Measuring illicit cigarette trade in Colombia

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ABSTRACT

Background By 2016, tobacco industry provided the only illicit trade estimates in Colombia and used these to discourage tax increases since the 1990s. To establish the viability of a threefold hike in the excise tax, policy makers needed unbiased estimates of the illicit cigarette.

Objective To estimate the size of illicit cigarette trade in five Colombian cities (63% of the market), analyse characteristics of smokers of illicit cigarettes and compare market share results with one industry-funded survey.

Methods Street cross-sectional survey with smokers' self-report on consumption pattern, last purchase information and direct observation of smoker's packs. Sampling frame: smokers, men and women, 12 years old or older, all income levels, resident in five Colombian cities (Bogotá, Medellín, Cali, Cartagena and Cúcuta) with 1 733 316 smokers in 2013. Sample size 1697, simple random sample by city, sampling weights based on age groups and cities. Confidence level 95%, margin of error 3.5% for Bogotá and Medellín and 5% for the other three cities. Data collection period: 24 August–14 September 2016.

Results Illicit cigarettes represent 3.5% of consumption in the five cities, a much lower estimate than the industry data. There are significant differences across cities, with Bogotá at the bottom (1.5%) and Cúcuta at the top (22.8%).

Conclusion The low overall penetration of illicit cigarettes in Colombia indicates that the industry's warnings against tax increases are not justified. The limited importance of tax levels as determinant of consumption of illicit cigarettes is also suggested by the differences across cities, all of them with the same tax regime.

INTRODUCTION

Tobacco consumption is an important risk factor for non-communicable diseases,[1 2] and cigarette prices and affordability are its main drivers in Colombia. Understanding the behaviour of illicit trade of cigarettes is necessary to advance interventions to reduce affordability. It brings cheaper cigarettes to the marketplace, and tobacco industry (TI) discourages tax increases claiming that higher taxes will just shift consumption to illicit cigarettes.

Colombia is an upper middle-income country with a moderate smoking prevalence of 10.9% by 2015, approximately half of the global average (22.7%) and two-thirds of the America's average (17.2%).[3] For population aged 12–65 years, the Psychoactive Substances Consumption Survey (PSCS) shows a last-month prevalence of cigarette smoking in urban areas[i] equal to 12.95% in 2013[4] and a decreasing trend from 17.06% when compared with 2008.[5] In 2016, the median price of a 20-stick cigarette pack in supermarkets was COP$ 3128, approximately $2.5 international dollars (supplementary figure 1). Following a rapid adjustment in 2010 after a moderate tax increase, prices increased slightly above the inflation rate until December 2016. Colombia displayed until that year the second lowest price in the Americas.[6]

Many developing countries like Colombia do not have official or academic estimates of illicit trade of cigarettes. Thus, estimates from the TI are the only source of information. The industry takes advantage of this circumstance and overestimates the magnitude of illicit trade with the purpose of preventing governments from increasing tobacco taxes.[7–9] The problem is exacerbated by the weak monitoring capacities of subnational authorities and lacking coordination and appropriate tools to control cigarette distribution across the country.[10]

Independent estimates of illicit trade are performed by agents not related to the TI. They can apply the best methods available[11] to provide consistent and unbiased estimates of the problem and reduce information asymmetries, thereby elucidating its real magnitude. International evidence has shown a systematic and consistent gap between academic and TI estimates of illicit cigarette trade, including the UK,[12 13] South Africa,[14] Hong Kong[15] and Warsaw.[16]

The purpose of this paper is to estimate the penetration of illicit cigarette (PIC) trade in Colombia using direct methods. It also contributes in filling the gap of independent measurements of illicit cigarette trade in developing countries, as most of research in this area has been done for developed countries,[17] only a few have been done for developing countries,[18–20] and there were no previous independent estimations for Colombia.

Smuggling in Colombia deals with a wide number of goods (weapons, fuel, cattle, alcohol, cigarettes and so on) and actors. Some belong to large-scale criminal networks, with power and resources to pay off local authorities or intimidate those who try to denounce crimes. Others come from families with a long-standing, and even respected, tradition in smuggling.[21] The presence of weakening factors to institutional capacity to fight illicit activities has been a constant source of concern. For instance, illegal groups limit

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[i]Areas with more than 30 000 people. According to the National Department of Statistics in Colombia (DANE), the proportion of population living in rural areas was 23.9%, and the National Health Survey for Colombia in 2007 shows that there are no significant differences in smoking prevalence between urban and rural areas.

the State's ability to control some areas of the territory such as the extensive border with Venezuela[22] or the importance of informal distribution channels in sales of legal and illegal cigarettes. There is a strong synergy between money laundering and illicit trade. Illicit trade of cigarettes has been used by the drug cartels as a mechanism of money laundering, and the TI implicitly participated in that business in order to evade taxes.[23] These connections between the cigarette market and other illegal activities suggest that measuring PIC in Colombia at the supply side suffers from underestimation bias associated with measuring illicit activities. Thus, estimation of illicit cigarette trade from the demand side as the one presented in this paper is more accurate and precise for the particular characteristics of the market in Colombia.

METHODS

The variable of interest for this study was the PIC, that is, the fraction of the local market that is captured by cigarettes produced abroad that were illegally introduced in the local market. This fraction can be measured either as the proportion of the consumption of cigarettes (PIC-C) identified as illicit or as the proportion of individuals smoking illicit cigarettes (PIC-I).

After considering the suitability of different methods[11] to the Colombian case, the preferred alternative was a mix of two methods: (1) smokers self-report of cigarettes' characteristics and consumption pattern to identify imported cigarettes and (2) examination of cigarette packs in the hands of these smokers. The first method allowed to identified smuggling within smokers that buy single sticks. The second was important mainly as a source of information to validate self-report.

Sample

The PSCS was chosen as the sampling frame. PSCS interviewed individuals at home and collected information on tobacco and alcohol consumption, as well as the use of psychoactive drugs. However, because of the PSCS's anonymity protocol, contact data at the individual level (address and phone number) was not accessible. Because of the lack of a sampling frame with smokers' contact data, the sampling frame were all individuals who were smoking on the streets at the time of the survey.

Due to financial restrictions, we prioritised urban areas where the market for cigarettes was concentrated, that is, we used the PSCS to identify the cities with the highest number of smokers[ii], and we limited the scope of the study to five cities, namely, Bogotá (Colombia's capital), Medellín, Cali, Cúcuta and Cartagena. Under this restriction, the sampling frame or universe is the smoking population aged 12–65 years living in the five biggest markets of cigarettes in Colombia. These cities represent 45.9% of the population covered in PSCS and 57.3% of the smokers (figure 1)[iii]. Thus, the sample is statistically representative of each of the five cities and representative of the five cities as a whole.

In Colombia, there were no previous independent studies measuring penetration of illicit trade. Therefore, we defined the variance for the sample design based on the only information available, that is, from studies funded by the industry,[24–26] so we

used a penetration of 20% for Bogotá, 15% for Medellín and Cali and 25% for Cartagena and Cúcuta.

The sample of 1697 individuals was chosen using simple random sampling (SRS) with a 95% CI for each city and margin of error of 3.5% for Bogotá and 5% for the other cities. SRS for proportions was the most appropriate method given that PSCS has independent data for each city, allowing comparisons among them. The sampling error was smaller for Bogotá and Medellín in order to have bigger samples in the cities where more smokers are located. Expansion weights were calculated based on the probability of inclusion by quinquennial age groups from ages 12 to 62 years, and the last group was composed of individuals older than 62 years.

To minimise biases related to selection of respondents, the sample was restricted to match the PSCS's distribution of smokers by age and gender. To do so, places visited by surveyors were distributed across space (neighbourhoods) and time (hours), and quotas of age and gender were closely monitored during fieldwork. Spatial distribution of the sample in each city considered the surrounding areas of educational institutions, business districts, shopping districts, bars and restaurants, public transportation stations, city parks and residential areas. It also included 'San Andresitos', places where illicit trade is openly available. In addition, survey spots were chosen in a way that a wide area of each one of the cities was covered by the survey crew to control for income-related biases. Identification of smokers in these public areas was relatively easy, because since 2008 Colombia has a comprehensive smoke-free areas regulation in place with good compliance levels. Thus, the survey included residents of each city 12 years or older who were found smoking in the spots selected for the fieldwork. People smoking products other than cigarettes, children under 12 and non-residents were excluded.
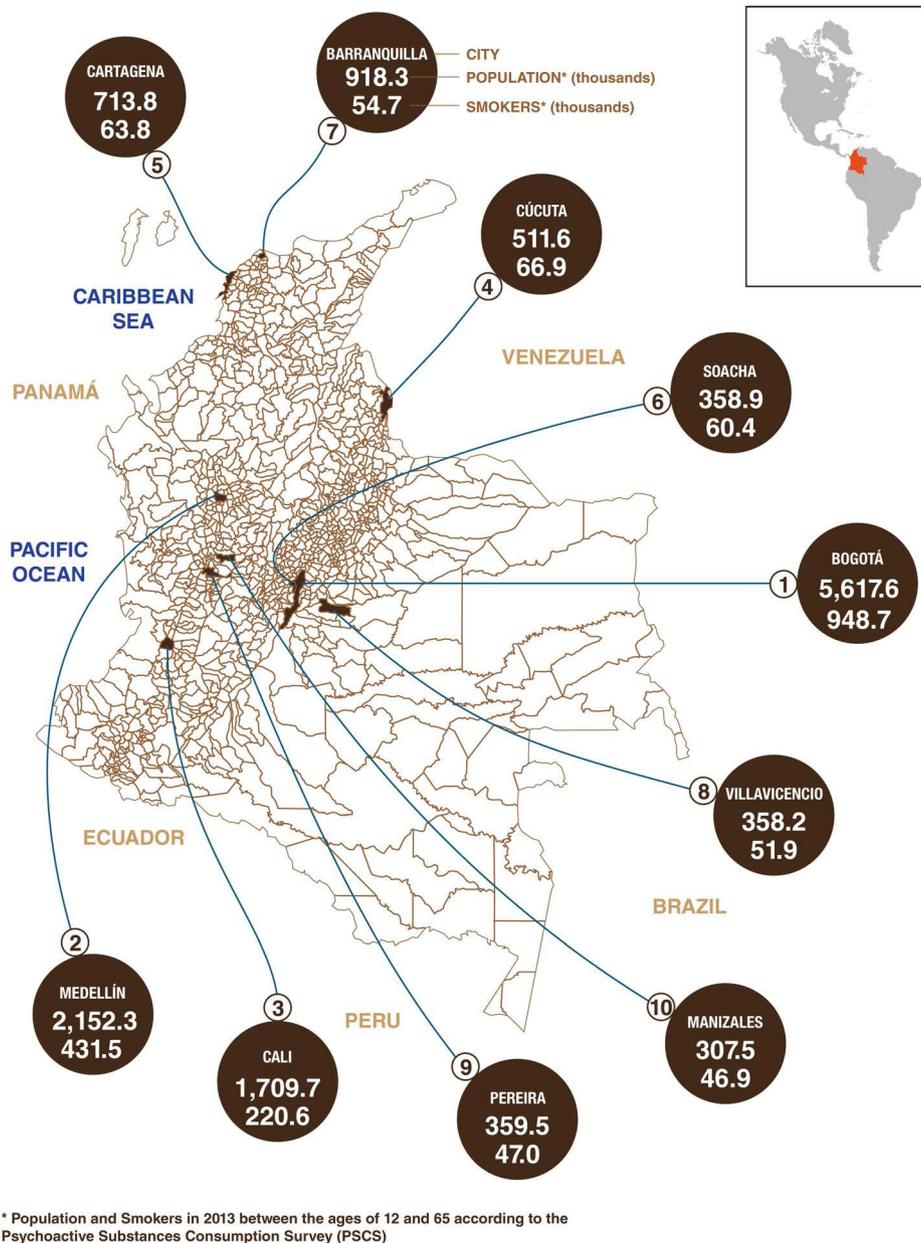
Survey

We developed a cross-sectional face-to-face survey where a short questionnaire is applied individually to people who are smoking on the street. By interviewing them individually we create conditions to minimise social desirability bias. The survey records characteristics of the person's cigarette pack or stick. Therefore, smokers were not directly asked about whether the cigarette was legal or not, only about observable characteristics of the product and price. To avoid rejection, the number of questions was minimised to guarantee that the survey did not last for more than 6 min, the average time a cigarette burns when lighted. Questions capture only essential information for identification of illicit cigarettes and characterisation of the smoker. In order to comply with local laws and regulations as well as applicable international norms and standards, the research protocol, including the questionnaire, was submitted to and obtained approval by a local ethics committee.

Questions were divided in four sections[iv]. The first section is composed of a filter to include only residents[v], the informed consent and basic characteristics of the individual such as age, gender and location. The second section characterised the individual's smoking behaviour and the pack of cigarettes, when available. The third section captured data on characteristics of the last purchase such as brand, format[vi], price and place of purchase. Finally, the last section collected information on socioeconomic

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[ii]An alternative closer to the variable of interest was the number of cigarettes. However, we did not consider it because in surveys on streets the number of cigarettes is not observable.

[iii]There are negligible discrepancies between the total number of smokers shown in the map and the total number of smokers in the PSCS due to differences between the aggregated data reported in PSCS and the microdata we used for the map.

[iv]A copy of the questionnaire can be provided on request.

[v]This avoids the bias coming from including tourists.

[vi]Carton, packs of 20, 18 or 10 sticks, and sticks.

Figure 1 Top 10 Colombian cities with the highest number of smokers.

characteristics such as level of education, employment status and income. The name given to the survey is Demand for Illicit Cigarettes Survey (DEICS), and the specific application for Colombia (COL) in 2016 is called DEICS-COL-2016.

Identification

Identification of illicit trade was based on the information provided by smokers. There were two types of smokers. Type 1 were the ones who had the pack with them[vii]. In these cases, it was possible to record information on brand, country of origin, health warning and the import/production statement[viii] directly from the pack, and a photograph of the package was taken for quality control of data. Type 2 were people with no pack available. For these cases, identification relied on information from last purchase's brand and price, and information on country of origin, health warning and the import/production statement was not available.

To classify observations as illicit, we applied three filters to all observations. The first filter was to check last purchase's brand for both types of smokers with the Tobacco Packaging and Labeling Committee (TPLC) in the Ministry of Health in Colombia[ix]. The TPLC is responsible for authorising the local circulation of brands, packaging and labelling of tobacco products. Therefore, any cigarette pack or stick found in Colombia whose brand has not been authorised by the TPLC is illicit.

[vii]All type one smokers were willing to show the pack.

[viii]The statement is either 'imported to Colombia (importado para Colombia)' for packs produced in other countries, or 'produced in Colombia (producido en Colombia)' for locally produced packs.

[ix] We did not consider submission of type one smokers' information to the TPLC because we considered information directly taken from the pack was more reliable than self-reported information on brand.

Table 1 Distribution of observations classified as illicit trade by criteria

Classification criteria	Pack available	Pack not available	Stick	Total
Physical features and price	20	3	5	28
Only price	6	4	4	14
Only physical features	19	5	38	62
Total	45	12	47	104

Estimates based on DEICS-COL-2016. 104 observations out of 1697 were identified as smokers of illicit trade.

COL, Colombia; DEICS, Demand for Illicit Cigarettes Survey.

Observations whose last purchase's brand was not found in the TPLC list were classified as illicit[x].

In the second filter, for type 1 smokers, we classified the available pack as foreign when the country of origin was not Colombia, including those that did not register any country of origin[xi]. Within the foreign packs, we classified as illicit those that did not have any of the following mandatory elements: (1) Colombian health warning and (2) import/production statement.

The third filter used a price threshold, based on the fact that the current tax scheme implicitly determines a minimum price for legal cigarettes, similar to the method used in Brazil.[20] Any price under COP$100 for sticks, COP$1700 for 20-stick pack and COP$20 000 for carton was classified as illicit. With these criteria, the binary variable illicit trade equals 1 for observations that classified as illicit in any of the filters and 0 otherwise.

Fieldwork

The fieldwork was done from 24 August to 14 September 2016. All surveyors have at least a bachelor degree and previous experience in surveys. Their training took 1 day, 70% of it explaining the survey and providing instructions and 30% conducting pilot surveys. Surveyors were endowed with a tablet containing the questionnaire and a vest and a cap identifying the person as sent by the Liga Colombiana contra el Cáncer. Relating the survey to health goals and not to a regular market analysis made possible to get a low rejection rate of 7.77%, that is, 132 individuals refused to answer the survey.

Statistical analysis

Estimation of PIC trade used statistical inference by combining expansion factors with individuals identified as smoking illicit cigarettes (Fieldwork). For descriptive statistics, most variables are self-explanatory as they were included exactly as defined in the questionnaire, and dummies were used to represent categorical variables in econometric estimations. The only exceptions were the variables illicit trade and smoking intensity. The construction of the first one was described in detail in Fieldwork, and smoking intensity is defined as the number of cigarettes smoked in a week based on reported consumption frequency. All the analysis was done in Stata/MP V.13.0.

[x]All brands produced in Colombia every year have presented at least one request to the TPLC. Therefore, we assumed all brands with no record of submission to the TPLC are foreign.

[xi]It might be possible that some packs reported as foreign were produced in Colombia. However, there is no evidence of illegal cigarette production plants in the country to support this hypothesis.

RESULTS

Colombia has two taxes on tobacco products: excise tax and value-added tax (VAT). In 2016 VAT was 16%, and the values of the excise tax components were: an ad valorem tax (10%) and a specific tax (COP$701 per 20-cigarette pack). In December 2016, a tax reform increased the VAT to 19% and the specific tax to COP$1400 in 2017, COP$2100 in 2018 and annual updates from thereon equal to the percentage increase in the consumer price index plus four percentage points (see tax structure in supplementary figure 2).

Out of 1697 surveys, we found 104 observations that can be classified as illicit trade. Table 1 shows the number of cases of smokers classified under each criterion.

Columns in table 1 identify the cases where smoker showed the pack (45 smokers), reported purchase by pack but did not show the pack (12) and cases where smoker reports purchase by stick (47). A percentage of 59.6 of the suspected illicit cigarette smokers were identified using only the physical characteristics (brand, warnings and imported label), while cases identified exclusively by the price criteria represent 13.4%. This suggests that a multiple criteria approach is more reliable to identify cases of smokers with illicit cigarettes.

Estimates of PIC-C and PIC-I at the national level as well as for each city are presented in table 2. Measured as proportion of cigarettes, PIC in the main urban areas (national) in Colombia is estimated to be 3.46%, while measured as fraction of people smoking illicit cigarettes, PIC is 3.35%. By city, Bogotá has the lowest PIC-C with 1.53%, followed by Medellín (3.41%), Cali (3.69%), Cartagena (8.94%) and Cúcuta (22.84%). This spatial distribution shows that illicit cigarettes are mostly found in cities close to border areas, especially the ones close to the border with Venezuela (Cúcuta) and to the Caribbean (Cartagena).

One advantage of the mixed method is that it allows an examination of correlates of consumption of illicit trade of cigarettes. Univariate analysis can be performed by testing the null hypothesis of PIC-I equal among the various categories of many variables using a χ^2 distribution. These tests, not shown here, suggest that age, age of initiation, location (city) and education have significant differences of penetration of illicit trade among categories. A more general multivariate approach is to estimate a probit model of PIC-C on correlates. The model should be estimated by city; however, because PIC-I was extremely low in cities such as Bogota, the lack of variation in the endogenous

Table 2 Estimates of penetration of illicit trade

Total/city	Indicator	Estimate	95% CI	
Total (national)	PIC-C	3.46	2.59	4.33
	PIC-I	3.35	2.49	4.2
Bogotá	PIC-C	1.53	0.95	2.12
	PIC-I	3.19	2.36	4.03
Medellín	PIC-C	3.41	2.54	4.27
	PIC-I	1.73	1.11	2.35
Cartagena	PIC-C	8.94	7.58	10.29
	PIC-I	3.82	2.91	4.73
Cúcuta	PIC-C	22.84	20.85	24.84
	PIC-I	15.55	13.83	17.27
Cali	PIC-C	3.96	3.03	4.88
	PIC-I	3.39	2.53	4.25

Estimates based on DEICS-COL-2016. CIs estimated using a normal approximation.

COL, Colombia; DEICS, Demand for Illicit Cigarettes Survey; PIC-C, proportion of the consumption of cigarettes; PIC-I, proportion of individuals smoking illicit cigarettes.

Table 3 Correlates of consumption of illicit trade

Variable	Category	Marginal effect	SE
Gender	Male (base)		
	Female	−0.0004	0.0024
Age		0.0004*	0.0002
Education	None/elementary/middle school (base)		
	High school/associate degrees	0.0056	0.0044
	Bachelor/master degree	−0.0044	0.0037
Occupation	Worker (base)		
	Unemployed	0.0125	0.0122
	Retired/disabled/other	0.0293	0.0318
	Student	0.0635*	0.0288
	Housekeeper	0.0141	0.0149
Smoking intensity		<0.0001	<0.0001
Age of smoking initiation		−0.0001	0.0003
City	Bogotá (base)		
	Medellín	−0.0040†	0.0022
	Cartagena	−0.0021	0.0036
	Cúcuta	0.0619‡	0.0181
	Cali	0.0009*	0.0004

Marginal effects of probit estimates based on DEICS-COL-2016. Estimates from 1678 observations, less than the sample size because of missing values in age of initiation. Age, age of initiation and smoking intensity included linear and squared terms. Marginal effects calculated at the mean of covariates. Heteroskedasticity-robust SEs in the last column.
*At 5%.
†At 10%.
‡Denotes significance at 1%.
COL, Colombia; DEICS, Demand for Illicit Cigarettes Survey.

variable affects the numerical convergence of the estimation and estimates were not reliable. Table 3 shows the marginal effects of the probit model at the national level.

The estimated parameters show statistical significance for age, occupation and location. At the mean of the covariates, older individuals have higher probability of smoking illicit cigarettes. Also, students have higher chances of smoking illicit cigarettes compared with workers. Regarding locations, there is a higher chance of smoking illicit cigarettes for smokers in Cali and Cúcuta compared with Bogotá, and the magnitude is extremely higher in Cúcuta. At the other side, smokers in Medellín have lower chances of smoking illicit cigarettes relative to Bogotá. Age, smoking intensity and age of initiation were included in linear and squared terms to control for non-linearities; despite that, intensity and age of initiation do not seem to affect consumption of illicit trade.

DISCUSSION

The estimation of PIC presented in this paper is the first academic study in Colombia, where TI has estimated PIC-C at 13% and PIC-I at 9%.[25] The TI's overestimation of approximately 10 percentage points is similar to Australia's case,[13] and it casts doubt on TI's evidence. A review of the limited information available for the industry's surveys in Colombia[24 25] revealed potential biases, the most important ones being (1) the small size of the sample to make inferences at the local level as well as for urban and rural areas, and (2) a spatial distribution of smokers that does not match the one observed in PSCS.

One strength of this study is that it overcomes some limitations of previous analysis. Measurement of cigarette illicit trade

has been performed by the customs agency (DIAN) and by the TI. DIAN usually relies on indirect measurements (often called triangulation) that compare other countries' export records to Colombia with Colombia's import records from its trade partners.[26] Meanwhile, the industry conducts smokers' surveys, apparently done at the place of residence.[24 25] Triangulation studies are helpful to identify technical smuggling[27] (p 1570). Tobacco products rank relatively low in the 'undervaluation' category compared with other products (US$14 million in 2012[xii]) and report very small values in other types of technical smuggling.[28]

Some portion of cigarette smuggling in Colombia seems to come from large-scale organised networks and bootlegging[11] (p 6), making it more difficult to detect it using official records. Triangulation methods do not provide information about distribution of smuggled goods within the country, which is one important aspect to produce recommendations and to analyse market dynamics. This limitation leads to consider direct measuring methods, like counting discarded packs, which does not seem to be an appropriate alternative since most smokers in Colombia do not buy packs, and it provides no information on consumption patterns and socioeconomic characteristics of the smokers. Our study overcomes some of these limitations by using a rigorous statistical design that allows to make unbiased statistical inferences about PIC, and for such design it considers some unique characteristics of the Colombian case, for example, inclusion of single stick usage.

Information of PIC before this study came from TI's public statements[29] and seizures records. Based on that information, the authorities perceived that the market was flooded by Paraguayan and Uruguayan brands. Even though this study was not designed to measure penetration by country of origin, one unexpected finding was that there was only one case of a Paraguayan brand and no cases at all for Uruguayan brands. Even the active search of illegal brands in Bogotá did not find cigarettes from these origins. When discussing this issue with the authorities one explanation was that the Paraguayan cigarettes found in seizures probably were on their way to Ecuador. What this study can conclude is that the overall presence of Paraguayan cigarettes is low, given the moderate estimates of illicit trade penetration.

Despite its strengths, the paper has some limitations. First, the identification criteria do not permit us to determine if some cigarettes classified as part of the illicit trade bundle were introduced by cross-border shopping (a typical form of tax avoidance). This is likely to be a small source of upward bias in the aggregate penetration figure. However, in a border city like Cúcuta, it may inflate results in a significant way. Second, identification criteria are more likely to capture cases of tax evasion of foreign brands. Nonetheless, other manifestations of illegality are set aside. For instance, sales of domestically produced cigarettes not reported to the tax authorities; other types of non-compliance different from tax payment such as domestic brands sold without approval of the TPLC or sold by stick. Since the focus of this work is illicit trade, we leave the analysis of these cases for future research. Third, the low magnitude of PIC might suggest that it is the result of a sample biased towards high-income areas. However, high-income smokers are less likely to smoke on the street as compared with lower income smokers, and so if there is any bias,

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[xii]In 2013 tobacco market sales were reported to reach COP$ 1.65 trillion. At the average exchange rate of that year the undervalued cigarettes estimated by DIAN would represent about 1.5% of total sales.

it must be in the other direction with an under-representation of high-income smokers.

CONCLUSIONS

This paper contributes with the first independent estimation of illegal trade of cigarettes in Colombia and aims to reduce information asymmetries that have undermined Colombia's implementation of the Framework Convention on Tobacco Control[30] and the Protocol to Eliminate Illicit Trade in Tobacco Products.[31] Estimated PIC is 3.5%, far below previous estimates by the industry (14%). Illicit trade of cigarettes does not represent a threat for tax revenues from tax increases in Colombia because the magnitude of the problem is moderate. In addition, even after the tax reform in 2016, cigarette prices in Colombia are below the regional average, so there are no incentives to take advantage of price differentials with surrounding countries.

Significant differences in PIC across cities have some implications. First, tobacco taxes, homogeneous across space, do not play an essential role on illicit trade. Second, illicit trade is a problem in areas close to borders and at the same time these areas are the ones with the lowest number of smokers. Thus, if tobacco taxes lead to any increase in PIC, this should not affect areas where most smokers are located, and therefore should not significantly affect tax revenues. Third, even in areas where illicit trade increases in response to tobacco taxes, only a small proportion of smokers are expected to switch to illicit cigarettes. This seems to be consistent with the results of the survey, showing that flavour, not price, is the main reason for smokers to choose a cigarette brand. Fourth, policies to fight illicit trade need a differential approach based on understanding the local characteristics of the problem, especially in border regions.

For future research, this study constitutes a baseline to evaluate the impact of the 2016 tobacco tax reform on illicit trade. In addition, the lack of matching between the brands found in this study and the ones seized by the border police (Policia Fiscal y Aduanera (POLFA) raises the hypothesis that Colombia is used as a way to get into other markets (ie, Ecuador), but not as the final destination of illicit trade.

What this paper adds

► This paper addresses the challenges of performing a direct measurement of illicit trade in a middle-income country.
► Results provide the first independent estimate of illicit trade penetration in the cigarette market in Colombia.
► Market share of smuggled cigarettes is 3.5%, although there are remarkable differences among cities.
► The current size of illicit trade in Colombia should not discourage authorities to increase cigarette taxes and the differences with tobacco industry's estimates stress the need to use independent studies to support policy decisions and monitor illicit trade of cigarettes.

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