Smuggling, Taxes and Cigarettes in Colombia

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Abstract:

This paper quantifies the relationship between legal cigarette sales, smuggling and tobacco taxes in Colombia. Using a two-part econometric approach, the paper concludes that (i) taxes correlate negatively to legal sales and positively with illegal sales, and (ii) increments in the smuggling flows into the country relate negatively to legal sale

1. Introduction

Cigarette taxes are a prevailing policy to address tobacco use worldwide (WHO, 2015). However, tax increments can boost smuggling, harming the legal market while jeopardizing tobacco taxes' public health and fiscal benefits (Lovenheim, 2008).[1] While developed economies tend to worry about the domestic interstate impact of smuggling, the concern in developing countries revolves around international cross-border issues. Still, despite its importance, the literature on organized smuggling is scarce, leading recent literature reviews to explicitly exclude it from their analysis (DeCicca, Kenkel, and Lovenheim, 2022).

This paper adds to the literature exploring the relationship between tobacco tax increments, the demand for legal cigarettes, and the expansion of the illicit cigarette trade in the context of a developing country. Using proprietary Nielsen data on the retail cigarette market, we quantify the effect of tobacco tax increments on legal and smuggled cigarette sales, fitting next a demand model for legal cigarettes where we estimate a novel elasticity of legal sales to contraband.

Colombia is an ideal case to study because tax increments overlap with a sustained expansion of cigarette smuggling. Between January 2013 and December 2019, consumption fell 3.1 percentage points, while smuggling expanded from 8.74% to 10.63%. Our results show that a 10% increase in tobacco taxes reduces legal sales by 11.4% but increases smuggled cigarette sales by 7.2%. Furthermore, the estimated price elasticity of demand for legal cigarettes elasticity is -0.27, while a 10% increase in smuggling reduces legal sales by 0.3%. These results imply that taxes have decreased the legal cigarette market while boosting illicit trade.

2. Methods

Data

We base our estimates on Nielsen data on price and quantity available for Colombian retailers between 2008 and 2020. Unfortunately, the information is not comparable across the entire period due to methodological changes. Therefore, we estimate a reduced form model of cigarette sales on taxes using data from September 2017 to December 2020 (denoted as Nielsen1). Then we estimate a demand model for legal cigarettes on smuggling using data from 2008 to 2018 (denoted as Nielsen0). Unfortunately, the unavailability of tax data before 2017 prevents us from combining both datasets.

Nielsen's data is available monthly for 15 cities and disaggregated for each of the 17 cigarette references legally sold in Colombia, implying that the unit of observation is at the reference, month, and city level. According to industry standards, we classify each reference into a given sales segment, i.e., premium groups, high-price references, etc. Based on earlier efforts by Maldonado et al. (2018), we define smuggled cigarettes as those references sold but not legally registered in Colombia.

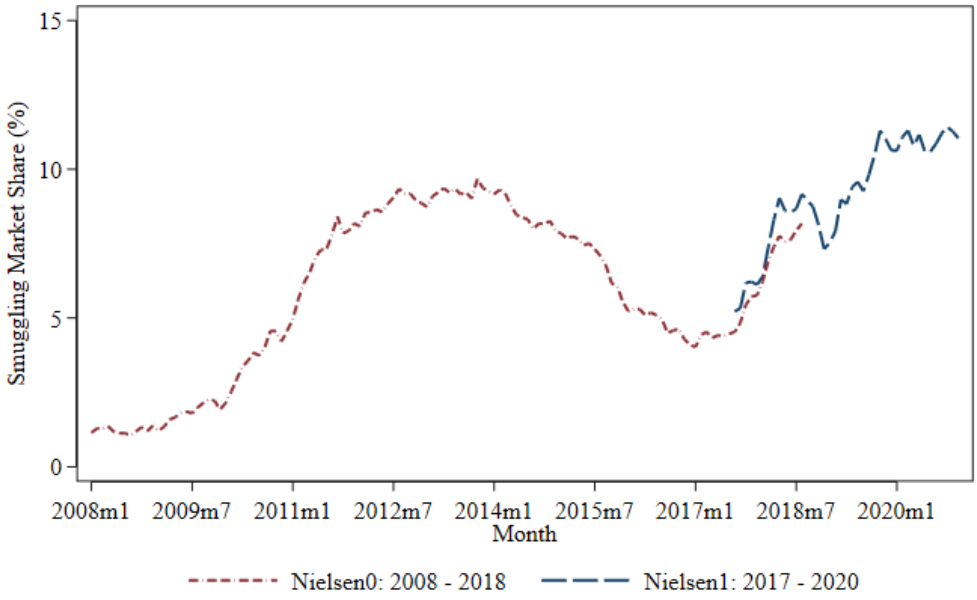
Lastly, we collect reference-specific cigarette taxes in Colombia from the domestic statistical agency (DANE) and the Ministry of Finance. Since 2016, the cigarette tax has included a flat and an *ad valorem* component. The flat component, fixed for all cigarette products, equals COP 1,400 in 2017

[1] For other related references see: Buehn & Mohammad (2012); Galbraith & Kaiserman (1997); and Gruber, Sen & Stabile (2003)

and COP 2,100 in 2018. Starting in 2019, it annually increases by the consumer price index plus four percentage points. The *ad valorem* tax is equivalent to 10% of the taxable base. DANE certifies the taxable base semiannually according to the average price in the distribution channels. This tax is specific to each cigarette reference.[2]

Figure 1 depicts a long-run view of cigarette contraband. The reversion of the declining smuggling trend reported between 2014 and 2016 coincides with the tax increments implanted since 2016.

Figure 1: Cigarette smuggling in Colombia: 2008-2020

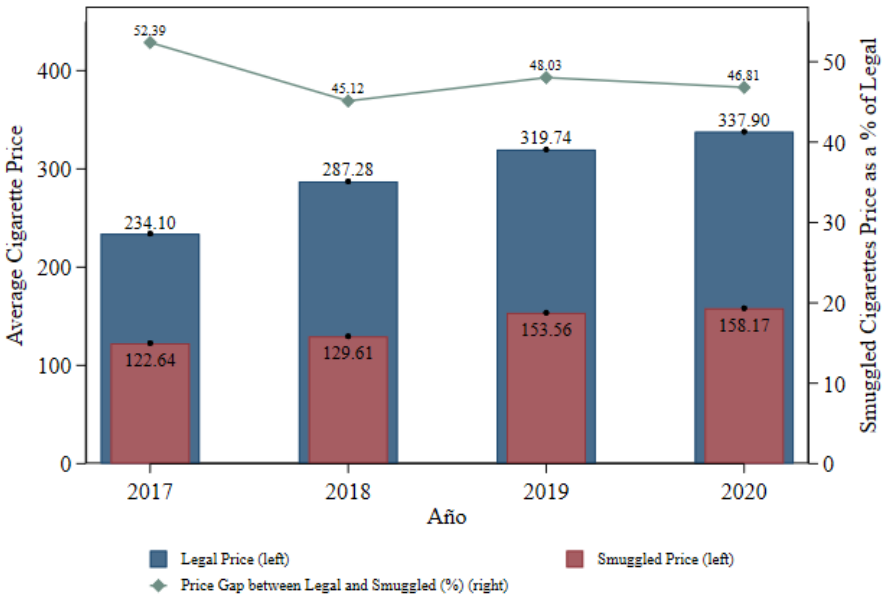


Source: Nielsen. Own calculations.

Figure 2 shows that smuggled reference prices were 52% of legal ones in 2017. By 2020 illegal reference prices are 47% of legal ones.

Figure 2: Price gap between legal and smuggled cigarettes

[2] Descriptive statistics available upon request to the authors.



Source: Nielsen. Own calculations.

Empirical Strategy

We first assess the tax impact on the quantities sold for both legal and smuggled references estimating a reduced-form expression between August 2017 and December 2020:

$$\log Q_{it} = \alpha + \beta \log T_{it} + \delta Covid19_t + \theta X_t + \gamma_i + \varepsilon_{ti} \quad (1)$$

where $\log Q_{it}$ denotes the logarithm of the quantities sold of reference i over time t. $\log T_{it}$, exogenously set by the government, is the logarithm of the total tax, $Covid19_t$ is an indicator variable between March and August 2020, capturing the inherent transportation difficulties for legal and illicit cigarettes during that period. X_t includes a linear trend to control for effects influencing consumption and quarterly fix effects for seasonality while γ_i are reference fix effects. Our coefficient of interest, β, captures the impact of taxes on the total volume of cigarettes sold.

Next, using data from January 2008 to September 2018, we follow Gruber et al. (2003) approach to estimate a demand model for legal cigarettes.

$$\log Q_{ict} = \alpha + \beta \log P_{ict} + \gamma \log C_{ct} + \theta X_t + \delta_{ic} + \varepsilon_{tic} \quad (2)$$

$\log Q_{ict}$ denotes the logarithm of the observed legal sales for $i's$ reference in city c and month t. keeping the subscripts, $\log P_{ict}$ is the logarithm of the price (including the tax). X_t include a linear trend and quarter fix effects. The former controls any pattern in consumption derives from other potential regulatory measures, while the former deals with seasonality. δ_{ic} are city-reference fix effects, which control for any fixed differences in tastes for smoking across cities. The variable of interest is $\log C_{ct}$ contraband product sales in city c and period t.

Price endogeneity in equation (2) is dealt with by taking advantage of the panel structure of the data to develop an instrument. We use the average price of the same reference in other cities as an instrument for the price of reference i in city c during month t (Hausman et al., 1994).

3. Results

Column 1 (Table 1) shows the results for equation (1) for all references in the sample, column 2 uses low and medium segments, and column 3 uses high and premium ones. Our results suggest that a 10% tax increase reduces sales of legal cigarettes by 11%. This effect is driven by the low and medium segments because, relative to its price, the flat tax is higher. Column 4 shows that for a 10% tax increase, smuggling rise by 7%.

Although taxes reduce demand, contraband tends to dilute the expected effect, which complements Stehr's (2005) findings for the U.S. and validates Gallego et al.'s (2020) findings discussed earlier.

Table 1: The Effect of Tobacco Taxes on Cigarettes Sales

	(1) Log Sales All Segments	(2) Log Sales Low and Medium Segments	(3) Log Sales High and Premium Segments	(4) Log Sales Smuggled
Log Total Tax	-1.140***	-1.652***	0.289	0.725***
	(0.254)	(0.322)	(0.269)	(0.216)
Covid-19 [2020m3, 2020m8] (=1)	-0.199***	-0.177**	-0.260***	-0.263***
	(0.059)	(0.074)	(0.075)	(0.048)
Observations	1,574	321	746	41
Quarter FE	Yes	Yes	Yes	Yes
Linear Trend	Yes	Yes	Yes	Yes
References FE	Yes	Yes	Yes	

Robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1
Source: Nielsen; DANE. Own calculations.

Column 1 (Table 2) estimates the entire sample for equation (2), while column 2 shows the results for the cheaper market segments. The former suggests that a 10% increase in price leads to a 2.6% decrease in legal cigarette sales.

The results are consistent with National Cancer Institute and WHO (2016), who find that in high-income countries, the aggregate demand elasticity ranges between -0.2 and -0.6 (pg. 133), while in middle and low-income countries, it ranges between -0.2 to -0.8 (pg. 134). On Colombia, James et al. (2019) and Gallego et al. (2020) report an elasticity of -0.44 and -0.66, respectively. When considering only low market segments, we find a slightly larger elasticity of 2.9% for every 10% increase in the price.

Column 1 (Table 2) shows that a 10% increase in smuggling reduces demand by 0.3%. Column 2, for low-segment references, reports that a 10% increase in smuggled cigarette sales declines legal sales by 1%. The latter finding explains earlier findings by Gallego et al. (2020), who estimate with limited data that low-price cigarette consumers are more likely to consume smuggled cigarettes.

Noting that the average sales of legal cigarettes per reference are 2.5 million units per city, the result implies that if smuggling in the city increases by 10% (i.e., 260,000 units), legal sales will fall by 7,500 units each month, on average. Considering the 102 references, it would represent around 750,000 units decline in legal sales.

Table 2: Effect of Smuggling on Legal Cigarettes Sales

	(1) Log Sales All Segments	(2) Log Sales Low Segments
Log Price	-0.266***	-0.287***
	(0.053)	(0.069)
Log Smuggled Sales	-0.031***	-0.101***
	(0.009)	(0.018)
First Stage F Statistics	24,411.10	12,749.76
Observations	45,667	10,095
Quarter FE	Yes	Yes
Linear Trend	Yes	Yes
Town x Reference FE	Yes	Yes

Robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Source: Nielsen; DANE. Own calculations.

4. Conclusion

There is a significant gap between the price of smuggled and legal cigarettes, explained by the increase in tobacco taxes in recent years. Indeed, we find that taxes negatively affect the legal market while incentivizing illicit trade. If one only studies the legal market, it overestimates the tax effectiveness in reducing tobacco demand -especially in developing countries. We conclude that tobacco taxes explain the relative decline of the legal market and the sustained increase in smuggling.

We complement the above exercise using a demand model, finding that a 10% increase in smuggled cigarettes in Colombia reduces the demand for legal ones by 750,000 units. Although Colombia's tax policy has shrunk the cigarette market, it has significantly contributed to an increment in contraband. It reveals the need for further understanding markets where illegality is rampant in developing countries to design an optimal tax.

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