Impact of a Recent Tobacco Tax Reform in Argentina

Martin González-Rozada

Universidad Torcuato Di Tella

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Abstract

The literature on policies for the control of the tobacco epidemic suggests that increasing selective taxes on the consumption of tobacco products is the most cost-effective policy. Cigarette tax structure in Argentina is very complex. All the tax bases for cigarette consumption taxes are related and, therefore, any modification of a tax affects the collection of the rest of the taxes. This is important given that funds raised by one of the taxes, the Special Tobacco Fund (FET), are allocated among the tobacco provinces according to the value of tobacco production. These provinces oppose in the congress to any reform that increase taxes on cigarette consumption that negatively affects these funds. In May 2016, the government decided to increase the rate of one of the taxes, the internal tax, from 60% to 75% until December 2017. We study the impact on cigarettes' demand price elasticity, consumption and tax revenues of this tobacco tax reform. Using an Error Correction Model, we estimate short- and long-run demand price and income elasticities. We explore the sensitivity of the reform on these elasticities by estimating the model using total average retail price and average retail price of the cheapest and most expensive cigarette brands. We find that the tax reform of May 2016 induced an increase in the magnitude, in absolute value, of the short-run demand price elasticity. This increment in the demand price elasticity occurred not only for the average real retail price but also for both the cheapest brands of the market and the most expensive ones. We also show that the tax reform increased the funds collected by the FET.

Keywords: tobacco tax reform, demand price elasticity of cigarettes, error correction model, Special Tobacco Fund

JEL Codes: H2, H23, I18

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1 Universidad Torcuato Di Tella, Av. Figueroa Alcorta 7350 (BCW). Buenos Aires, Argentina. Email: mrozada@utdt.edu. Pedro Martinez Bruera provided excellent research assistance. This paper is funded by the University of Illinois at Chicago’s Institute for Health Research and Policy through its partnership with Bloomberg Philanthropies.
1. Introduction

The literature on policies for tobacco control suggests that increasing selective taxes on the consumption of tobacco products is the most cost-effective policy. The reason is that increasing taxes causes the prices of tobacco products to increase. This makes the different tobacco products less accessible, thus reducing initiation, prevalence and consumption of tobacco. In addition, because the demand for tobacco is inelastic, higher taxes generate increases in tax revenues (see Gajalakshmi et al., 2000, Jha and Chaloupka, 2000 and Ranson et al., 2000, among others for international evidence. See González-Rozada, 2006; González-Rozada and Rodríguez-Iglesias, 2014; González-Rozada et al., 2017 for evidence for Argentina).

There are two types of selective taxes on cigarettes. Specific taxes are a fixed amount of pesos/dollars per pack or per cigarette. These taxes increase the retail price of cigarettes and reduce the dispersion of prices between expensive and cheap brands. Ad-valorem taxes are a percentage of the retail price of the tobacco product. The advantage of these taxes over specific taxes is that tax revenue adjusts directly with change in prices due to inflation, while specific taxes require a special updating mechanism to keep pace with price increases. On the other hand, the disadvantage of ad-valorem taxes with respect to specific ones is that they do not reduce the dispersion of prices between brands, and therefore induce a shift of consumption from more expensive brands to cheaper brands. The recommendation in order to achieve greater effectiveness of these taxes is a simplified tax structure and applying a well-designed specific tax in such a way that it does not lose its value when inflation increases (see Chaloupka and Rodriguez-Iglesias, 2018).

The tax structure on cigarette consumption in Argentina is very complex and all taxes are of the ad-valorem type. In May 2016, the government decided to increase the rate of one of the taxes, the
internal tax, from 60% to 75% until December 2017. In this paper, we study the impact on cigarettes’ demand price elasticity, consumption and tax revenues of this tobacco tax reform. Using an Error Correction Model, we estimate short- and long-run demand price and income elasticities. We explore the sensitivity of the reform on these elasticities by estimating the model using total average retail price and average retail price of the cheapest and most expensive cigarette brands. Then, using these estimations, we simulate the impact of increasing the rate of tax on the consumption of cigarettes on consumption and government revenue. The rest of the work is organized as follows. Section 2 describes the tax structure of cigarettes in Argentina and presents the tax reform and its impact on the tax burden, retail price and government tax revenue. Section 3 describes the data used in the estimation of the demand function of cigarettes and studies the underlying statistical properties of retail price, real income and consumption of cigarettes. Section 4 introduces the methodology used to estimate demand price and income elasticities. Section 5 shows the main results of the paper. This section describes the impact of the increase in the tax rate of internal taxes on the demand price elasticity. We estimate this demand price elasticity for the average retail price of a pack of 20 cigarettes and for the average retail price of the cheapest and most expensive brands in the market. The evidence in this section shows that the tax reform of May 2016 induced an increase in the magnitude, in absolute value, of the short-run demand price elasticity. This increment in the demand price elasticity occurred both in the cheapest brands of the market and in the most expensive ones. However, the effect was larger for the most expensive cigarette brands. Our simulation exercise implies that an increment in the tax rate on cigarettes of 20% would increase tax revenues and would reduce per capita consumption of cigarettes. Section 6 concludes the work.
2. Tax Structure of Cigarettes in Argentina

The tax structure on cigarette consumption in Argentina is very complex. Federal taxes affecting cigarettes are four ad-valorem taxes: the additional emergency tax (IAE), the value added tax (VAT), the special tobacco fund (FET) and the internal tax (II). The tax base of each one is different. For example, the tax base of the IAE is the retail price, but the tax base of the II is the retail price minus the VAT, IAE and FET. This structure implies than changing the tax rate of one of the taxes affects the base of the other taxes. This is important because, in practice, one of the taxes, the FET, acts as a subsidy to tobacco producers. The main objective of the FET is to guide, coordinate and supervise the actions tending to achieve the modernization, reconversion, complementation and diversification of the tobacco areas, both in the primary production and in the associated agro-industrial chain. The funds raised by the FET are allocated among the tobacco provinces according to the value of tobacco production. The Ministry of Agriculture of the Nation is the enforcement authority of the FET. It has in its functions to fix the price of the different varieties of tobacco and transfer the collection of the FET to the provinces so that they make cash the payment of the surcharge to the producers. That is, the FET acts as a subsidy to tobacco producers and the tobacco industry in particular.

Usually, those who oppose increasing taxes on tobacco products use the FET as an argument against it by saying that increment in taxes will reduce the FET funds. It is important then, for policy reasons, to show evidence that this is not the case when increasing cigarette taxes.

The Tax Reform

In May 2016, through Decree 626, Argentina established an increase in the rate of II on cigarettes from 60% to 75% by 2016. This decree was later extended through Decree 15/2017 by December
2017. The tax burden before the tax reform of May 2016 was 68.5%. The average retail price in April 2016 was almost AR$ 26 per pack of 20 cigarettes (AR$ 3.1 in real terms) and internal taxes represented 47% of that retail price.

After the May 2016 reform, the tax pressure increased and reached almost 80% in December 2017. In that month, II represented almost 61% of the average retail price of almost AR$ 50 per pack of 20 cigarettes (AR$ 4.5 in real terms).

The impact of the tax increase on the average real price of a pack of 20 cigarettes was huge increasing the real retail price from AR$ 3.1 to AR$ 4.5 in only one month. This effect slowly disappeared in the subsequent months due to increasing inflation. This evidence shows that the effects of this tax reform affect real retail price in the short-run while these effects vanish in the long-run due to the inflation in the country. The tax reform affected differently retail prices of the cheaper and most expensive brands. Average retail prices of cheapest brands increase 40% in the month after the reform while for the most expensive brands, average retail prices increase 50%.

After the second quarter of 2016, there was a clear increase in the collection of internal taxes. Before the tax reform, tax revenues from II were around 4,500 million of constant AR$, while after the reform these revenues were almost 6,000 million. As with the real retail price this increment in government revenues from II diminish in time due to inflation.

Figure 1 shows the tax collection, in millions of constant pesos of the fourth quarter of 2017, coming from the FET before and after the implementation of Decree 626 of May 2016 (marked in the figure by the dotted vertical line). As can be observed, after the reform that increased the rate of II from 60 to 75%, the tax collection from the FET increased throughout the period analyzed.
Before the reform FET revenues were around AR$ 750 million and jumped to more than AR$ 850 million just after the reform.

Figure 1. Tax revenue collected by the FET

Note: author elaboration.

This evidence shows that it is possible to increase taxes on the consumption of cigarettes without affecting the FET funds. As mentioned above, affecting the FET funds is a political concern when there is a proposal to increment taxes on cigarettes.

3. Data and Statistical Properties

We use monthly data from January 2005 to June 2018 for consumption (approximated by the total sales of packages of 20 cigarettes), average real retail price of cigarettes and real income of the population, represented by the average remuneration of registered workers of the private sector.
published by the Ministry of Labor, Employment and Social Security. In order to specify the demand function for cigarettes, we first needed to find the statistical properties of these variables. Using the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979) we demonstrate that all three variables have individually a unit root. Then, using the Johansen Trace test (Johansen, 1991), we show that the three variables are cointegrated.

4. Methodology for estimating the demand price elasticity of cigarettes

Cointegration implies that the tobacco demand function can be specified with a model that takes into account not only the relationship between the variables in the short-run, but also in the long-run. Using an error correction model the long-run relationship among consumption of cigarettes, real retail price and real income is:

\[ c_t = k_i + \lambda_1 p_t + \lambda_2 y_t + u_t \]  

(1)

Where \( c_t \) is the natural log of consumption, \( p_t \) is the natural log of real retail price, \( y_t \) is the natural log of real income and \( u_t \) is an error term. \( \lambda_1 \) is the demand price elasticity and \( \lambda_2 \) is the real income elasticity. Equation (1) is the long-run equilibrium relationship.

In the short-run, the variables may not be in the steady state; therefore, we specify the dynamics of the short-run relationship using \( r \) lags in equation (2).

\[
\Delta c_t = \delta + (\alpha - 1) \left\{ c_{t-1} - \frac{k_{t-1}^*}{1 - \alpha} - \frac{\beta}{1 - \alpha} p_{t-1} - \frac{\gamma}{1 - \alpha} y_{t-1} \right\} + \sum_{j=1}^{r-1} \alpha_j^* \Delta c_{t-j} + \beta_0 \Delta p_t \\
+ \sum_{j=1}^{r-1} \beta_j^* \Delta p_{t-j} + \gamma_0 \Delta y_t \sum_{j=1}^{r-1} \gamma_j^* \Delta y_{t-j} + \theta_0 \Delta p_{2016} + \sum_{j=1}^{r-1} \theta_j \Delta p_{t-j} D_{2016} + \epsilon_t
\]  

(2)
Where $\tilde{\delta}$, $\alpha$, $\beta$, $\gamma$, $\alpha^*$, $\beta_0$, $\beta_0^*$, $\gamma_0$, $\gamma_0^*$, $\theta_0$ and $k_i^*$, are the parameters of the model and $\tilde{\epsilon}$ is a stationary error term. The value of $r$ determines the number of months involved in the long-run concept of the model. The term in levels between braces represents the solution of long-run equilibrium (1), while all the variables in first differences measure the short-run dynamics. Some of the parameters in (2) have an interpretation in terms of the short-run elasticities of cigarette consumption. In particular, $\beta_0$ is the short-run demand price elasticity and $\gamma_0$ is the short-run real income elasticity. To capture the impact of the tax reforms, we introduced a binary variable, $D_{2016}$, adopting the unity value since May 2016 when the reform was applied onwards. This indicator variable interacts with the price variables in the short-run specification (2). Then, the impact of the reforms on the short-run demand price elasticity is measured by: $\beta_0 + \theta_0$.

We estimate the ECM using the Engle-Granger methodology (Engle and Granger, 1987). This is a two-stage estimate. First, we estimate the long-term equilibrium relationship (1) and then we estimate the ECM (2) to obtain the short-run effects. We performed this estimation not only for the average real retail cigarette price, but also for the average retail price of the most expensive and cheapest brands. In this way, estimations will give us the sensitivity of the tax reforms on the consumption of cigarettes.

5. Results

Table 1 shows the estimation of equation (1) including a dummy variable for the Christmas bonus. The long-run demand price elasticity is -0.441, while the long-run real income elasticity is 0.127. These values imply that, in the long-run, a 10% increase in the real retail price reduces cigarette consumption by 4.41% and a 10% increase in real income increases the consumption of cigarettes by 1.27%. All estimators are statistically significant at usual levels of significance.
Table 1. Long-run Elasticity Estimation

Note: author elaboration.

Table 2 shows the estimation of the short-term dynamics, including the effect of the tax increase from May 2016. $Z(t-1)$ represents the estimation of term in levels between braces of equation (2). The variable $D_{2016}$ is a binary variable adopting the unity value since the month of May 2016 when the tax reform was implemented. As can be seen in the table, the short-run demand price elasticity without the effect of the reform is -0.91 while, as a result of the reform of May 2016, this value is -1.38. These results suggest that, in the short-run before the reform, a 10% increase in real retail price induced a 9% decrease in consumption, while after the tax reform the same increase in real retail price produced a decrease in consumption of cigarettes of around 14%. 

![Table 1](image.png)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-Statistic</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log (real retail price)</td>
<td>-0.441378</td>
<td>0.041681</td>
<td>-10.58949</td>
<td>0.0000</td>
</tr>
<tr>
<td>Log (real income)</td>
<td>0.127087</td>
<td>0.032331</td>
<td>3.93081</td>
<td>0.0001</td>
</tr>
<tr>
<td>Christmas bonus</td>
<td>-0.113140</td>
<td>0.023840</td>
<td>-4.745777</td>
<td>0.0000</td>
</tr>
<tr>
<td>Intercept</td>
<td>9.548160</td>
<td>0.254803</td>
<td>37.47268</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Adjusted R-Squared: 0.508313
F-Statistic: 56.48126
P-Value: 0.000000
To analyze the impact of the increase in the tax rate on cigarettes on the demand price elasticity of the cheapest cigarette brands, we repeat the analysis presented above. That is, we estimate the short- and long-run elasticities using the average price of the cheapest brands in the market. The dependent variable in these models is the natural logarithm of the total sales of cigarettes. As mentioned above, the strategy used to capture the impact of the reform was to use an indicator variable that adopts the unit value as of May 2016 and interact with the price variable of cigarette packages of cheap (expensive) brands used in the estimations. The long-run demand price elasticity estimation is -0.10 and it is statistically significant implying that an increase of 10% in

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**Table 2. Short-run Elasticity Estimation**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-Statistic</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z(t-1)</td>
<td>-0.807217</td>
<td>0.094831</td>
<td>-8.530189</td>
<td>0.0000</td>
</tr>
<tr>
<td>Δ Log(real retail price_{c1})</td>
<td>-0.911623</td>
<td>0.163823</td>
<td>-5.564695</td>
<td>0.0000</td>
</tr>
<tr>
<td>Δ Log(real retail price_{c2})</td>
<td>-0.279836</td>
<td>0.170829</td>
<td>-1.638103</td>
<td>0.1036</td>
</tr>
<tr>
<td>Δ Log(real retail price_{c3})</td>
<td>-0.060063</td>
<td>0.173316</td>
<td>0.350127</td>
<td>0.7268</td>
</tr>
<tr>
<td>Δ Log(real income_{c1})</td>
<td>0.334004</td>
<td>0.032027</td>
<td>10.42893</td>
<td>0.0000</td>
</tr>
<tr>
<td>Δ Log(real income_{c2})</td>
<td>0.26583</td>
<td>0.033446</td>
<td>7.821132</td>
<td>0.0000</td>
</tr>
<tr>
<td>Δ Log(real income_{c3})</td>
<td>0.108007</td>
<td>0.028520</td>
<td>3.787008</td>
<td>0.0002</td>
</tr>
<tr>
<td>Christmas bonus</td>
<td>-0.241369</td>
<td>0.021381</td>
<td>-11.28871</td>
<td>0.0000</td>
</tr>
<tr>
<td>Δ Log(consumption_{c1})</td>
<td>-0.373577</td>
<td>0.070903</td>
<td>-5.262917</td>
<td>0.0000</td>
</tr>
<tr>
<td>Δ Log(consumption_{c2})</td>
<td>-0.326439</td>
<td>0.05735</td>
<td>-5.726882</td>
<td>0.0000</td>
</tr>
<tr>
<td>Δ Log(real retail price_{c1}) × D_{2015}</td>
<td>-0.471339</td>
<td>0.218453</td>
<td>-2.157623</td>
<td>0.0326</td>
</tr>
<tr>
<td>Δ Log(real retail price_{c2}) × D_{2015}</td>
<td>-0.059271</td>
<td>0.221668</td>
<td>-0.267384</td>
<td>0.7896</td>
</tr>
<tr>
<td>Δ Log(real retail price_{c3}) × D_{2015}</td>
<td>-0.516597</td>
<td>0.220334</td>
<td>-2.344608</td>
<td>0.0204</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.017963</td>
<td>0.004576</td>
<td>3.929505</td>
<td>0.0001</td>
</tr>
<tr>
<td>Adjusted R-Squared</td>
<td>0.803356</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-Statistic</td>
<td>50.65259</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P-Value</td>
<td>0.000000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: author elaboration.
the real retail price of the cheaper brands induces a fall in the total consumption of cigarettes of only 1%. The long-run income elasticity is similar in magnitude to that obtained previously.

The short-run demand price elasticity is not statistically significant if the tax reform of May 2016 is not taken into account. The effect of the reform is to transform this elasticity estimation into a statistically significant number of -0.225. This implies that an increase of 10% in the real retail price of cheaper brands induces a 2.2% drop in total cigarette consumption.

The long-run demand price elasticity for the most expensive cigarette brands in the market is -0.287, which is statistically significant and suggests that a 10% increase in the real retail price of these brands of cigarettes produces a 2.8% decrease in total consumption. The income elasticity in both cheaper and expensive brands takes values similar to the case presented in Table 1. The short-run demand price elasticity without the effect of the tax reform is -0.146, statistically significant. This estimate implies that, in the short-run, a 10% increase in real retail price of the most expensive cigarette brands induce a 1.5% decrease in consumption. The impact of the tax reform in May 2016 brings the value of this elasticity to -1.266, which is also statistically significant, implying that the same increase in real retail price will reduce consumption by around 13%.

The evidence in this section shows that the tax reform of May 2016 induced an increase in the magnitude, in absolute value, of the short-run demand price elasticity. This increment in the demand price elasticity occurred both in the cheapest brands of the market and in the most expensive ones. However, the effect was larger for the most expensive cigarette brands.

5.1. Simulation of Results

To analyze the impact of the reform of May 2016 on cigarette consumption and tax collection, a simulation exercise was carried out. In the exercise, the tax burden is 79.7% and we use the long-
run demand price elasticity of -0.44 presented in Table 1. We construct three alternative scenarios according to three different demand price elasticity of cigarettes. The first one, a "neutral scenario" uses a demand price elasticity of -0.44. The second scenario, a "favorable scenario" from the point of view of tax collection, uses a demand price elasticity of -0.36, which comes from adding to -0.44 twice its standard error. The third scenario, an "unfavorable scenario" from the point of view of tax collection, uses a demand price elasticity of -0.52, which comes from subtracting from -0.44 twice its standard error. For April 2016, we use the following parameters in the simulation:

Consumption of cigarettes: 177,056,579 packages
Average retail price: AR$ 25.88 per package
Tax on cigarettes: AR$ 20.65 per package
Government revenue for taxes on cigarettes: AR$ 3,658,275,567
Exchange rate: 14.25 AR$ per dollar
Population (over 15 years old): 31,452,302
Consumption per capita: 67.53 packages per year

Figure 2 shows the changes in the government’s tax revenue for the three scenarios described above. Overall, the figure shows that there is enough room to increase taxes on cigarette consumption and increase government's tax revenue. Only in the unfavorable scenario, when the demand price elasticity is -0.52, does the figure show the point at which the government's tax revenues begin to fall as the tax rate increases and surpass a value of 70%. In the other two scenarios, the figure shows that the government could raise taxes on cigarettes up to 100% and improve their tax collection.

For example, if the government decides to increase the tax rate on cigarettes by 20%, it would increase tax revenues from US$ 417 million in the unfavorable scenario to US$ 570 million in the
favorable scenario. This increment of 20% implies taking the tax on the package of cigarettes to 26.70 pesos per package, and therefore bringing the average retail price to 31.92 pesos per package.

Figure 2. Change in government revenue for each tax increase

![Graph showing change in government revenue for each tax increase]

Note: author elaboration.

At the same time, this increment in the cigarette tax rate would decrease the average per capita consumption of cigarettes from 50.3 to 46.1 packs per year in the favorable scenario, and to 44.2 packs per year in the unfavorable scenario, as illustrated in Figure 3.

Figure 3 shows the average annual consumption per capita of cigarette packages according to the tax rate on cigarettes for the three scenarios presented above. As can be seen, cigarette consumption decreases at a faster rate as the magnitude (in absolute value) of the demand price elasticity is higher.
6. Conclusion

We studied the impact on demand price elasticity, cigarette consumption and tax collection of a recent tax reform in Argentina. This reform increased the rate of internal taxes from 60 to 75%. Cigarette tax structure in Argentina is very complex. All the tax bases for cigarette consumption are related. Therefore, any modification of a tax affects the collection of the rest of the taxes. This is important given that the funds raised by one of the taxes, the FET, are allocated among the tobacco provinces according to the value of tobacco production. These provinces are opposed in the congress to any tax reform that negatively affects these funds. In other words, any tax reform that the government wants to implement should not significantly affect the amount collected by the FET to have a chance to pass as a law. In this context, the only selective tax that does not
adversely affect the FET is the internal tax. We provided evidence that the increment in the rate of internal taxes produced an increment in the revenue collected by the FET.

We estimate an ECM, obtaining short- and long-run demand price elasticities. We found a long-run elasticity of -0.441, suggesting that a 10% increase in the real retail price of cigarettes would decrease consumption by around 4.4%. The estimation of the short-run demand price elasticity was -0.911 without the tax reform, whereas if we consider the reform, this short-run elasticity increases in absolute value to -1.385. The tax reform transforms a short-run demand price elasticity for the average retail price of the cheapest brands that is not statistically significant in a statistically significant one with a value of -0.225, implying that an increase in the real price of cheaper brands induces a 2.2% drop in total cigarette consumption. For the most expensive brands, the impact of the May 2016 tax reform brings the value of the short-run demand price elasticity to -1.27, which is also statistically significant. This number implies that a 10% increase in the real retail price of these brands will reduce consumption by around 13%. Our simulations show that it is possible to increase taxes on cigarette consumption and induce an increment in tax revenues and a reduction in consumption.
References


