Size and Characteristics of Tobacco Tax Evasion in Bosnia and Herzegovina 2025

Economics for Health Working Paper Series

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Paper No. 26/1/1

January 2026

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Suggested citation: Gligorić, D., Vidović, N., Ritan, V., & Borović, Z. (2025). *Size and characteristics of tobacco tax evasion in Bosnia and Herzegovina* 2025 (Economics for Health Working Paper No. 26/1/1). University of Banja Luka. www.economicsforhealth.org/research/size-and-characteristics-of-tobacco-tax-evasion-in-bosnia-and-herzegovina-2025-working-paper-series/

Acknowledgments

University of Banja Luka (Faculty of Economics) is funded by the Economics for Health team (formerly Tobacconomics) at Johns Hopkins University (JHU) to conduct economic research on tobacco taxation. JHU is a partner of the Bloomberg Philanthropies' Initiative to Reduce Tobacco Use. The views expressed in this document cannot be attributed to, nor can they be considered to represent, the views of JHU or Bloomberg Philanthropies.

Abstract

Background

Understanding the size and nature of the illicit tobacco market is important to improving tobacco control and cutting down on tax evasion. Since 2009, Bosnia and Hercegovina (B&H) has applied a mixed excise system combining both specific and ad valorem taxes, but rates are low and have not been raised and consequently cigarette prices have stayed low and become even more affordable, especially after the COVID-19 pandemic. The recent rise in excise revenues and stamp issuance likely points to higher legal sales and a shrinking illicit market, which made up 32.3 percent of consumption in 2019.

Methodology

This study is based on primary data collected in April and May 2025 from a stratified sample of 2,000 households across Bosnia and Herzegovina, covering all entities, cantons/electoral units, and 45 municipalities, including those bordering Croatia, Montenegro, and Serbia. Illicit tobacco consumption was determined using five criteria for manufactured cigarettes (MC) and heated tobacco products (HTP): presence of a tax stamp, health warning labels (HWL), place of purchase, brand legality, and price. For hand-rolled (HR) tobacco, only the first four criteria were applied. Determinants of tax evasion were analyzed using a logistic regression (logit) model to estimate the probability of illicit consumption.

Results

Results show a significant decrease in illicit tobacco use in Bosnia and Herzegovina, especially in the MC category, compared to a previous survey conducted in 2019 (Gligoric et al., 2021). In 2019, illicit MC and HR made up almost a third of the market; now, this share is only 8.4 percent. For MC, which

accounts for 91 percent of total tobacco consumption according to our survey, the size of the illicit market dropped from 18.1 percent to 7.3 percent. The illicit share of HR products remains high at 81.6 percent, although this represents a decrease of about 14 percentage points compared to 2019, when it was 95.4 percent. HTP consumption is mainly legal, with only one uncertain case regarding the tax stamp criteria.

The results highlighted several key factors linked to cigarette tax evasion in Bosnia and Herzegovina. It found that heavy smokers, older people, women, and those living in larger households are more likely to evade taxes. Tax evasion is also more common among smokers in the Brčko District and in municipalities near the Serbian border.

On the other hand, individuals from higher-income households are less likely to engage in tax evasion.

Conclusions

The findings provide evidence-based insights into the drivers of tobacco tax evasion in B&H, underscoring the need to design more targeted and effective fiscal and non-fiscal measures to reduce both the size of the illicit tobacco market and the overall consumption of illicit cigarettes. The research also clearly indicates a significant decline in the illicit tobacco market, suggesting that further increases in excise taxes can be implemented to curb smoking without the risk of expanding the illicit market.

JEL Codes: H26, H71, I18, F14, C25

Keywords: tobacco tax evasion, tobacco taxation, illicit tobacco market, cross-border smuggling, Bosnia and Herzegovina

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1. Introduction

Since 2009, tobacco tax policy in Bosnia and Herzegovina (B&H) has been based on a combination of an ad valorem excise (currently set at 42 percent of the retail price) and a specific excise (currently around 0.84 EUR per pack of 20 cigarettes). The policy envisioned gradual annual increases in the specific excise (by 0.077 EUR per pack each year); however, these incremental changes have proven insufficient to bring about a substantial reduction in tobacco consumption.

Under pressure from the tobacco industry, in 2019 policy makers halted increases in specific excise rates, citing concerns about the expansion of the illicit market while also noting that the legally mandated threshold for excise increases (90 EUR per 1,000 sticks) had been reached. The tobacco industry argued that higher cigarette prices act as a so-called "tailwind" for the growth of illicit trade.

Although the total tax burden on cigarettes in Bosnia and Herzegovina (B&H) accounts for approximately 85 percent of the retail sales price (RSP), cigarette prices remain significantly lower than in the European Union. In the aftermath of the COVID-19 pandemic (2020–2023), cigarette price increases have lagged behind the growth of both real gross domestic product (GDP) and the consumer price index (CPI), making cigarettes increasingly affordable. During that period CPI increased by 22 percent and real GDP increased by 10 percent, while cigarette prices increased by only 12 percent (Gligoric et al., 2025).

While government revenue from tobacco excise and the number of issued excise stamps indicate a downward trend in the illicit tobacco market, we believe this trend was already underway before the beginning of this research and cannot be attributed solely to recent developments. The marked increase in affordability, combined with a relatively low price elasticity of demand, suggests that a substantial part of the growth in legal cigarette consumption is driven by rising smoking prevalence and increased smoking intensity. To

counteract these trends and prevent further increases in smoking rates in B&H, cigarette prices must keep pace with real economic growth and inflation. This implies that specific excise taxes—being the primary mechanism for driving up prices—should be increased in a timely and consistent manner.

In our previous study based on the Survey on Tobacco Consumption in Southeastern European countries (STC-SEE), conducted in 2019, we found that 35.3 percent of smokers in Bosnia and Herzegovina (B&H) evaded tobacco taxes and 32.3 percent of total tobacco consumption was illicit (Gligorić et al., 2021). In recent years, policy makers in B&H have intensified efforts to combat the illicit tobacco market. Moreover, in the neighboring country of Montenegro—a major source of cigarette smuggling into B&H historically—the illicit market has declined due to major government interventions (Tobacconomics, 2023), while both cigarette prices and excise taxes have increased significantly. Taken together, these trends point to a hypothesis that the share of illicit tobacco consumption in B&H is likely lower today than it was in 2019.

Considering that a reduction in the illicit market indicates greater willingness among policy makers to increase excise taxes, and that understanding the determinants of tobacco tax evasion helps implement measures to curb the illicit market, we estimate the size and determinants of tobacco tax evasion in B&H in 2025. The most widely used methods to measure the illicit cigarette market are consumer surveys, littered pack surveys, and gap analysis. Consumer surveys are particularly valuable because they allow the collection of additional data that helps reveal purchasing patterns and motives. Primary data were collected in cooperation with the World Bank office in B&H, based on a sample of 2,000 adults, which ensures more reliable results compared to the survey conducted in 2019 with 1,000 adults. To identify tax evasion, five key criteria are considered: the place of purchase, the legality of the brand, the presence of a tax stamp, health warning labels (HWL), and the price paid for a pack of cigarettes. The determinants of tobacco tax evasion will be estimated using a binary choice (logit) model.

The aim of this research is to explore the size and determinants of tobacco tax evasion in B&H in 2025, updating the findings from our previous research and reflecting recent developments in the illicit tobacco market. By identifying the scale of the illicit market and the key factors driving tax evasion, the study provides policy makers with a valuable evidence base for designing effective strategies and measures to reduce the smoking epidemic in Bosnia and Herzegovina. The paper is structured as follows: section two reviews the relevant literature; section three describes the methodological approach; section four presents the results of the study; and section five discusses these results, summarizes the key conclusions, and provides policy recommendations.

2. Literature Review

Tobacco taxation is widely recognized as one of the most effective public policy instruments for reducing tobacco use and its associated health and economic burdens (Guindon et al., 2014). Sometimes the efficiency of tax policy is undermined by the prevalence of illicit tobacco trade, particularly in countries with limited institutional capacity and complex tax structures. B&H, like many other countries in the Western Balkans, faces persistent challenges in addressing tobacco tax evasion, which directly diminishes the intended public health and fiscal effects of tobacco control measures (Vladisavljevic et al., 2022).

The World Health Organization Framework Convention on Tobacco Control (FCTC) defines illicit trade in tobacco products as “any practice or conduct prohibited by law and related to the production, shipment, receipt, possession, distribution, sale, or purchase of tobacco”, which typically includes illegal practices such as smuggling, sale of untaxed products, and distribution of counterfeit or unregistered brands (Joossens et al., 2014).

These practices manifest in several ways. One primary method involves the cross-border movement of tobacco products, where goods move from lower-

tax jurisdictions to higher-tax jurisdictions without paying the correct tax (if any at all). This is generally referred to as smuggling.

Another common occurrence is the unauthorized manufacturing of tobacco goods domestically where the producer is not paying excise taxes. In some instances, there is counterfeiting, where producers manufacture registered brands without the consent of the brand's owner, though this practice is relatively rare even by the admission of major tobacco companies with well-known brands (Ross & Blecher, 2019). These counterfeit brands can be smuggled from one jurisdiction to another or manufactured in one jurisdiction.

In other instances, there is production of genuine, registered brands in situations wherein manufacturers report only a fraction of their actual output to tax authorities (Guindon et al., 2014), typically called under-reporting. A further practice is the production of so-called illicit whites, where unregistered brands are produced in one jurisdiction, often legally, and then sold in another without paying partial or full taxes.

In B&H specifically, there is a somewhat common practice in which unbranded cigarettes are manufactured and sold, predominantly in the open-air market. Tax evasion was very prevalent in B&H in 2019, particularly in the smaller market for hand-rolled (HR) tobacco products. Evidence suggests that as much as 93.3 percent of HR tobacco consumed in B&H was untaxed, and 18.6 percent of manufactured cigarette (MC) users also evaded tobacco taxes (Vladisavljević et al., 2022).

To assess the legality of tobacco products, several criteria are employed internationally. The most widely adopted framework, the Identification of an Illicit Pack (IIP), defines a cigarette pack as illicit if it lacks a valid tax stamp, displays an inappropriate or missing health warning label, is purchased from unauthorized sources, or is sold at a price substantially below the official market rate (Joossens et al., 2014).

A recurring argument by the tobacco industry is that higher excise taxes lead to increased illicit trade. However, empirical studies contradict this claim (Joossens et al., 2014; Divino et al., 2022a). Joossens et al., (2014), in a comprehensive survey across 18 European countries, found no significant correlation between cigarette prices and the share of the illicit market. Rather, the availability of illicit products was closely linked to the strength of institutions and the presence of informal distribution networks. Supporting this conclusion, a group of researchers reported that in B&H, higher tax evasion rates were recorded in municipalities bordering countries with known high levels of illicit trade, as well as in regions with weaker enforcement capacities (Gligorić et al., 2021; Vladisavljevic et al., 2022).

Driezen et al. (2018) specifically investigate cross-border cigarette purchasing within Europe, revealing that smokers in regions bordering lower-price countries are significantly more likely to engage in such behavior. In Poland and Germany, for example, where such borders exist, the odds of purchasing out-of-country cigarettes were over four times higher among residents near these borders.

Socioeconomic characteristics have also been identified as relevant factors in shaping consumer behavior related to tax evasion. Licht et al. (2011) and Guindon et al. (2014) highlight that lower-income populations are more likely to use price-minimizing strategies, such as switching to illicit or cheaper tobacco products, rather than engaging in cross-border or duty-free purchasing. These findings are consistent with patterns observed in B&H, where tax evasion is more prevalent among older smokers, women, and those from low-income households (Vladisavljević et al., 2022).

A study from Brazil (Divino et al., 2022b) found that illicit cigarettes account for 36.08 percent of their market and demonstrated that strengthening tobacco control measures—by raising the costs of smuggling (and thus increasing the price of illegal cigarettes) and implementing higher tobacco taxes and minimum prices—can effectively reduce both illicit and legal

tobacco consumption. Another study from Brazil contradicted the tobacco industry's claim that higher prices stimulate illicit tobacco consumption, showing that, following tax-driven cigarette price increases, the shift in demand from the legal to the illicit market was not statistically significant (Divino et al., 2022a).

The reviewed literature emphasizes the multifaceted nature of tobacco tax evasion. While legislative frameworks in B&H establish the basis for controlling the illicit market, further empirical investigation is necessary to capture the scope and dynamics of illicit trade practices.

3. Data and Methodology

3.1 Determining cases of tax evasion and avoidance

The data for this study were collected through a computer-assisted personal interviewing (CAPI) survey conducted across all administrative units of Bosnia and Herzegovina, including both border and non-border municipalities and urban and rural settlements. The fieldwork took place from April 4 to May 7, 2025. A random sampling approach was employed, with the sampling frame derived from the 2013 population census to ensure representativeness. The survey instrument consists of 67 questions, of which 60 are respondent-answered and seven are recorded by interviewers (for example, observational or technical data).

The questionnaire is structured into sections that begin with sociodemographic and screening questions, followed by detailed modules on different tobacco and nicotine products (manufactured and hand-rolled cigarettes, heated tobacco, e-cigarettes, smokeless tobacco, and waterpipe), including consumption patterns, expenditures, purchasing behavior, cessation attempts, and attitudes toward taxation and regulations. It concludes with questions on exposure to smoking restrictions, advertising, and a classification section capturing income and household composition.

Out of 2,000 interviewed households, after applying weights (age, gender, region, and residence, based on the last available census from 2013), we found 860 cases of smokers from which data on their tobacco products could be obtained (Kantar Index Kosova, 2025). Though the questionnaire mirrors the one used in 2019 for comparison purposes, the one from 2025 put additional focus on novel products, such as heated tobacco products (HTP) and electronic cigarettes.

In order to identify tax evasion and tax avoidance, the first step is to review the legislation in B&H regarding the legal places of purchase, legal brands, and health warning labels (HWL) and to define prices of tobacco products in 2025.

The legal places of purchase in B&H are retail and wholesale stores and duty-free shops. There is no official list of tobacco brands that can be sold in B&H, but the Indirect Taxation Authority (ITA) of B&H regularly publishes the list of tobacco brands sold in the country and their retail prices (Večernji list, 2024; Faktor, 2025). Prices of the most-sold brands and the cheapest brand of cigarettes based on the sales of excise stamps are also from the ITA.

A pack of manufactured cigarettes (MC) is classified as illicit if it meets at least one of the five characteristics of illegal packs listed in Table 1 below (Vladisavljević et al., 2022; Tobacconomics, 2023).

Table 1. Criteria for defining illicit tobacco products[1]

	Point of sale (POS)	**Health warning label (HWL)**	**Tax stamp**
Tax-evasion criteria for MC and HR tobacco	Legal: - retail - wholesale stores - duty-free shops	Illegal: - Lack of a local HWL defined by the rulebook which states: label needs to cover at least	Illegal: - Lack of a proper tax stamp that is defined by the Rulebook on Excise Tax Stamps for Tobacco Products, Alcoholic Drinks,

[1] Detailed information available in the Appendix.

	Point of sale (POS)	Health warning label (HWL)	Tax stamp
	Illegal: - sales in open-air markets and on the streets	35% of the front side and 50% of the back side, have a predefined text specified by the rulebook, and comply with regulations on the size of the letters, position, text label color, and background color; OR - lack of a foreign HWL for products bought outside B&H. We compared packs and data obtained in the survey to the rules in the rulebook and approximated whether the HWLs were in compliance.	Fruit Brandy, Coffee and Wine; OR - lack of a foreign tax stamp, except for cases that were bought in duty-free shops. We compared packs and data obtained in the survey to the rules in the rulebook and visually approximated whether the B&H stamps complied with them (if all elements were present).
Legislation in B&H	Law of excise of B&H (Official Gazette 49/09, 2009)	Rulebook on labeling the packaging of tobacco products (Republika Srpska), (Official Gazette of Republika Srpska. no. 124, 2011) Law on Control and Limited Use of Tobacco, Tobacco and Other Smoking Products (Official Gazette of the Federation of B&H, No. 38/22)	Law of excise of B&H, (Official Gazette 49/09, 2009) Rulebook about excise stamps for tobacco products, alcoholic beverages, fruit natural brandies, coffee and wine, (Official Gazette BiH, no. 50/09, 74/14, 2009) Rule book on the application of the law of excise duties in B&H (Official Gazette no. 50/09, 80/11, 48/12, 74/14, 85/17 and 4/18, 2009)

	Point of sale (POS)	Health warning label (HWL)	Tax stamp
Additional criteria to identify tax evasion			
Legality of the brand		**Price of the pack (only for MC)**	
Illegal: - **The brand is not included on the domestic market price list** (publicly available) **(Večernji list, 2024; Faktor, 2025)**		Illegal: - The price of the pack is less than 70% of the retail price of the cheapest legal brand (5.90 BAM) (Večernji list, 2024; Faktor, 2025).	

A pack of hand-rolled cigarettes (HR) is considered illicit if it meets one of the four criteria: lack of a tax stamp, illegal POS, lack of HWL, or being an illegal brand in B&H. The price criterion was not applied to HR because price data are available per kilogram of cut tobacco, whereas respondents reported consumption in cigarette sticks, making accurate calculation impossible.

3.2 Probability model

To estimate the probability of a smoker purchasing illicit tobacco (evading tobacco taxes), the following binary choice model is estimated:

$$\Pr(Y_i = y_i) = f(X\beta),$$

where y_i equals 1 if the inspected pack is illicit, and 0 otherwise; and X stands for independent variables: sociodemographic characteristics, smoking-related behaviors, and determinants of cross-border cigarette purchasing.

The probability of tax evasion is estimated via a logit model using weighted data from our 2025 tobacco usage household survey in Bosnia and Herzegovina (TUHSBH), fielded by Kantar Index Kosova (Kantar Index Kosova, 2025).

Two separate models with the following dependent variables are estimated[2]:

- overall model, which includes both MC and HR cigarette smokers; and
- MC model, which includes only MC smokers.

In the analysis, the identification of illicit packs or IIP represents the dependent variable, while the independent variables in the regression model include control variables from three key categories usually used in these kinds of estimations: sociodemographic characteristics, smoking-related behaviors, and determinants of cross-border cigarette purchasing (see Appendix Table A12).

Several sociodemographic characteristics are included as explanatory variables in estimating the probability of tax evasion. These include: household income, household income per capita, employment status, education level, type of residence (urban versus rural), age, gender, and region of residence. In addition, smoking behavioral characteristics are considered as potential determinants of tax evasion, namely smoking intensity (measured by the number of cigarettes smoked per day) and smoking status (daily versus less-than-daily smoking).

This study also estimates the potential impact of cross-border smuggling on the probability of tax evasion. Typically, bordering countries with lower cigarette taxes and a higher share of illicit tobacco consumption can serve as potential sources from which illicit cigarettes are smuggled into the country. B&H shares borders with three countries: Serbia, Montenegro, and Croatia.

Croatia, as a European Union member state, has higher cigarette taxes and prices, along with stronger non-price tobacco control measures. Therefore, in this research, Croatia is not identified as a risk country regarding cross-border smuggling.

[2] Due to a negligible number of HR smokers—only 35 (26 illicit and nine licit)—the probability model for HR cigarette smokers is not estimated.

The situation is different when it comes to Serbia and Montenegro, although it has evolved over recent years. In 2019, when we estimated the determinants of tobacco tax evasion in B&H for the first time, the price of the most-sold cigarette brand was 2.4 EUR in B&H, 2.1 EUR in Serbia, and 2.3 EUR in Montenegro. Thus, the price was the highest in B&H. In 2025, the price of the most-sold pack of cigarettes (Marlboro Gold) is the lowest in B&H, at 3.3 EUR, while it is 4.1 EUR and 4.0 EUR in Serbia and Montenegro, respectively.

The latest estimation of the illicit tobacco market in Serbia found that the overall proportion of illegal MC consumption accounts for 2.4 percent of the MC market (Vukmirović et al., 2024). On the other hand, the tobacco industry in Serbia is strong, and the country shares a long border with B&H. Therefore, in our models we account for the probability of tobacco tax smuggling from Serbia, out of caution. Although the share of the illicit market for cigarettes in Montenegro decreased by half in 2022 to 22.1 percent, compared to 51 percent in 2019 (Tobacconomics, 2023), the current share may still be higher than in B&H. Therefore, we also examine the potential impact of cross-border smuggling from Montenegro.

An additional argument for including potential cross-border smuggling from Serbia and Montenegro is based on our 2019 results, which showed that proximity to the border with Serbia and Montenegro, combined with lower cigarette prices in those countries, significantly increases the likelihood of tax evasion in the border municipalities of Bosnia and Herzegovina.

To account for the impact of cross-border cigarette smuggling from Serbia and Montenegro, two variables are included in the analysis:

- a dummy variable for municipalities bordering Serbia or Montenegro; and
- the driving distance from the municipality to the nearest border crossing with Serbia or Montenegro.

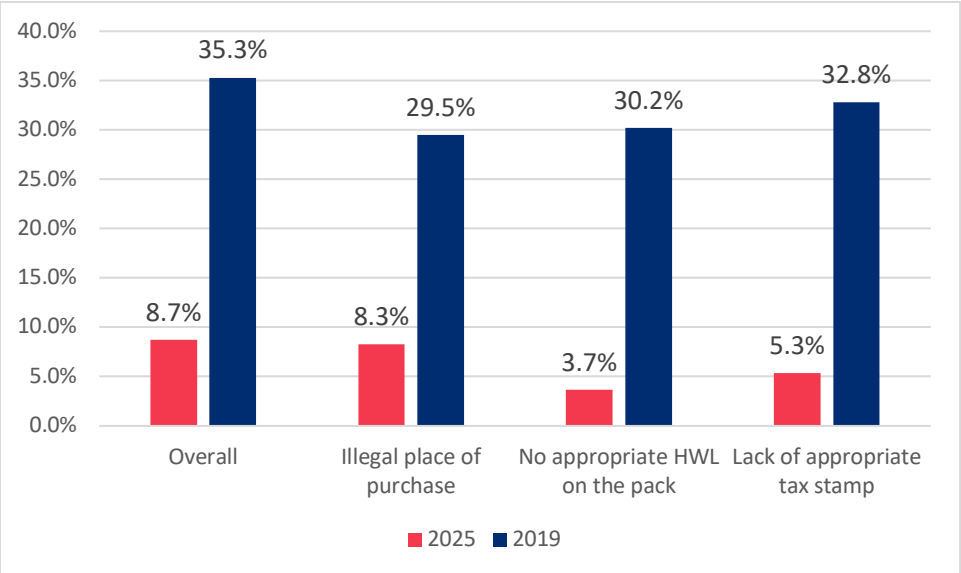
The use of a price-to-distance ratio, a commonly applied measure combining two key factors that influence cross-border cigarette purchasing, was not appropriate in this case, as cigarette prices in both Serbia and Montenegro are currently higher than in B&H.

4. Results

4.1 Size and characteristics of tax evasion in B&H

The sample includes 860 current smokers of MC, HR, and heated tobacco product (HTP) cigarettes (after applying sample weights), with 725 of them being MC smokers. Among them, 8.7 percent are identified as tax evasion cases (Appendix Table A1). Results show that out of 860 cases, 8.3 percent were bought at an illegal POS, 5.3 percent did not have a legal tax stamp, 4.9 percent were from illegal brands, and 3.7 percent did not have an adequate HWL (Figure 1 and Appendix Table A1). There were only seven cases of tax avoidance (six of MC and one of HTP), which is insufficient for deeper analysis. This result could have been expected, considering that cigarette prices in Bosnia and Herzegovina are lower than in neighboring countries and most other European countries.

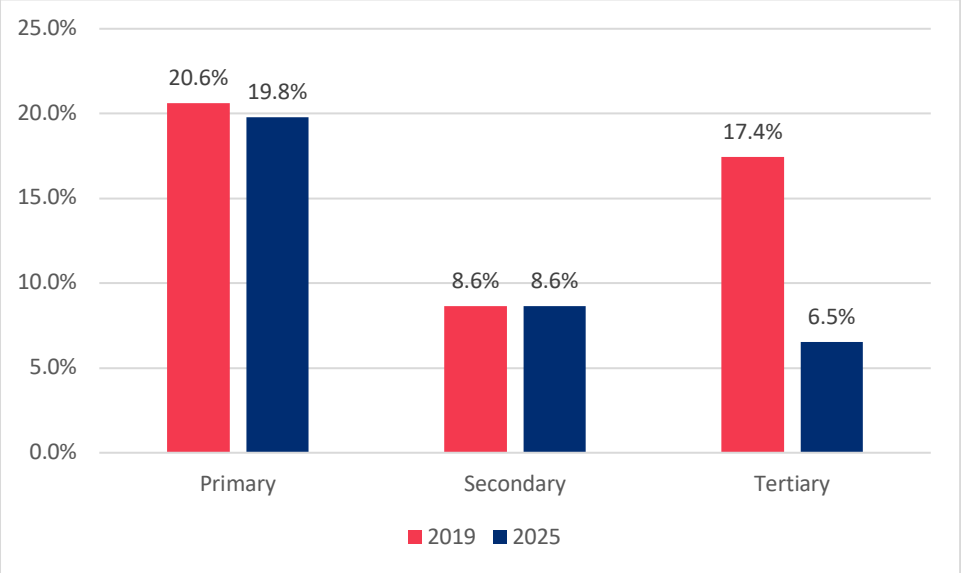
Figure 1. Tax evasion by criteria (MC, HR, and HTP, n=860)



Sources: Appendix Table A1 and STC-SEE data; authors' calculations

Tobacco tax evasion appears to be marginally more prevalent among male smokers (8.8 percent) compared to female smokers (8.6 percent), as shown in Appendix Table A2. The prevalence of tax evasion is notably higher among individuals with lower educational attainment, with 19.8 percent of those with primary education engaging in tax evasion, compared to 8.6 percent among those with secondary education and 6.5 percent among those with tertiary education (Figure 2). Furthermore, smokers residing in rural areas exhibit a higher rate of tax evasion (9.4 percent) than those in urban areas (7.8 percent). Regional differences are also observed: smokers in the District of Brčko (BD) have the highest rate of tax evasion (10.5 percent), followed by those in the Federation of Bosnia and Herzegovina (FB&H), at 8.8 percent, and the Republic of Srpska (RS), at 8.4 percent (Appendix Table A2). The majority of smokers purchase cigarettes from legal points of sale (91.7 percent), with 96.3 percent reporting that their packs display the appropriate health warning labels (HWLs), and 94.7 percent indicating that their packs bear the correct tax stamp (Appendix Table A3).

Figure 2. Likelihood of buying illicit cigarettes among smokers, by education level (N=860)



Sources: Appendix Table and A1 and STC-SEE data; authors' calculations

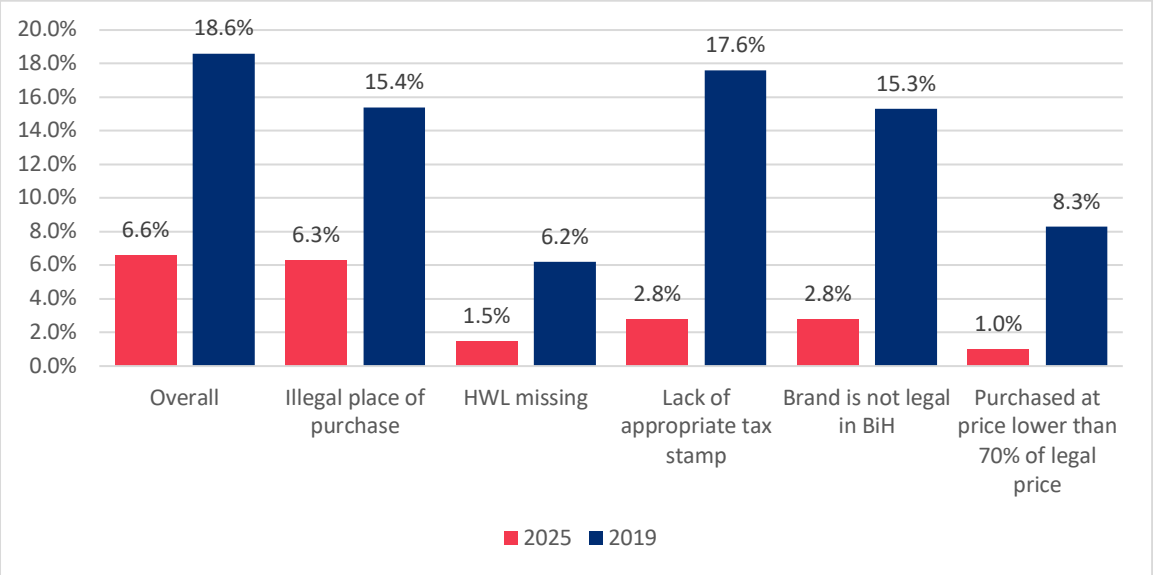
There is only one observed case of illicit HTP; however, due to the fact that this pack is borderline illicit (possible removal of the original tax stamp), there is no space for deeper analysis of this category.

4.2 Manufactured cigarette tax evasion

Among 725 smokers of MC, 6.6 percent of packs that are classified as tax evasion cases are identified as such based on at least one of the defined criteria (Appendix Table A4).

Among the defined criteria, the most frequent indicator of tax evasion is purchase at an illegal POS (6.3 percent), followed by lack of tax stamp and illegal brand (both 2.8 percent). Only 1.5 percent of packs did not have a HWL, and one percent were purchased at a price below 70 percent of the legal retail price for that brand (Figure 3 and Appendix Table A4).

Figure 3. MC tax evasion cases by criteria (n=725)

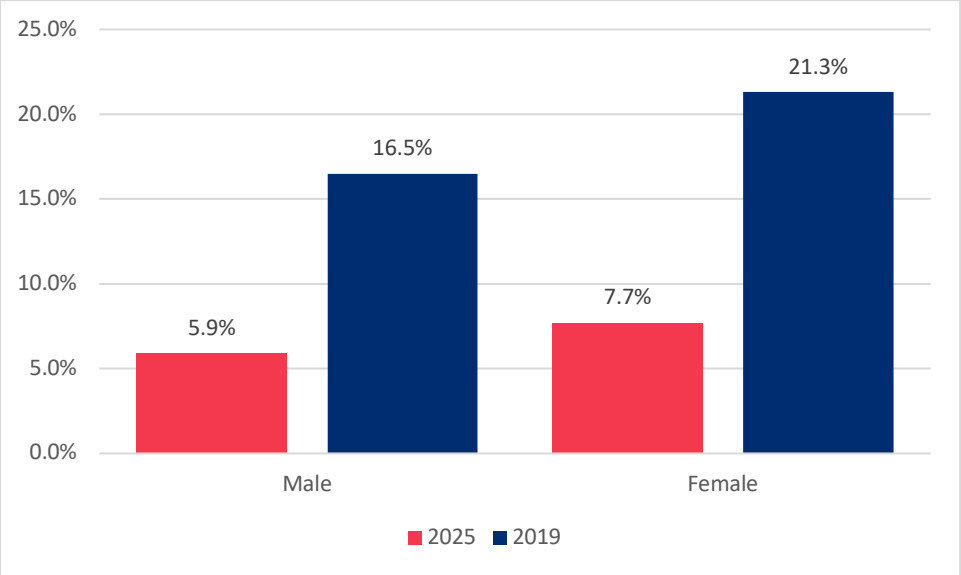


Sources: Appendix Table A 4 and STC-SEE data; authors' calculations

The share of women purchasing illicit MC packs is higher than that of men (7.7 percent versus 5.9 percent, respectively) (Figure 4). The prevalence of illicit MC purchases is also higher among rural residents compared to urban residents (7.2 percent versus 5.9 percent) as shown in Figure 5, and among individuals from BD (15.1 percent) compared to those from RS (8.2 percent)

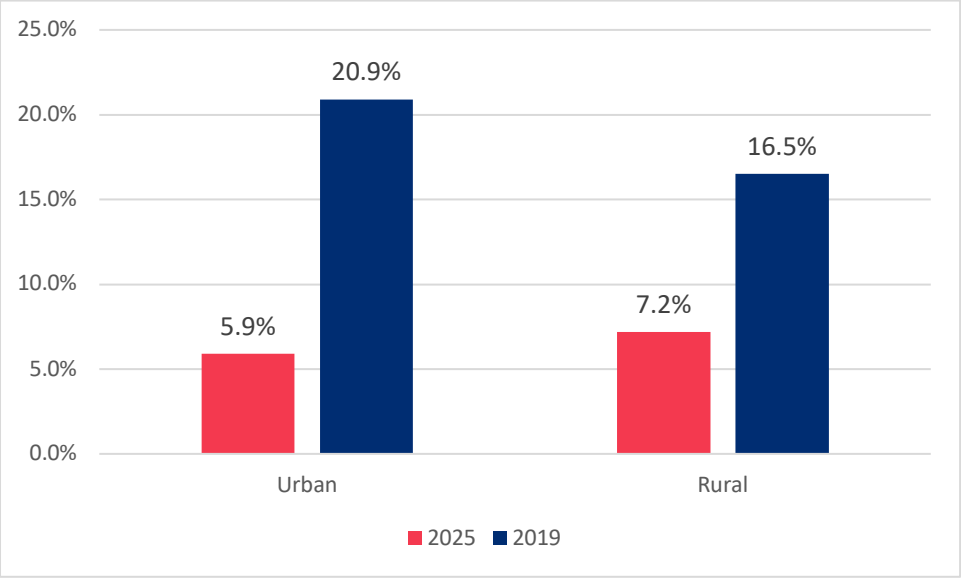
and FB&H (5.4 percent) (Figure 6 and Appendix Table A5). Relative to 2019, the most significant decrease occurred in the Brčko District, a territory of B&H known for weaker law enforcement, where the prevalence of tax evasion was extremely high at 83.9 percent in 2019, while RS had the least significant progress; however, it also had the lowest prevalence in 2019. Furthermore, illicit MC are now slightly more present in rural settlements than in urban areas, which represents a shift from the pattern present in 2019 (Figure 5).

Figure 4. Likelihood of buying illicit MC among smokers, by gender MC (n=725)



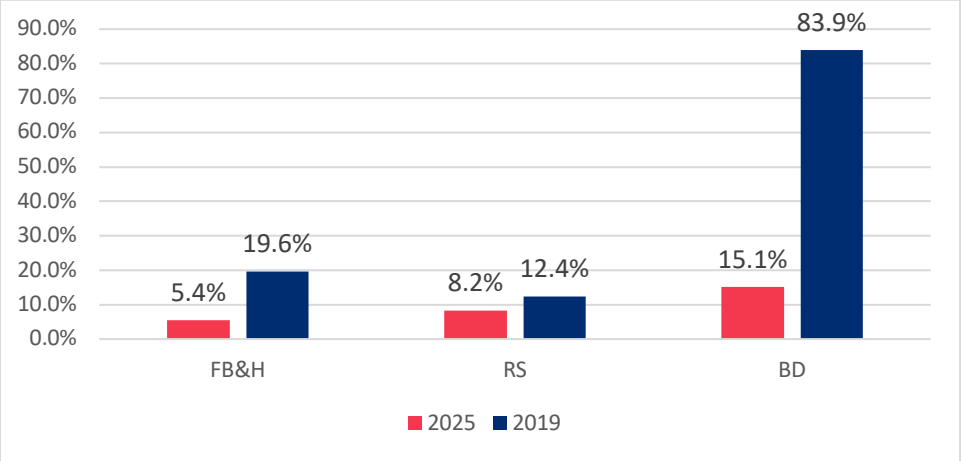
Sources: Appendix Table A5 and STC-SEE data; authors' calculations

Figure 5. Likelihood of buying illicit MC among smokers, by type of settlements (n=725)



Sources: Appendix Table A5 and STC-SEE data; authors' calculations

Figure 6. Likelihood of buying illicit MC among smokers, by territorial units (n=725)

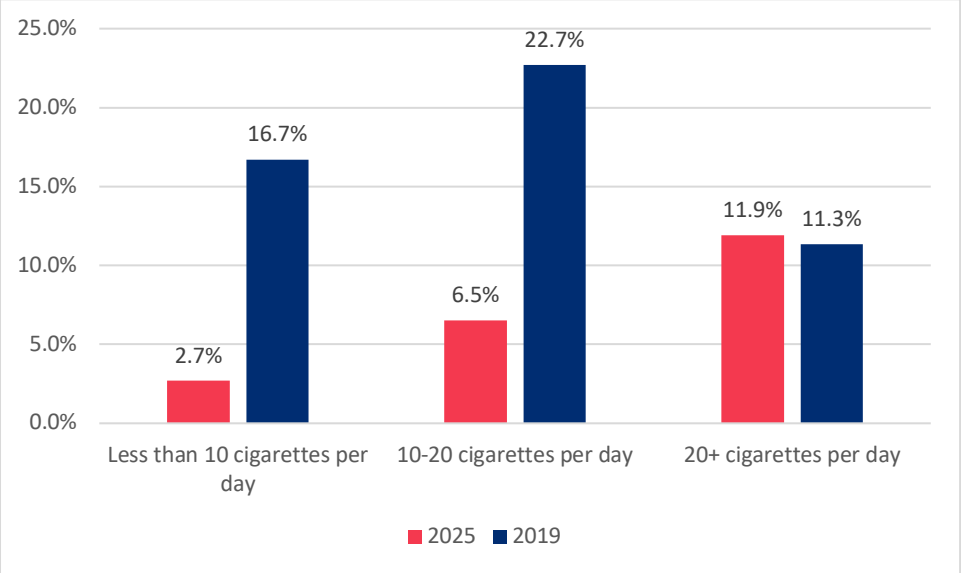


Sources: Appendix Table A5 and STC-SEE data; authors' calculations

Figure 7 presents the share of MC smokers within each daily consumption group who evaded tobacco taxes in 2019 and 2025. Among lighter and medium MC smokers, the share of tax evaders declined sharply, from 16.7 percent to 2.7 percent for those smoking fewer than 10 cigarettes per day, and from 22.7 percent to 6.5 percent for those smoking 10–20 cigarettes per day. Among heavy smokers (20+ cigarettes per day), the proportion of tax-evading MC smokers remains almost unchanged, with a slight increase from 11.3 percent to 11.9 percent. Overall, these results suggest that tax-evading

behavior among MC smokers has become substantially less common among lighter and medium smokers, while remaining stable among heavy smokers.

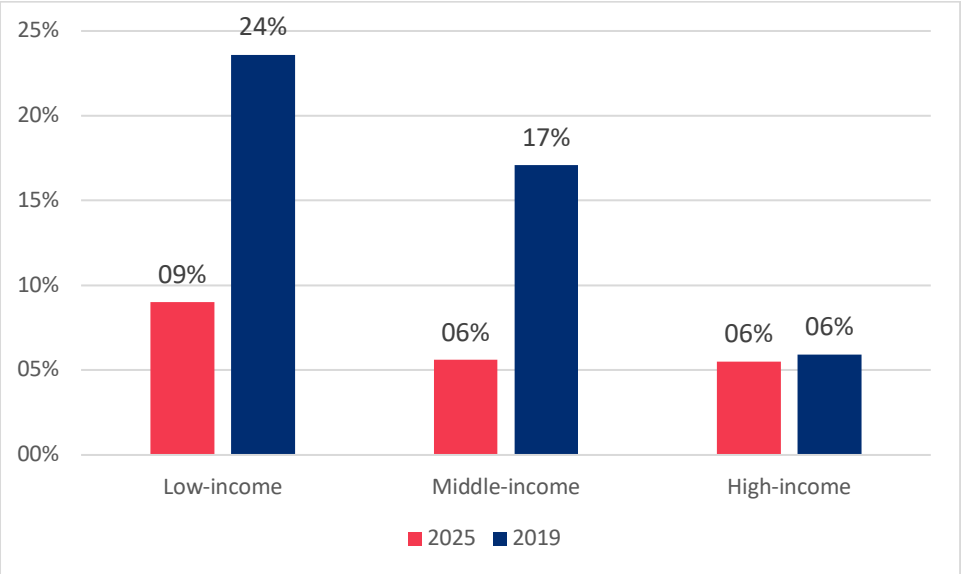
Figure 7. Likelihood of buying illicit MC among smokers, by smoking intensity (n=725)



Sources: Appendix Table A5 and STC-SEE data; authors' calculations

Individuals who belong to the low-income group have the highest prevalence of tax evasion (nine percent), while there is not much difference between the middle- and high-income groups (Figure 8).

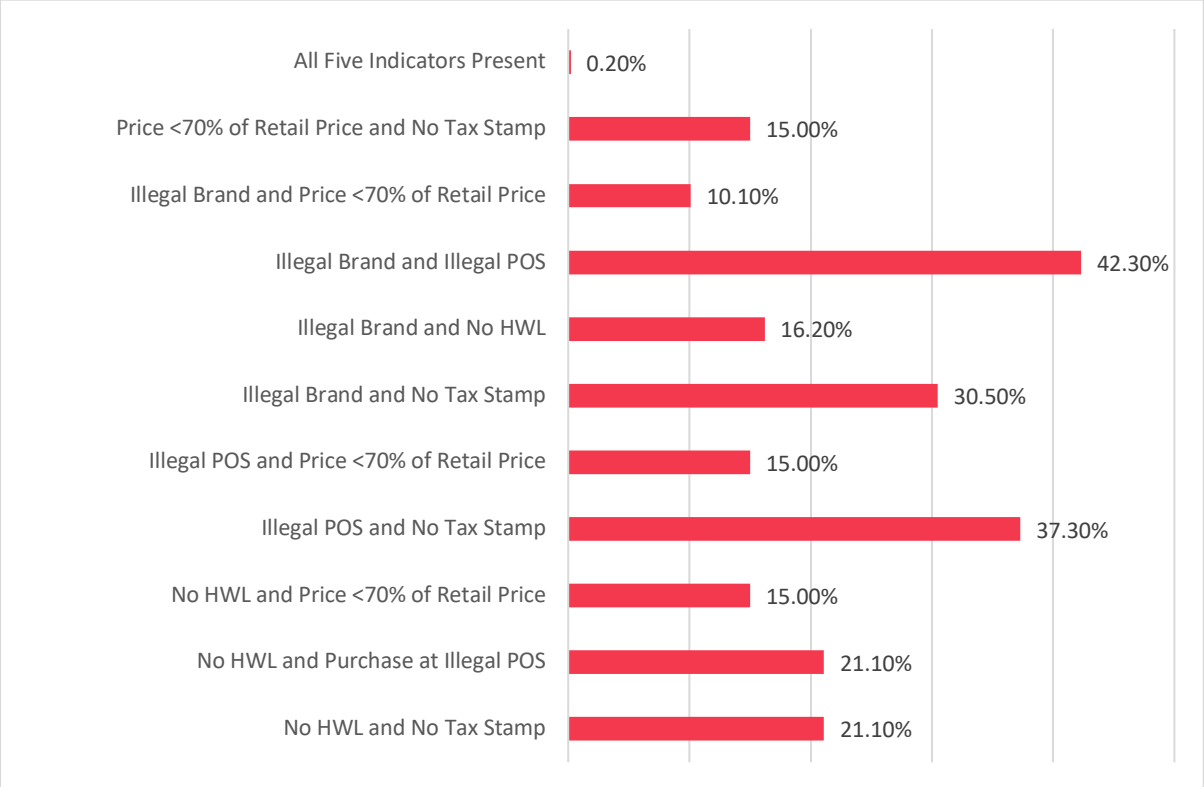
Figure 8. Likelihood of buying illicit MC among smokers, by household income group (n=725)



Sources: Appendix Table A5 and STC-SEE data; authors' calculations

Analysis of combined indicators of illicit cigarette purchases shows that the combination of an illegal brand and purchase at an illegal POS was present in 42.3 percent of cases, while the purchase at an illegal POS and absence of a tax stamp was observed in 37.3 percent of cases. Cases involving both an illegal brand and no tax stamp accounted for 30.5 percent of the sample. In 21.1 percent of illicit cases, the violations involved both the absence of a HWL and a tax stamp, with the same share for the combination of no HWL and purchase at an illegal POS. Additionally, 16.2 percent combined an illegal brand and no HWL, while in 15.0 percent of cases the violation consisted of a price lower than 70 percent of the retail price combined with one additional criterion—the absence of a HWL, purchase at an illegal POS, or the absence of a tax stamp. In 10.1 percent of illicit cases, an illegal brand was combined with a price below 70 percent of the retail price. Only 0.2 percent of cases met all five criteria (Figure 9 and Appendix Table A7).

Figure 9. MC tax evasion criteria (n=725)



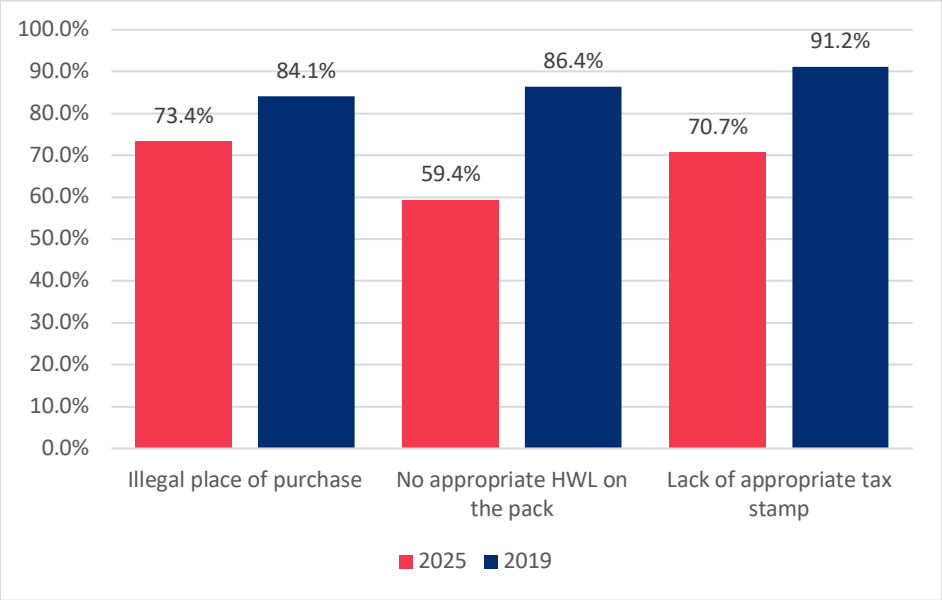
Sources: Appendix Table A7 and STC-SEE data; authors' calculations

The photo database shows that most of the illicit MC are factory-made cigarettes in unbranded cartons, in packs of 20 sticks, without a HWL or tax stamp. Compared to the 2019 database, there is a significant decrease of branded illicit cigarettes.

4.3 Tax evasion for HR cigarettes

For HR cigarettes, 73.4 percent of cases met at least one indicator of illicit purchase. Among these, 73.4 percent involved purchase at an illegal POS, 59.4 percent involved packs without an appropriate HWL, 70.7 percent lacked an appropriate tax stamp, and 63.2 percent were identified as illegal brands (Figure 10). Compared with the 2019 findings—where illicit HR purchases were almost universal and indicators such as missing tax stamps and improper HWLs exceeded 90 percent and 86 percent, respectively—these figures suggest a noticeable decline in the prevalence of illicit HR products, although levels remain high.

Figure 10. HR tax evasion cases by criteria (n=35)



Sources: Appendix Table A8 and STC-SEE data; authors' calculations

Among HR cigarette smokers, 73.4 percent overall reported purchasing illicit HR cigarettes. By gender, 69.1 percent of male smokers and 82.3 percent of female smokers purchased illicit HR cigarettes. In 2019, illicit use was

extremely high for both groups—especially among women, where it reached 97.9 percent—indicating that gender differences persist but have narrowed over time.

With regard to age, 100 percent of smokers aged 18–24 reported purchasing illicit HR cigarettes, compared to 50.1 percent for those aged 25–44, 67.2 percent for those aged 45–64, and 67.6 percent for those aged 65 and older. In contrast to this differentiation by age in 2025, the 2019 study found very limited variation across age groups due to the near-universal prevalence of illicit HR consumption.

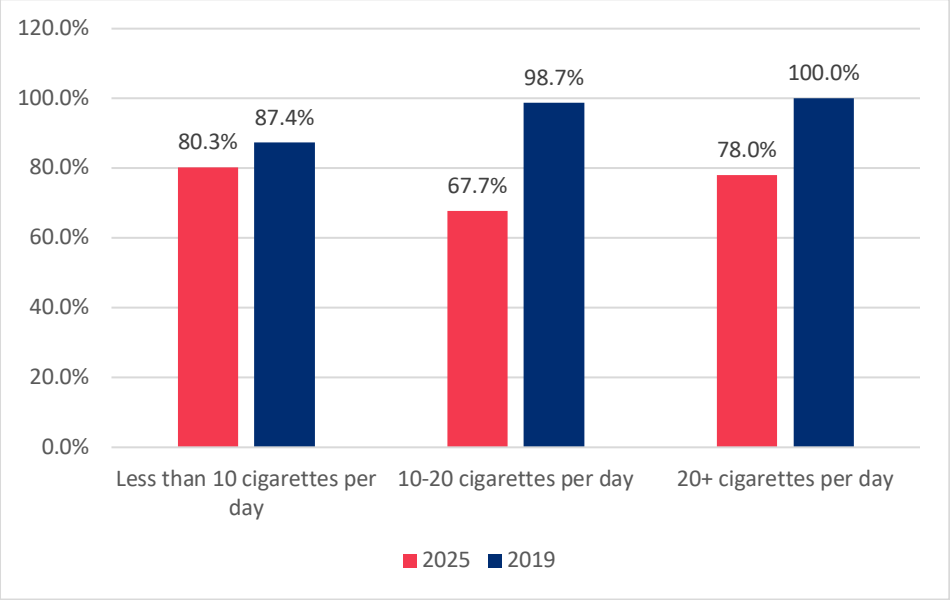
By region, the proportion of smokers who have purchased illicit cigarettes was 71.1 percent in FB&H and 100 percent in RS, while data for BD were not available (Appendix Table A9). These results are broadly consistent with 2019, when illicit HR use was also widespread across regions and universal in BD, although the overall prevalence in FB&H is now lower.

Looking at household income, 78.7 percent of those in the low-income group and 66.8 percent in the middle-income group reported illicit purchases; data for the high-income group were not available. Compared with the 2019 findings—where illicit HR consumption exceeded 90 percent across all income categories—these results indicate a decline across the income distribution, though low-income smokers remain more likely to purchase illicit products.

Figure 11 presents the share of HR smokers within each daily consumption group who evaded tobacco taxes in 2019 and 2025. In all three groups, the proportion of tax-evading HR smokers is lower in 2025 than in 2019. The decline is particularly strong among those smoking 10–20 cigarettes per day (from 98.7 percent to 67.7 percent) and 20+ cigarettes per day (from 100 percent to 78 percent), while the reduction among lighter smokers, consuming fewer than 10 cigarettes per day, is more modest (from 87.4 percent to 80.3 percent). This indicates a shift in tax evasion prevalence, as lighter smokers

are now the ones who are most prone to tax evasion (Figure 11 and Appendix Table A9).

Figure 11. Prevalence of tax evasion by smoking intensity (HR) (n=35)



Sources: Appendix Table A9 and STC-SEE 2019 data; authors' calculations

For HR cigarettes, a large share of smokers—73.4 percent—made their purchases at illegal POS such as open-air markets or street vendors. In terms of package labeling, 59.4 percent did not have health warnings and 70.7 percent of HR cigarettes were purchased without the appropriate tax stamp. Regarding brand legality, 63.2 percent were identified as illegal brands (Appendix Table A10). In 2019, these individual indicators were substantially higher, especially the absence of tax stamps and HWLs, both of which were observed in more than 85–90 percent of HR cases, again suggesting a decline in illicit penetration, though from very elevated baseline levels.

Among illicit HR cigarette purchases, 59.4 percent of cases involved both a missing HWL and a missing tax stamp, and the same share were missing a HWL and purchased from an illegal POS. The combination of illegal POS and no tax stamp was observed in 70.7 percent of cases. Additionally, 60.5 percent of purchases involved both an illegal brand and no tax stamp, while 49.1 percent involved missing a HWL and an illegal brand. The combination of an

illegal brand and illegal POS was present in 63.2 percent of cases (Appendix Table A11). Compared with 2019, when multiple illicit indicators typically appeared together in nearly all HR cases, the 2025 data continue to show strong clustering of indicators but at lower overall levels.

4.4 Factors affecting probability of tax evasion

The probability of tax evasion is estimated separately for MC smokers and jointly for MC and HR smokers. Three models describing the propensity for illicit purchasing of an MC pack are used (Appendix Table A13). By defined criteria and tests, the third model demonstrates the best fit (Appendix tables A14 and A15).

The analysis of MC smokers' propensity for tax evasion highlights several important patterns. Individuals who consume a higher number of cigarettes daily are more likely to engage in tax evasion. Regional differences are evident, with smokers residing in the Brčko District showing a notably higher tendency to evade taxes. Demographic and socioeconomic factors also play a role: the likelihood of tax evasion increases with age, but decreases with higher household income per member. Gender differences are observed as well—male smokers are less likely to evade taxes compared to female smokers. In addition, smokers living in larger households, defined by the number of household members, demonstrate a greater likelihood of tax evasion. Finally, living in municipalities bordering Serbia is associated with increased tax evasion, likely due to greater access to cross-border smuggling opportunities.

To estimate an overall model of tax evasion—including both MC cigarette and HR cigarette smokers—a broad set of covariates is employed (see Appendix Table A16). By defined criteria and tests, the third model demonstrates the best fit (Appendix tables A17 and A18).

The regression results broadly confirm the patterns observed in the descriptive analysis. Heavy smokers, older individuals, residents of the Brčko District, and those living in municipalities bordering Serbia remain

significantly more likely to purchase illicit cigarettes. Lower household income is also associated with a higher probability of tax evasion. The model additionally shows that larger households exhibit an elevated likelihood of tax evasion, even after controlling for income and other demographic characteristics. These findings indicate that the observed relationships are robust and not driven solely by simple group differences.

5. Discussion and Policy Recommendations

When comparing the 2019 and 2025 surveys, there is a notable decrease in the share of illicit tobacco trade in B&H. In 2019, illicit tobacco accounted for 32.3 percent of the total market, whereas in 2025 this share declined to 8.4 percent. This reduction is due to a decrease in tax evasion in both the HR tobacco segment (95.4 percent in 2019 compared to 81.6 percent in 2025), and among MC users, where tax evasion declined from 18.1 percent in 2019 to 7.3 percent in 2025. The study further estimates that 35.3 percent of current smokers in B&H evaded tobacco taxes in 2019; this includes 18.6 percent of MC smokers and 93.3 percent of HR smokers. By 2025, the prevalence of tax evasion dropped to 6.6 percent for MC and 73.4 percent for HR cigarette smokers (Gligoric et al., 2021; Index Kantar Kosova, 2025).

Although a much smaller proportion of MC smokers evade tax compared to HR smokers, MC remains the dominant product on the market, accounting for approximately 91 percent of total cigarette consumption, whereas HR cigarettes represent only about 2.2 percent (while the share of tobacco product consumption that is HTPs is 6.7 percent). As a result, tax evasion among MC smokers should not be overlooked and must be considered a significant component of overall tobacco tax evasion. Policy makers should take this into account when designing future interventions to reduce the illicit tobacco market.

The data indicate that tobacco products tax evasion in B&H is most common among individuals with primary education or less (19.8 percent), those from

low-income households (14.5 percent), older adults aged 65 and above (11.3 percent), and heavy smokers consuming more than 20 sticks daily (17.5 percent). Rural residents (9.4 percent) and smokers in the District of Brčko (10.5 percent) also show higher rates of illicit tobacco use. In contrast, tax evasion is less prevalent among those with tertiary education, high-income households, and younger smokers aged 18–24. Gender differences are minimal, with similar rates among men and women.

Analysis of the survey results demonstrates that tax evasion in the tobacco market remains a substantial issue in B&H, though the 2025 data indicate a notable and significant decline in illicit trade of tobacco products compared to 2019. B&H has not yet ratified the WHO FCTC Protocol to Eliminate Illicit Trade in Tobacco Products, and urgent adoption of this international treaty is recommended to facilitate a more systematic and coordinated approach in combating the illicit tobacco trade.

The study highlights that a substantial portion of illicit purchases still take place on the street or in open-air markets. Patterns of tax evasion have also shifted between 2019 and 2025, with a marked decrease observed in the overall share of the illicit market, especially for HR products. Nevertheless, nearly all cases of MC tax evasion involve multiple violations, and approximately nine out of ten HR cigarette packs continue to lack an appropriate tax stamp, indicating persistent gaps in enforcement.

BD remains the region with the highest rate of tax evasion, underlining the need for greater involvement and accountability at the local level. However, effective response also requires continued coordination among the entity governments of RS and FB&H, as well as the B&H Council of Ministers, given that indirect taxation falls under the Indirect Taxation Authority and inspections are managed at the entity level.

Limitations

Our study has one major limitation stemming from the methodology employed. According to the defined criteria for detecting illicit purchases, if a pack of cigarettes is bought at an illegal point of sale, it is considered illicit. Although most packs sold at illegal points of sale also exhibit other indicators of illicitness, this approach may result in a slight overestimation of the level of tax evasion, as street vendors sometimes resell legally bought packs of cigarettes. However, selling cigarettes at illegal points of sale is not lawful in any case, as other regulations—such as the prohibition of selling cigarettes to persons under 18 or near primary and secondary schools—may also be violated. Additionally, such practices break other tax regulations apart from the excise tax on tobacco products. For these reasons, we believe that these tobacco products should be treated as illicit.

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Appendix

Criteria for determining cases of tobacco tax evasion

To identify illicit tobacco products in our analysis of tax evasion in Bosnia and Herzegovina, we applied a set of indicators grounded in domestic legislation and rulebooks, as well as in international standards. These criteria were used to assess tobacco products recorded during our 2,000-household survey, enabling a systematic classification of items as either licit or illicit. For manufactured cigarettes (MC) we applied five indicators, while for hand-rolled tobacco (HR) we used four, excluding price due to the absence of standardized packaging. We also monitored the presence of heated tobacco products (HTP) and encountered only one borderline case that could not be definitively classified as licit or illicit due to limited evidence.

Importantly, we did not rely solely on the data recorded by the field agency. In all instances where a tobacco package was shown to the interviewer, we conducted our own visual inspection using images and photos collected in the database. This allowed us to cross-check and verify the key indicators for classification. A small number of ambiguous cases, particularly those where it was unclear whether a product should be classified as MC or HR, were further reviewed and resolved in consultation with the Economics for Health team.

The first criterion considered was the POS. Products were deemed legally purchased if acquired from registered retail or wholesale stores or duty-free shops. Purchases made in open-air markets or from street vendors were classified as illegal, as such points of sale are not authorized under the Law on Excise Duties of Bosnia and Herzegovina (Official Gazette 49/09). There were several cases of open-ended answers on the POS question where interviewees stated petrol stations as POS; however, these are also legal retail POS in B&H.

The second criterion involved the health warning label (HWL). In accordance with the Rulebook on Labeling the Packaging of Tobacco Products (Official Gazette of Republika Srpska, no. 124/11) and the Law on Control and Limited Use of Tobacco, Tobacco and Other Smoking Products (Official Gazette of the Federation of B&H, no. 38/22), compliant packaging must feature an HWL that covers at least 35 percent of the front and 50 percent of the back of the pack, includes a prescribed warning text, and follows specific rules regarding font size, placement, and the colors of both text and background. Foreign products lacking any HWL were also considered non-compliant. Each HWL was visually compared to these regulatory standards to determine whether the product met legal requirements. Though neither we nor the agency could precisely measure the size of each label using measuring devices, we think that the visual check and comparison with the legal pack allow a confident classification of the product as licit or illicit based on this criterion.

The third indicator is related to the tax stamp. According to the Rulebook on Excise Stamps for Tobacco Products, Alcoholic Beverages, Fruit Natural Brandies, Coffee and Wine (Official Gazette B&H, nos. 50/09 and 74/14) and the Rulebook on the Application of the Law on Excise Duties in B&H (Official Gazette B&H, nos. 50/09, 80/11, 48/12, 74/14, 85/17, and 4/18), all tobacco products must carry a valid domestic excise stamp unless purchased in a duty-free shop. These regulations define the look and the size of the tax stamp and its elements, along with the security elements that should prevent counterfeiting.

According to the rulebook, every individual tobacco product must be marked with an excise stamp. The stamp contains the inscription “Bosnia and Herzegovina – Indirect Taxation Authority” in both Latin and Cyrillic script, the state coat of arms, the retail price, the name of the importer (for imported products), the producer’s name, and a series code with a serial number. Excise stamps are rectangular in shape, printed in blue for domestically produced tobacco and in red for imports, and include anti-counterfeiting

features such as watermarks, UV-sensitive fibers, a hologram, and a unique serial number printed on certified security paper.

During visual inspection, we assessed whether the stamp was present and whether all mandatory security elements were included. Products lacking a proper domestic or acceptable foreign stamp were marked as illicit. In rare cases where the tax stamp was not fully visible in the image or was damaged in a way where we cannot confirm its legality without a reasonable doubt from the image, we relied on the information from the agency.

Two additional indicators were applied exclusively to MC. The first was brand legality. A product was considered illegal if the brand did not appear on the official domestic market price lists, which are publicly published and regularly updated. For this study, we consulted the latest available price lists published in the statewide available media: Večernji list (2024) and Faktor (2025). The price list is not made publicly available by the ITA, however, it is a common practice in B&H for cigarette prices to be published in national media outlets.

The second additional indicator was the price of the cigarette pack. According to our operational definition, a pack sold for less than 70 percent of the retail price of the cheapest legal brand (set at 5.90 BAM as per the price list available alongside the brand list) was flagged as potentially illicit. This approach aligns with standard practices in studies of illicit tobacco and serves as a practical proxy for identifying underpriced and potentially untaxed products.

This structured and legally grounded methodology—relying on visual verification, public documentation, and consultation with experts—allowed us to systematically classify each tobacco product encountered in the field. The combined use of data inspection, rulebook comparison, and field-level evidence provided a robust basis for estimating the prevalence of illicit tobacco consumption in the observed sample.

Table A1. Tax evasion for MC, HR, and HTP smokers by criterion (N=860)

	Percentage (CI=95 percent)				
Criteria	Overall	Illegal point of sale	No appropriate HWL on the pack	Lack of an appropriate tax stamp	Illegal brand
Evasion	8.72 (6.86, 11.01)	8.28 (6.46, 10.55)	3.68 (2.48, 5.44)	5.33 (3.87, 7.31)	4.95 (3.55, 6.87)

Table A2. Percentage distribution of tax evasion cases for MC, HR, and HTP smokers, by selected demographic and socioeconomic characteristics (N=860)

Percentage (CI=95%)		
Overall		8.72 (6.86, 11.01)
Gender	Male	8.8 (6.38, 12.03)
	Female	8.61 (6.01, 12.18)
Education	Primary or less	19.84 (9.14, 37.86)
	Secondary	8.63 (6.52, 11.34)
	Tertiary	6.53 (3.68, 11.33)
Residence	Urban	7.85 (5.33, 11.41)
	Rural	9.38 (6.91, 12.61)
Age	18–24	3.63 (1.37, 9.31)
	25–44	4.73 (2.76, 7.99)

		Percentage (CI=95%)
	45–64	5.36 (2.99, 9.44)
	65+	11.28 (6.34, 19.27)
Region	FB&H	8.77 (6.48, 11.78)
	RS	8.43 (5.54, 12.61)
	BD	10.51 (0.34, 28.14)
Household income group	Low-income	14.49 (10.23, 20.12)
	Middle-income	6.57 (4.68, 9.16)
	High-income	4.51 (1.35, 13.97)
Smoking intensity	<10 sticks daily	9.13 (4.89, 16.42)
	10–20 sticks daily	8.47 (6.17, 11.51)
	20+ sticks daily	17.46 (11.05, 26.48)

Table A3. MC, HR, and HTP cigarette smokers by place of purchase, presence of HWL, and presence of tax stamp (N=860)

Percentage (CI=95%)	
Tax stamp presence	
Has a legal tax stamp	94.7 (92.7, 96.1)
Lack of an appropriate tax stamp	5.3 (3.9, 7.3)
HWL presence	
Has an appropriate **HWL**	96.3 (94.6, 97.5)
No appropriate HWL on the pack	3.7 (2.5, 5.4)
Point of sale	
Legal point of sale	91.7 (89.5, 93.5)
Illegal point of sale	8.3 (6.5, 10.6)

Table A4. Tax evasion for MC smokers by each criterion (N=725)

Percentage (CI=95%)						
Criteria	**Overall**	**Illegal point of sale**	**No appropriate HWL on the pack**	**Lack of an appropriate tax stamp**	**Illegal brand**	**Purchased at a price lower than 70% of the legal price**
Overall	6.6 (4.9, 8.9)	6.3 (4.6, 8.5)	1.5 (0.7, 2.9)	2.8 (1.7, 4.5)	2.8 (1.7, 4.5)	1.0 (0.4, 2.2)

Table A5. Percentage of tax evasion cases for MC smokers, by selected demographic and socioeconomic characteristics (N=725)

Percentage (CI=95%)		
Overall		6.6 (4.9, 8.9)
Gender	Male	5.9 (3.9, 9.0)
	Female	7.7 (5.1, 11,4)
Education	Primary	8.0 (1.9, 27.7)
	Secondary	6.6 (4.7, 9.3)
	Tertiary	6.4 (3.4, 11.6)
Residence	Urban	5.9 (3.6, 9.5)
	Rural	7.2 (4.9, 10.4)
Age	18–24	3.8 (1.2, 11.1)
	25–44	5.1 (2.9, 9.1)
	45–64	5.0 (2.6, 9.4)
	65+	7.9 (3.8, 15.7)

Percentage (CI=95%)		
Region	FB&H	5.4 (3.5, 8.2)
	RS	8.2 (5.3, 12.6)
	BD	15.1 (4.9, 38.2)
Household income groups	Low-income	9.0 (5.6, 14.3)
	Middle-income	5.6 (3.8, 8.3)
	High-income	5.5 (1.6, 16.7)
Smoking intensity	<10 sticks daily	2.7 (0.1, 7.0)
	10–20 sticks daily	6.5 (4.5, 9.3)
	20+ sticks daily	11.9 (6.7, 20.5)

Table A6. Percentage of tax evasion cases for MC smokers, by place of last purchase, presence of health warning, presence of tax stamp, legality of the brand, and price of the last-purchased pack of MC (N=725)

Criteria	Percentage (CI=95%)
Point of sale	
Legal point of sale	93.7

	(91.5, 95,4)
Illegal point of sale (open-air markets and street vendors)	6.3 (4.6, 8.5)
HWL presence	
Has a legal HWL	98.5 (97.1, 99.2)
No appropriate HWL on the pack	1.5 (0.8, 2.9)
Tax stamp presence	
Has a legal tax stamp	97.2 (95.5, 98.3)
Lack of an appropriate tax stamp	2.8 (1.7, 4.5)
Brand legality	
Legal brand	97.2 (95.5, 98.3)
Illegal brand	2.8 (1.7, 4.5)
Price	
Equal to or higher than 70% of the legal price	99.0 (97.8, 99.6)
Purchased at a price lower than 70% of the legal price	1.0 (0.4, 2.2)

Table A7. Percentage distribution of MC smokers by combination of tax evasion criteria (N=48)

	Percentage (CI=95%)
No appropriate HWL and no tax stamp	21.1 (10.6, 37.5)
No appropriate HWL and illegal POS	21.1 (10.6, 37.5)
No appropriate HWL and price is less than 70% of the legal price	15.0 (6.6, 30.5)
Illegal POS and a lack of an appropriate tax stamp	37.3 (23.4, 53.9)
Illegal POS and purchased at a price lower than 70% of the legal price	15.0 (6.6, 30.5)
Illegal brand and a lack of an appropriate tax stamp	30.5 (17.6, 47.4)
Illegal brand and no appropriate HWL	16.2 (7.2, 32.5)
Illegal brand and an illegal POS	42.3 (27.7, 58.4)
Illegal brand and purchased at a price lower than 70% of the legal price	10.1 (3.6, 25.1)
Purchased at a price lower than 70% of the legal price, and lack of an appropriate tax stamp	15 (6.6, 30.5)
All five criteria are met	0.2 (0.1, 0.7)

Table A8. Tax evasion for HR cigarette smokers by each criterion (N=35)

Percentage (CI=95%)					
Criteria	**Overall**	**Illegal point of sale**	**No appropriate HWL on the pack**	**Lack of an appropriate tax stamp**	**Illegal brand**
Overall	73.4 (53.0, 87.2)	73.4 (53.0, 87.2)	59.4 (39.6, 76.5)	70.7 (50.4, 85.2)	63.2 (42.9, 79.7)

Table A9. Percentage of tax evasion cases for HR cigarette smokers, by demographic and socioeconomic characteristics (N=35)

Percentage (CI=95%)	
Overall	73.4 (53.0, 87.2)
Gender	
Male	69.1 (44.0, 86.5)
Female	82.3 (44.5, 96.4)
Education	
Primary	79.9 (27.7, 97.6)
Secondary	70.3 (47.0, 86.3)
Tertiary	100
Residence	
Urban	75.3 (41.7, 92.8)
Rural	72.2 (45.2, 89.1)
Age	
18–24	100
25–44	50.1 (11.1, 89.0)
45–64	67.2 (13.7, 96.3)
65+	67.6 (25.5, 92.7)

Region	
FB&H	71.1 (49.7, 85.9)
RS	100
BD	N/A
Household income group	
Low-income	78.7 (48.7, 93.5)
Middle-income	66.8 (37.3, 87.2)
High-income	N/A
Smoking intensity*	
<10 sticks daily	80.3 (40.6, 96.1)
10–20 sticks daily	67.7 (39.2, 87.2)
20+ sticks daily	78.0 (26.4, 97.2)

*smoking intensity of both MC and HR

Table A10. Percentage of HR cigarette smokers, by place of last purchase, presence of health warning, and presence of tax stamp on HR cigarettes (N=35)

Criteria	Percentage (CI=95%)
Point of sale	
Legal point of sale	26.6 (12.9, 47.0)
Illegal point of sale (open-air markets and street vendors)	73.4 (53.0, 87.2)
HWL presence	
Has a legal HWL	40.6 (23.5, 60.5)
No appropriate HWL on the pack	59.4 (39.6, 76.5)

Tax stamp presence	
Has a legal tax stamp	29.3 (14.8, 48.6)
Lack of an appropriate tax stamp	70.7 (50.4, 85.2)
Brand legality	
Legal brand	36.8 (20.3, 57.1)
Illegal brand	63.2 (42.9, 79.7)

Table A11. Cross-tabulation: percentage distribution of HR cigarette smokers by combination of tax evasion criteria (N=35)

Percentage (CI=95%)	
No appropriate HWL on the pack and lack of an appropriate tax stamp	59.4 (39.5, 76.5)
No appropriate HWL on the pack and illegal POS	59.4 (39.5, 76.5)
Illegal POS and lack of an appropriate tax stamp	70.7 (50.4, 85.2)
Illegal brand and lack of an appropriate tax stamp	60.5 (40.5, 77.6)
No appropriate HWL on the pack and an illegal brand	49.1 (30.3, 68.2)
Illegal brand and an illegal POS	63.2 (42.9, 79.7)

Table A12. Description of variables used in the probability model

Variables	Notes
Sociodemographic characteristics	
Household income in absolute level, monthly (in BAM)	"<1000", "1001-2000", "2001-3000", "3001-4000", "4001-5000", ">5000" Due to a large number of missing values in the data, interval values were imputed using other personal and household characteristics to minimize sample loss.
Household income group	Low-, Middle-, and High-income group The population was divided into three income groups (terciles) based on household income per member
Employment status	Employed, Self-employed, Unemployed, Pensioners, Student
Level of education	Primary- (primarily or less), Secondary (three or four years), Tertiary+ (Higher school, Bachelor's, Master's/Magistracy, Doctorate)
Settlement type	0 "Rural", 1 "Urban"
Age	Continuous variable, in years
Age group	"18-24", "25-44", "45-64", "65+ "
Gender	0 "Female", 1 "Male"
Region	FB&H (Federation of B&H), RS (Republic of Srpska), BD (District of Brcko)
Household size	Number of household members
Number of adults	Number of household members above 18 years old
Smoking behavioral characteristics	
MC smoking intensity (MC per day)	"<10", "11-20" , "20+"
HR smoking intensity (HR cigarettes per day)	"< 20 ", "> 20"

Variables	Notes
MC+ HR smoking intensity (cigarettes per day)	“1-10“, “11-20”, “20+”
Smoking intensity	Continuous variable, cigarettes per day
Smoking status (Dummy)	"Daily smokers", "Other"(less than daily smoker and non-smoker)
MC current smokers (Dummy)	"Current smoker_mc" (daily or less than daily MC smokers), "Other" (non-smoker of MC)
HR current smokers (Dummy)	"Current smoker_hr" (daily or less than daily HR smokers), "Other" (non-smoker of HR cigarettes)
Daily smokers (Dummy)	“Daily smoker” (daily smoker of classic tobacco), “Other” (less than daily smoker)
Determinants of cross-border cigarette purchases	
Dummy variable for the municipalities at the border with Serbia	If the municipality is at the border with Serbia, dummy variable takes value 1, if otherwise 0
Dummy variable for the municipalities at the border with Montenegro	If the municipality is at the border with Montenegro, dummy variable takes value 1, if otherwise 1
Minimum distance from the municipality to nearest country with lower price	Value of variable is equal to the distance (in km) to the closest border crossing of the country (Serbia or Montenegro) with lower cigarette price

Table A13. Probability estimation of tax evasion for MC smokers (n=727)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	model_1	se	model_2	se	model_3	se
Dependent variable: Illicit purchases of MC						
Smoking intensity (cig. per day) (<10)						
10–20	0.912*	(0.536)	1.102**	(0.535)	0.944**	(0.479)
20+	1.741***	(0.506)	2.005***	(0.524)	1.777***	(0.548)
Region B&H (FB&H)						
RS	0.433	(0.579)	0.314	(0.592)	-0.428	(0.724)
BD	1.514***	(0.284)	1.662***	(0.262)	1.689***	(0.267)
Age	0.039***	(0.015)	0.038***	(0.013)	0.041***	(0.014)
Gender (female 0, male 1)	-0.541*	(0.320)	-0.621**	(0.304)	-0.607*	(0.323)
Income per household member (Low-income)						
Middle-income			-1.032**	(0.482)	-1.024**	(0.517)
High-income			-0.868**	(0.419)	-0.815**	(0.410)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	model_1	se	model_2	se	model_3	se
Border Municipality dummy-SERBIA					1.958***	(0.719)
Constant	-5.334***	(1.015)	-4.790***	(0.988)	-4.819***	(1.026)
Observations	727		727		727	
Log lik	-164.2		-159.7		-152	
AIC	340.4		335.5		321.9	
BIC	367.9		372.2		363.2	
Pseudo R2	0.0720		0.0972		0.141	

*** p<0.01, ** p<0.05, * p<0.1

Note: Robust standard errors in parentheses.

Table A14. Linktest – MC tax evasion model

evasion_mc	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
Model 1						
_hat	1.284206	1.010016	1.27	0.204	-.6953901	3.263802
_hatsq	.0565169	.1958906	0.29	0.773	-.3274216	.4404555
_cons	.3261204	1.249282	0.26	0.794	-2.122428	2.774668
Model 2						
_hat	2.106238	.6906144	3.05	0.002	.7526586	3.459817
_hatsq	.2218658	.1304479	1.70	0.089	-.0338073	.477539
_cons	1.195896	.8491217	1.41	0.159	-.4683519	2.860144
Model 3						
_hat	1.180597	.4634075	2.55	0.011	.272335	2.088859
_hatsq	.0416559	.1002141	0.42	0.678	-.1547601	.2380719
_cons	.1488069	.5205466	0.29	0.775	-.8714457	1.16906

Table A15. Hosmer-Lemeshow GoF test – MC tax evasion model

Model 1					
Number of observations	727	727	727	727	727
Number of groups	5	10	15	20	50
Hosmer-Lemeshow chi2(3)	1.72	5.22	12.40	12.10	33.62
Prob > chi2	0.6336	0.7337	0.4948	0.8421	0.9426
Model 2					
Number of observations	727	727	727	727	727
Number of groups	5	10	15	20	50
Hosmer-Lemeshow chi2(3)	4.05	9.66	18.12	19.81	61.55
Prob > chi2	0.2559	0.2900	0.1530	0.3435	0.0906
Model 3					
Number of observations	727	727	727	727	727
Number of groups	5	10	15	20	50
Hosmer-Lemeshow chi2(3)	3.53	9.00	7.33	17.51	45.63
Prob > chi2	0.3169	0.3419	0.8846	0.4882	0.5705

Table A16. Probability estimation of tax evasion for MC and HR cigarette smokers (n=742)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	**model_1**	**se**	**model_2**	**se**	**model_3**	**se**
DEPENDENT VARIABLE: Illicit purchases of MC and HR						
Smoking intensity (cig. per day) (<10)						
10–20	-0.148	(0.392)	-0.036	(0.395)	**-0.118**	(0.350)
20+	0.811**	(0.396)	1.098***	(0.379)	**0.938****	(0.399)
Region B&H (FB&H)						
RS	-0.048	(0.591)	-0.063	(0.602)	**-1.019**	(0.681)
BD	0.751***	(0.202)	0.672***	(0.207)	**0.650*****	(0.197)
Age	0.049***	(0.013)	0.038***	(0.013)	**0.045*****	(0.013)
Household income			-0.403**	(0.166)	**-0.653*****	(0.218)
Household size					**0.295***	(0.153)
Border Municipality dummy-SERBIA					**2.426*****	(0.789)
Constant	-4.595***	(0.730)	-3.060***	(1.025)	**-3.489*****	(1.141)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	**model_1**	**se**	**model_2**	**se**	**model_3**	**se**
Observations	742		742		**742**	
Log Lik	-222.9		-218.3		**-202.2**	
AIC	455.8		448.5		**420.4**	
BIC	478.8		476.2		**457.3**	
Pseudo R2	0.0743		0.0935		**0.160**	

*** p<0.01, ** p<0.05, * p<0.1

Note: Robust standard errors in parentheses.

Table A17. Linktest – overall tax evasion model (both MC and HR)

evasion	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
Model 1						
_hat	2.205179	0.7958291	2.77	0.006	0.6453823	3.764975
_hatsq	0.2812736	0.179272	1.57	0.117	-0.070093	0.6326401
_cons	1.132555	0.8186603	1.38	0.167	-0.4719897	2.7371
Model 2						
_hat	2.284659	0.6237523	3.66	0.000	1.062127	3.507191
_hatsq	0.3129656	0.142566	2.20	0.028	0.0335414	0.5923899
_cons	1.093515	0.6236039	1.75	0.080	-0.1287257	2.315757
Model 3						
_hat	1.509461	0.3521267	4.29	0.000	0.8193053	2.199617
_hatsq	0.1292681	0.0791383	1.63	0.102	-0.0258403	0.2843764
_cons	0.355507	0.363484	0.98	0.328	-0.3569086	1.067923

Table A18. Hosmer-Lemeshow GoF test – overall tax evasion model (MC+HR)

Model 1					
Number of observations	742	742	742	742	742
Number of groups	5	10	15	20	50
Hosmer-Lemeshow chi2(3)	3.88	4.57	9.81	14.93	34.02
Prob > chi2	0.2745	0.8026	0.7097	0.6668	0.9364
Model 2					
Number of observations	742	742	742	742	742
Number of groups	5	10	15	20	50
Hosmer-Lemeshow chi2(3)	7.71	13.97	20.59	22.91	57.02
Prob > chi2	0.0524	0.0826	0.0814	0.1939	0.1747
Model 3					
Number of observations	742	742	742	742	742
Number of groups	5	10	15	20	50
Hosmer-Lemeshow chi2(3)	1.88	7.66	11.65	14.43	42.08
Prob > chi2	0.5980	0.4670	0.5565	0.7006	0.7129