal cigarette tax revenue: AR\$9,631,658,747 (US\$1,393,872,467); Exchange rate: US\$1 = AR\$9.65¹²; Population: 42,202,935 (over 15 years: 31,452,302)¹³; Per capita consumption: 49.80 packs/year and Per capita consumption (over 15 years): 66.82 packs/year.

The simulation exercise was conducted for three different cigarette price elasticities of demand. The first scenario, called "neutral scenario", is based on the -0.299 estimated value. The "high revenues scenario" considered a -0.202 price elasticity of demand obtained from the -0.299 estimated value plus twice its standard error (0.049). The "low revenues scenario" is a -0.398, obtained from the -0.299 estimated value less twice its standard error

Assuming tax increase amount passes through totally to retail price (that is probably a conservative scenario, considering tobacco industry will reduce profits as tobacco consumption falls), that's the case of no tax-over shift or under shift. In this situation, and considering tobacco tax structure, as tax as share of price increase (whatever the tax instrument chosen by the policy-maker), cigarette prices increases.

A rise in the tax rate brings about an equivalent-amount increase in the price charged by the government for each pack, as shown on the horizontal axis. For example, in this exercise a 10% increase in the tax rate is interpreted as a 10% increase in the AR\$7.19 price¹⁴, which is the amount that the government collects per pack: the per-pack price

¹⁰ These values remain constant during the period under analysis, because changes in FET specific tax component do not affect these tobacco products.

¹¹ November 2013 monthly sales multiplied by 12, which is near the sales-year average of cigarette between 2005 and 2012: 2005: 1,844,276,896 – 2006: 1,987,111,021 – 2007: 2,051,049,324 – 2008: 2,167,693,707 – 2009: 2,119,781,226 – 2010: 2,088,106,058 – 2011: 2,153,937,268 – 2012: 2,140,351,208.

¹² Considering the black market-dollar exchange rate for November 29, 2013.

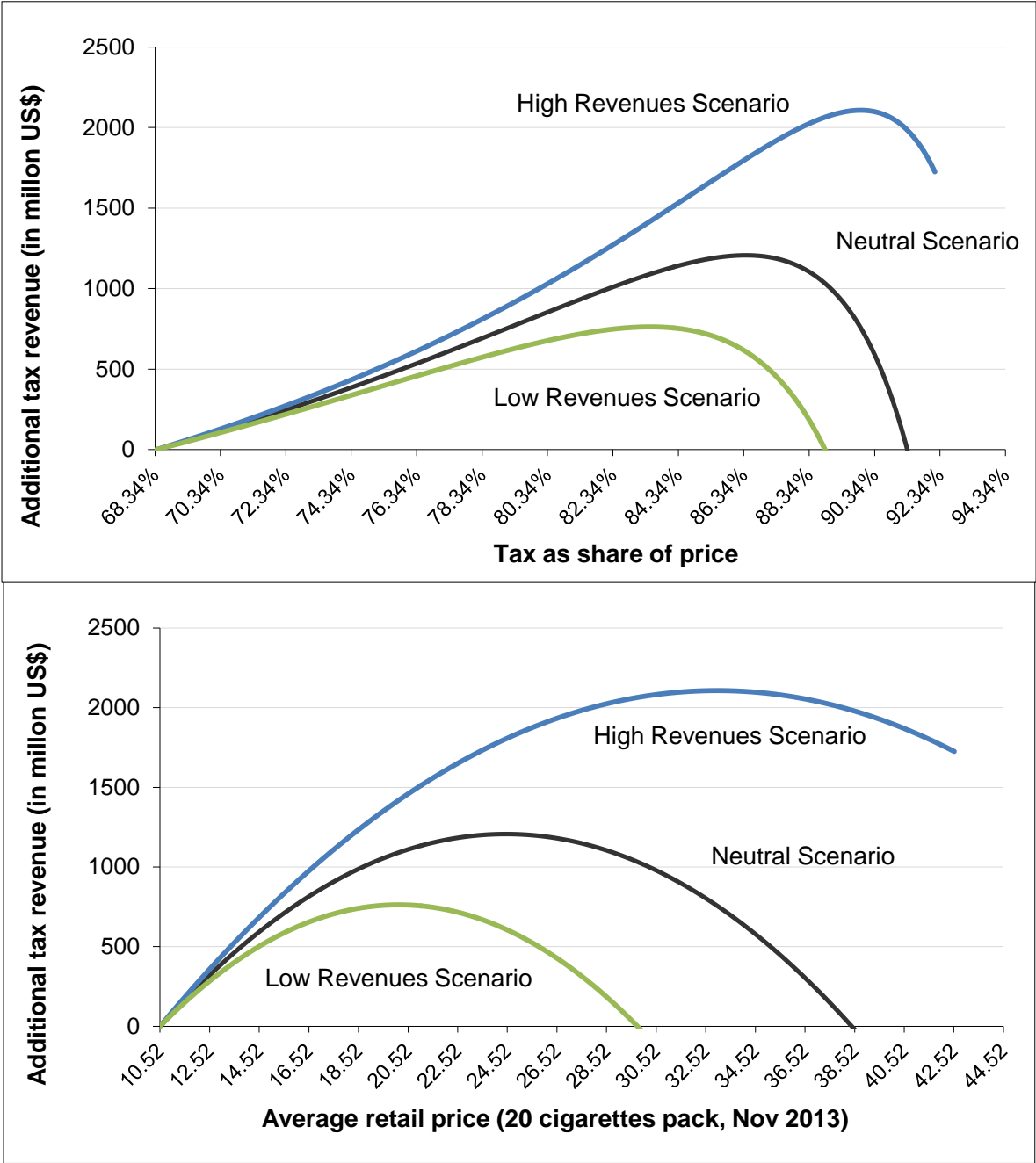
¹³ See Indec (2013)

¹⁴ Increasing 10% the amount collected per pack implies rising 2.96% the total tax on cigarettes (Excise duty plus VAT) as share of price, from 68,34% to 70.41%

levied goes from AR\$7.19 to $AR\$7.19 \times (1.10) = 7.913$. This 10% tax rise entails that the retail price increases from AR\$10.52 to AR\$11.24, i.e. a 6.84% price increment.

Considering the assumption on responsiveness of prices to tax increases, previous defined parameters and price elasticity results obtained we estimate the Laffer curve, which represents graphically the relationship between changes in federal tax revenue and the tax rates levied on cigarette consumption. Figure 1 shows the Laffer curves for the three scenarios described above.

Figure 1 Laffer curve



Source: Authors' estimations.

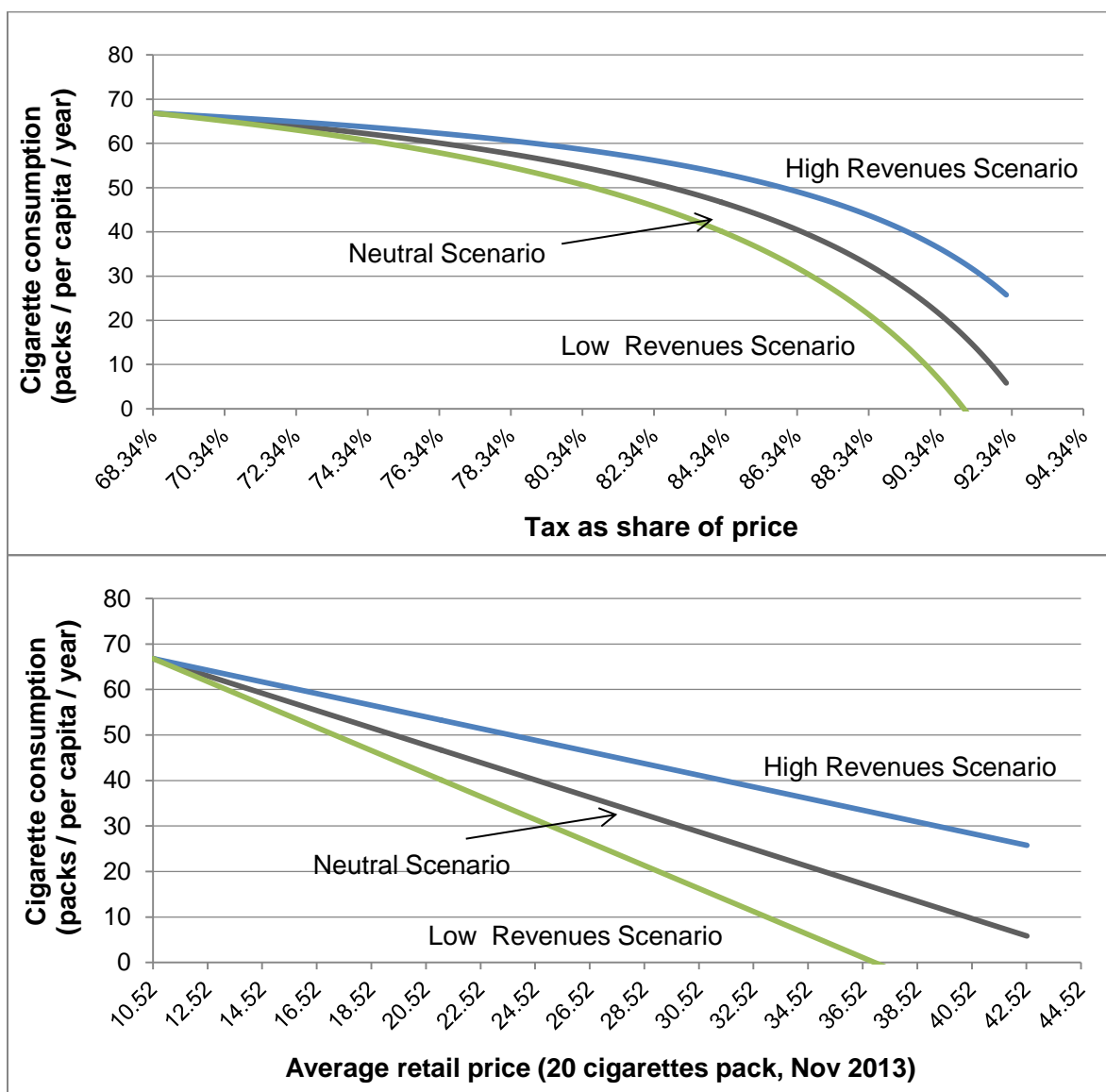
On the vertical axis, we can see the change in tax revenue that results from a cigarette consumption tax rise. The tax increase and its impact on tax revenue are a one-time change, meaning an instant impact, as shown by the Laffer curve.

As can be seen in Figure 1, there is enough room for the government to raise cigarette consumption tax rates in order to increase the resulting revenue. The low revenue scenario, where the price elasticity of cigarette consumption is -0.3979 , shows the "Laffer point" which is the peak point at which cigarette tax revenue starts to fall as the tax rate rises for 83.49% tax as share of price¹⁵. The Laffer point is reached for more than a 100% increment on government collects per pack, specifically for a 134% increase. Taking into account the bottom plot in Figure 1, that shows the Laffer curve considering in the x-axis prices instead of taxes, the Laffer point is reached for AR\$20.15, that is a 91.6% price increment per pack, from AR\$10.52 per pack price (November 2013). In the other two scenarios, the Laffer point is only reached after a 190% (193,7% for the neutral scenario, which implies a AR\$24.45 price per pack) increase on government collection per pack, which indicates that the government may raise cigarette taxes and improve tax revenue.

Figure 2 shows the evolution of average annual per capita consumption of cigarette packs (for the population aged over 15 years) under the tax rate increase for the three scenarios defined above. As in the preceding figure, the top plot shows the taxes imposed on cigarette consumption on the horizontal axis, and the average annual per capita consumption for the population aged over 15 years is shown on the vertical axis; while the bottom plot shows the prices per 20 cigarette pack increment on the horizontal axis. In the neutral scenario a 10% increase in prices, from AR\$10.52 to AR\$11.57 per pack (induced by a 14.7% of increment in government revenue per pack), causes a 2.99% drop in average annual per capita consumption (from 66.82 to 64.81 packs per year).

¹⁵ We consider total tax on cigarettes (Excise duty plus VAT). We are assuming the government tries to maximize total revenue on cigarette.

Figure 2. Relationship between Cigarette Consumption and Tax Rates



Source: Authors' estimations.

It is important to note that, certainly, the favorable scenario for government tax collection turns into the worst possible scenario in terms of the fall in consumption, whereas the lower revenues scenario becomes the scenario where consumption is more sensitive to tax increases.

5. DISCUSSION

There is an imperative requirement of adopt significant increases in the tobacco taxes with the goal of reducing consumption and promoting public health. In the case of Argentina where the tax structure is complex, implementing a single uniform tax, as recommended by the best practices on tobacco taxation, would be an option only in the long run. In the short run, a successful policy to increase taxes must rely on increments of actual taxes. If the plan is implement a federal tax hike policy aimed at reducing

cigarette smoking in Argentina, and not to modify all the tax structure, this policy could be based on the taxes described above, particularly the tobacco excises: AET, Special Tobacco Fund taxable rate and Internal Tax. VAT does not seem to be a feasible option. If the aim of the VAT rate hikes is to increase the relative prices permanently (at least to offset income increases and not increase affordability), AET is a chronically emergency tax, which requires annual renewal, which involves difficulties to the sustainability of the tax increase; and FET works as a subsidy to the tobacco production. The impact of the increasing tax policy on the FET revenues is one of the main issues in the tax discussion in Argentina. FET works as a subsidy to the tobacco growers and the tobacco growing provinces. The considered tax increase policy aimed at reducing cigarette consumption should consider the variation in FET revenue in order to avoid a potential complaint by tobacco growers. The FET issue is, of course, much broader than just the revenue resulting from this tax, but a thorough analysis exceeds the purpose of this paper.

This paper analyses the tobacco tax structure and estimates a cigarette demand function in Argentina with the purpose of assessing the price elasticity of demand and income elasticity and clarifying the complex tax structure. The federal taxes levied on cigarettes have a dissimilar, vague origin, their name is not harmonized, and their bases differ significantly (*Ad valorem* taxes are imposed over different tax bases). *Ad valorem* taxes account for most of the tobacco tax structure in Argentina. The exception is a little component of the FET tax, which is a specific tax (mixed tax structure).

Total tax as a share of the price (including VAT) is close to the range recommended by the FCTC; however cigarettes in Argentina are among the most affordable of the LAC region. So it is clear that tax share on cigarettes cannot be the only indicator of success of tax policy in tobacco. Best practices refer to this 70% tax benchmark considering taxes uniquely applied to tobacco products. In this case, cigarettes excises in Argentina are far from the recommended minimum taxation structure.

The complexity of the overlapping bases and the lack of harmonization should be taken into account in the effective and sustainable tax policies. Another relevant factor to consider is the legal viability of the chosen policy option (e.g. constitutional and legal limitations for taxation), since a fiscal instrument with legal shortcomings can be taken apart very easily. The decision on whether to use one tax or the other, or a combination of both, is an empirical and political issue.

Likewise, actions should be taken in order to avoid (or at least reduce) the migration to other tobacco products. The other tobacco products in Argentina are not levied by AET or FET, while the Internal tax levy at a lower rate than the one applied for cigarettes. Lower taxes applied to the other tobacco products are a threat for the effectiveness of the increasing tax policy.

Following the recommendations derived from the best practices, the existing complicated ad valorem taxes should be changed with a uniform specific tax regularly adjusted for inflation and income growth. However, this long run objective seems to be very difficult to implement in the real political arena. In Argentina automatically tax indexation is forbidden by law. Any specific tax, given the effects of inflation, will lose effectiveness to reduce tobacco consumption; therefore it determines the majority of tobacco taxes are ad valorem tax. It is necessary to consider different mechanisms for updating the specific taxes (as the case of the specific FET component) or a combined strategy of any increase in ad valorem taxes by creating also the specific components. In addition, this research shows that there is an increasing tax burden on cigarettes, applied via a pseudo-indexation mechanism that increases the specific FET component according to the cigarette prices. This facilitates the possibility to implement an increasing tax schedule.

6. LIMITATIONS

Our elasticities are estimated assuming a log-linear demand function. The log-linear demand function implies that the price elasticity do not change as good's price increases; hence the elasticity of demand is constant at every point along this type of demand curve.

Our analysis consider aggregate data, providing general information for the tobacco consumers in Argentina as a whole but does not allow to analyze particularities of the groups that could be determinant in the definition of the tax policy. We are unable to identify smokers certain areas, at specific age or by gender, as well we cannot obtain inequality analysis.

The data collected and provided by MINAGRI is only for cigarettes, and do not provide information on other tobacco products consumed in Argentina.

7. CONCLUSIONS

This study confirms that the retail price and consumers' income are determining factors for the quantity consumed, as suggested by economic theory. The long-run cigarette consumption elasticity with respect to retail prices is -0.299, while the long-run income elasticity is 0.411. With these figures, a 10% increase in real prices will reduce long-run total cigarette consumption by 2.99%, and a 10% increase in real income will raise long-run consumption by 4.11%. A tobacco tax increase that raises prices will reduce tobacco consumption and simultaneously increase tax revenue. This study corroborates previous research studies developed in Argentina.

Using the elasticity estimates and the cigarette tax structure, we analyze the possibility of implementing a tax increase government policy to reduce cigarette consumption. Empirical evidence suggests that rises in taxes result in a reduction of cigarette

consumption as well as in an increase in the revenue that the government collects from these taxes even in the most conservative scenario analysis.

As in many other countries around the world, "best practices" are not feasible in the short term in Argentina; policies need to be generated on one side adapted to the local context and on the other instrumented to be sustainable. In that way, the report of the tobacco tax structure and the estimation of tobacco price and income elasticities help to identify potential tax instruments that can be increased by the government to reduce tobacco use in the short run. This research procedure makes possible the definitions of short run and long run plans to achieve best practices locally, highlighting critical and strategic issues to be considered in order to implement a tobacco tax increase policy in Argentina (as well in most countries).

This document emphasizes that any plan to promote an increasing tax policy aimed to reduce tobacco consumption requires a careful analysis of the tax structure, regulatory framework and the legal and constitutional constraints to drive in for a policy that is effective and sustainable to meet the goal of public health.

REFERENCES

- Alcaraz, V. O. (2006). Economía del Control del Tabaco en los Países del Mercosur y Estados Asociados: Bolivia.
- Bader, P., Boisclair, D., & Ferrence, R. (2011). Effects of tobacco taxation and pricing on smoking behavior in high risk populations: A knowledge synthesis. [Research Support, Non-U.S. Gov't Review]. *Int J Environ Res Public Health*, 8(11), 4118-4139. doi: 10.3390/ijerph8114118
- Chaloupka, F. (1998). How effective are taxes in reducing tobacco consumption. *The Social Cost of Smoking, Lausanne, Switzerland*.
- Chaloupka, F. J., Cummings, K. M., Morley, C. P., & Horan, J. K. (2002). Tax, price and cigarette smoking: evidence from the tobacco documents and implications for tobacco company marketing strategies. [Evaluation Studies Research Support, U.S. Gov't, P.H.S.]. *Tobacco Control*, 11 Suppl 1(suppl 1), I62-72.
- Chaloupka, F. J., Straif, K., & Leon, M. E. (2011). Effectiveness of tax and price policies in tobacco control. [Consensus Development Conference Research Support, Non-U.S. Gov't]. *Tobacco Control*, 20(3), 235-238. doi: 10.1136/tc.2010.039982
- Chaloupka, F. J., Yurekli, A., & Fong, G. T. (2012). Tobacco taxes as a tobacco control strategy. *Tobacco Control*, 21(2), 172-180.
- Debrott, D. (2006). Economía del control del tabaco en los países del Mercosur y Estados asociados. *Chile, Washington: Organización Panamericana de la Salud*.
- Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American statistical association*, 74(366a), 427-431.
- Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica: Journal of the Econometric Society*, 251-276.
- Farrelly, M. C., & Bray, J. W. (1998). Response to increases in cigarette prices by race/ethnicity, income, and age groups-United States, 1976-1993 (Reprinted from MMWR, vol 47, pg 605-609, 1998) (Vol. 280, pp. 1979-1980): Am Med Assoc.
- Farrelly, M. C., Nonnemaker, J. M., & Watson, K. A. (2012). The consequences of high cigarette excise taxes for low-income smokers. [Research Support, Non-U.S. Gov't]. *PloS one*, 7(9), e43838. doi: 10.1371/journal.pone.0043838
- González-Rozada, M. (2006). Argentina: Economía del Control de Tabaco en los Países de Mercosur y Estados Asociados.
- Indec. (2013). Estimaciones y proyecciones de población 2010-2040. : total del país Vol. 35. L. A. M. Edwin (Ed.) Serie Analisis Demografico Retrieved from http://www.indec.gov.ar/nuevaweb/cuadros/2/proyeccionesyestimaciones_nac_2010_2040.pdf
- Jha, P., & Chaloupka, F. J. (2000). The economics of global tobacco control. [Review]. *BMJ: British Medical Journal*, 321(7257), 358.
- Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica: Journal of the Econometric Society*, 1551-1580.
- Konfino, J., Linetzky, B., Goldberg, L., Ferrante, D., Ondarsuhu, D., & Ondarsuhu, D. (2013). *Global Adult Tobacco Survey: Argentina 2012* (1a Ed. ed.). Argentina: Ministerio de Salud de la Nación.
- Martinez, E., Mejia, R., & Pérez-Stable, E. J. (2013). An empirical analysis of cigarette demand in Argentina. *Tobacco Control*. doi: 10.1136/tobaccocontrol-2012-050711
- MECON. (2014). Retrieved 01/15/2014 <http://www.mecon.gov.ar/peconomica/basehome/infoeco.html>

- Mejia, R., Schoj, V., Barnoya, J., Flores, M. L., & Perez-Stable, E. J. (2008). Tobacco Industry Strategies to Obstruct the FCTC in Argentina. *CVD Prev Control*, 3(4), 173-179. doi: 10.1016/j.cvdpc.2008.09.002
- MINAGRI. (2014). Retrieved 01/15/2014 <http://64.76.123.202/site/agricultura/tabaco/04-estadisticas/index.php>
- Nikaj, S., & Chaloupka, F. J. (2013). The Effect of Prices on Cigarette Use Among Youths in the Global Youth Tobacco Survey. *Nicotine & Tobacco Research*.
- Pichon-Riviere A, A. A., Bardach A, Augustovski F, Caporale J, Caccavo Francisco. Carga de Enfermedad atribuible al Tabaquismo en Argentina. Documento Técnico IECS N° 7. Instituto de Efectividad Clínica y Sanitaria, Buenos Aires, Argentina. Mayo de 2013 (www.iecs.org.ar). . (2013). Carga de Enfermedad atribuible al Tabaquismo en Argentina. : Instituto de Efectividad Clínica y Sanitaria.
- Ramos, A., & Curti, D. (2005). Uruguay: Economía del Control del Tabaco en los Países del Mercosur y Estados Asociados: Washington, DC: Pan American Health Organization.
- Ramos, A., & Curti, D. (2006). Economía del Control del Tabaco en los países del Mercosur y Estados Asociados. *Uruguay, Washington: Organización Panamericana de la Salud*.
- Rodriguez-Iglesias, G., & Schoj, V. (2013). *Enfermedades crónicas no transmisibles (ECNT), políticas costo-efectivas y asequibilidad de los cigarrillos*. Paper presented at the Jornadas AES, Buenos Aires.
- WHO. (2010). *WHO Technical Manual on Tobacco Tax Administration*. Geneva: World Health Organization.

ⁱ This paper is based on a document prepared by Martin Gonzalez-Rozada and German Rodriguez-Iglesias for the project "Economía del Tabaco en Argentina" of the Interamerican Heart Foundation (FIC, Argentina) funded by the Fogarty International Center.