TOBACCO TAX MODELING:
EVIDENCE FROM NORTH MACEDONIA
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Abstract

Background

Tobacco smoking prevalence in North Macedonia is among the highest in Southeastern Europe, reaching 48.4 percent in 2019. This is well above the global average of 22.3 percent. North Macedonia also has the region's lowest cigarette prices, reflecting the country's low tax burden. The current specific excise tax level of EUR 54 per 1,000 cigarettes is low by European standards. As the country is in the process of European Union (EU) integration, the tobacco excise level needs to increase by 67 percent to reach the EU-required minimum of EUR 90 per 1,000 cigarettes. Considering this dynamic, the detrimental health effects of tobacco use, and the fact that tobacco excise taxes are widely proven to be the most effective measure to drive down tobacco consumption, there is significant room for a more aggressive tobacco taxation policy with substantial increases in the excise tax.

Methodology

The study employs tobacco taxation simulation modeling to estimate the impacts of specific excise increases on government revenues, from tobacco taxes, and on public health, measured by lives saved—that is, people who avoid smoking-related premature death due to quitting. The baseline year is 2023, and simulations are made for the years 2024 and 2025. We use different scenarios for the size of the increase in the specific excise tax and for the price and income elasticities of the three identified price segments. The calculations and assumptions are based on the World Health Organization's Tobacco Tax Simulation Model (WHO TaXSiM) (World Health Organization, 2018). This working paper adapts this model to the specific setting of tobacco excise policy changes in North Macedonia. Based on the data on legal cigarette sales and the country's tax structure, we employ tobacco tax simulation modeling to estimate changes in revenue and impacts on public health. The estimations of the impacts of the proposed increased excise on government revenues are done by applying different scenarios regarding price and income elasticities on different price segments (premium, mid-range, and economy).

Results

Using previously estimated price and income elasticities of tobacco consumption, the increase in excise revenues due to price increase varies across the different scenarios between 5.23 percent and 22.45 percent, and the increase in total tax revenues varies between 4.86 percent and 21.45 percent. It is evident that an increase in the excise tax creates noticeable health benefits in reducing the number of smoking-related deaths. A

larger increase in excise leads to more substantial health benefits. The results indicate that an increase in excise causes positive effects in reducing smoking intensity as well.

Conclusions

The results show that increases in the cigarette excise tax can play an important role in improving public health, through reducing smoking-related premature deaths, and in increasing government revenues, from excise and indirect taxes. This policy is also in line with the process of moving towards EU tax policy, which is important for North Macedonia as a country in the active process of EU integration.

JEL Codes: D62, I12, K32, L66

Keywords: tobacco tax model, tobacco tax revenues, excise tax

Introduction

Research Background

Smoking is the second-highest risk factor for death in the world in 2019, exceeded only by high blood pressure. The World Health Organization estimates that more than 8 million people die prematurely due to tobacco use each year. More than 7 millions of those deaths are the result of direct tobacco use, while about 1.2 million are non-smokers who die due to second-hand smoke exposure (World Health Organization, 2020). The fact that smoking is the second leading factor of global mortality—and smoking-related deaths are entirely preventable—makes it very important to consider different prevention measures that can contribute to reductions in premature death and illnesses related to smoking.

Tobacco prevalence in North Macedonia is among the highest in the Southeastern Europe, reaching 48.4 percent in 2019. Around half of smokers (51.3 percent) began to smoke very early in life, between 18 and 24 years of age. Smoking intensity is also very high: 44.4 percent of current smokers consume more than 20 cigarettes a day (Mijovic Hristovska et al., 2020). In 2019, in North Macedonia 170.17 deaths per 100,000 people were attributed to smoking, and the risk from tobacco increased by 2.4 percent between 2009 and 2019 (IHME, 2019).

While the average monthly net wage paid per employee for November 2022 was 33,011 denars (or USD 572.11, with an exchange rate of 57.7 denars per USD), according to the State Statistical Office (2023), the price of one pack of cigarettes varies from 105 denars (1.82 dollars) to 160 denars (2.77 dollars). This is relatively low compared to other regions, leaving significant room for price increases via higher excise taxes. In contrast, the average price per pack of cigarettes in the European Union in 2019 is 5.23 dollars. North Macedonia has both high smoking prevalence and the region's lowest cigarette prices (Zubović et al., 2019). In addition, North Macedonia has the most affordable cigarettes in the region, with 2.55 percent of average GDP per capita required to purchase 2,000 cigarettes (Djukić et. al., 2021). The estimation of the illicit market in North Macedonia is also very low at 1.9 percent—the lowest level of all countries in the region. Therefore, there is significant space for tobacco tax policy improvement.

Even though North Macedonia ratified the World Health Organization Framework Convention on Tobacco Control (WHO FCTC) in 2006, which introduced a general ban on smoking in public places, in recent years the government has become less restrictive about this ban. Smoking is again permissible, especially in restaurants and bars. Most adults in North Macedonia are exposed to tobacco smoke mainly in bars or nightclubs (73.6 percent)

and restaurants (44.2 percent) (Mijovic Hristovska et al., 2020). For effective tobacco control to be achieved once again, a package of tobacco control measures needs to be considered.

Tobacco taxation has been shown to be the most effective and cost-effective policy tool for reducing smoking prevalence and improving public health. It is one of six core tobacco demand-reduction interventions recommended in the WHO FCTC, and it is also referred to as a win-win policy, since it helps generate extra tax revenue that can be allocated to positive programs such as health and education while at the same time reducing tobacco consumption (World Health Organization, 2018). Tobacco excise taxes increase the cost of tobacco products, making them less affordable and less appealing to smokers. This reduces the demand for tobacco products and motivates many smokers to quit, lowering smoking prevalence and creating significant public health benefits, such as lower rates of smoking-related diseases like cancer, heart disease, and stroke. An increase in tobacco taxes likely also reduces youth smoking initiation, leading to lower long-term rates of smoking prevalence and avoiding potential premature deaths caused by smoking-related diseases.

The link between tobacco taxes and smoking consumption is well documented. A substantial body of evidence shows that as tobacco taxes rise, the demand for tobacco products falls. According to the WHO, a 10-percent increase in tobacco prices can reduce tobacco consumption by four percent in high-income countries and up to eight percent in low- and middle-income countries. Tobacco excise can generate substantial revenues for governments, which can be used to finance tobacco control programs, public health initiatives, and other social welfare programs. This revenue can be used to fund public health campaigns that raise awareness about the risks of smoking as well as programs and services to help smokers quit. As changes in excise taxes can affect both health and state budget revenues, it is important to have evidence-based economic analysis predicting the impact of changes of excise tax on both public revenues and health.

The Customs Administration of the Republic of North Macedonia regulates the excise tax base for tobacco products. The excise duty on cigarettes consists of a specific excise duty per cigarette (3.053 denars) and an ad valorem excise duty prescribed as a certain percentage (9 percent) of the retail price of cigarettes, set in accordance with Article 83 of the Excise Duties Law. In cases where the combined excise duty on cigarettes is lower than 3.053 denars per piece, a minimum excise duty of 3.253 denars for the same quantity is applied (Customs Administration of RNM).

The current specific excise tax level is EUR 54 per 1,000 cigarettes. The level needs to increase by 67 percent in order to reach the EU-required minimum of EUR 90 per 1,000 cigarettes. North Macedonia has started the process of EU integration and has officially started revising the33 chapters of the agreement among which is Chapter 16-Taxation. Thus, very soon the country will need to comply with EU directives. Therefore, there is not only significant space to improve tax policy but an imperative to do so in the short term.

The aim of this research is to estimate the potential effects of tobacco taxation policy for reducing cigarette consumption and improving public health in North Macedonia. More specifically, we use tax simulation modeling to estimate the impact that increases in excise tax would have on government revenues, from tobacco excise and VAT, on lowering smoking prevalence, and on reducing population mortality due to negative health consequences from long-term tobacco use. The idea behind this research is to show policy makers in greater detail how the creation of new tobacco taxation policies will bring benefits for both the government and the population.

Literature Review

The effect of tobacco taxation on consumption and public health has been well documented in the literature. Tobacco tax models rely on microsimulation models to assess the potential effects of changes in tobacco excise and prices on tobacco consumption, tax revenues, illicit trade, and health. The existing literature and public health practice community have developed several different tax models in recent decades, including TETSiM (Van Walbeek, 2010), TaXSiM (Feenberg & Coutts, 1993), SimSmoke (Levy et al., 2016), Tobacconomics (Chaloupka et al., 2010; Zhillima et al., 2022), and the extended cost-effectiveness analysis (ECEA) model.

While most models have similar approaches in estimating tax-change-related economic and health benefits, some are more focused on the health implications (for example, SimSmoke or ECEA), while others focus more on the economic and fiscal effects (for example, TaXSiM or TETSiM). Also, the models often serve as a basis for developing a country-specific model and are modified to reflect the specific policy setting in a certain country or a specific aim of the study. For example, the Bangladesh Cigarette Tax Simulation Model (BDTaXSiM) (Shimul et al., 2022) found that imposing a 65-percent excise tax and increasing the minimum price across all brands would reduce the prevalence of smoking from 15.1 percent to 14.0 percent, as 1.3 million adults would quit and 895,000 youths would not initiate use. The Ontario SimSmoke model (Chaiton et al., 2021) found that increasing tobacco excise taxes had the greatest independent predicted

decrease in smoking prevalence (2.8 percent), while increasing tobacco excise taxes that then raised prices was projected to have minimal impact on taxation revenue. Positive expected health outcomes from taxation policies using the SimSmoke model have also been estimated for Finland (Levy et al., 2012) and for the United States of America (Levy et al., 2016).

An increasing number of studies have simulated the health benefits of tobacco taxation for middle- and low-income countries and found positive outcomes, including Nayab et al. (2019) for Pakistan, Maldonado et al. (2022) for Colombia, Quimbo et al. (2012) for the Philippines, and Zhillima et al. (20212) for Albania. Positive impacts on tax revenues have also been found across studies: Goodchild et al. (2016) for 181 countries throughout the world, Quimbo et al. (2012) for the Philippines, Tesche and van Walbeek (2020) for countries within the Community of West African States, Schafferee et al. (2018) for 36 European countries, and Zhillima et al. (20212) for Albania, among others.

A comprehensive study covering 181 countries (98 percent of the world's smokers) was performed by Goodchild et al. (2016), who developed a model of the global cigarette market to quantify the impacts of an increase in excise on the retail price of cigarettes, cigarette excise revenue, cigarette consumption, the number of daily cigarette smokers, and the future number of smoking-attributable deaths averted among the world's adult population in 2014. They found that raising excise by $1 (international, or I$) per 20-cigarette pack would generate a substantial increase in cigarette tax yields in all countries, a decrease in global cigarette consumption of 18 percent, an increase in cigarette excise revenue generated throughout the world by I$ 190 billion, a decrease in the prevalence of daily cigarette smoking among adults by nine percent, and a decrease in the expected number of smoking-attributable deaths by about six percent. They also found that the majority of the smoking-attributable deaths averted would be in low- and middle-income countries.

Methodology

Data

The process of developing a tobacco tax model involves logical calculations and simulations that include relevant data and assumptions regarding the potential price increase of manufactured cigarettes. To begin the simulation, the total cigarette production, smoking prevalence, and decomposed cigarette price (excise taxes, other taxes, producer price, and supply chain margin) are calculated, along with elasticities (price, cross, income, and prevalence elasticity) and other key variables (real GDP projected, adult population, quitting percentages, illicit market size, and tax pass-throughs). Market segmentation into

three shares according to price (economy, mid-range, and premium) serves as a baseline against which the impacts of various tax policies on key market variables (consumer prices, consumption quantities, tax revenue, producer revenue, and tax incidence) can be calculated. The TaXSiM model is utilized, which relies on a limited number of assumptions to operate.

The data, their sources, and the assumptions used to create the baseline model and to simulate the impacts of a tax increase on tobacco consumption, government revenues, and health are presented in Table 1. We use official data sources whenever possible; however, due to lack of data on several variables, we use assumptions based on the existing literature as explained below.

Table 1. List of variables, data sources, and model assumptions

Data		
Variable	**Source**	**Assumptions**
Specific excise per pack	Ministry of Finance, Customs Administration Office	Set at MKD 3.053 per pack in the base year; an annual increase of 10 percent from its base value is assumed in Scenario 1, 30 percent increase in Scenario 2, and 50 percent increase in Scenario 3. Tax increases are assumed to be fully passed along to retail prices.
Ad valorem excise tax rate	Ministry of Finance, Customs Administration Office	Set at nine percent of the retail price; ad valorem rates are assumed to remain unchanged from the base year.
Value-added tax (VAT)	Ministry of Finance, Customs Administration Office	Set at 18 percent of retail price; VAT rates from the base year are assumed to remain unchanged.
Retail price per pack of cigarettes (for economy, mid-range, and premium	Official data provided by the Customs Office and authors' calculations	Prices of all cigarette brands, ranging from MKD 108 to MKD 160, are considered and an average price is appointed for each segment. Three scenarios are assumed: 1. In S1 the specific excise increases by 10 percent, in which case the price increases by 8.22 percent (in t+1) and 8.31 percent (in t+2).

market segments)		2. In S2 the specific tax increases by 30 percent, in which case the price increases by 23.15 percent (in t+1) and 24.27 percent (in t+2). 3. In S3 the specific price increases by 50 percent, in which case the price increases by 38.08 percent (in t+1) and 41.11 percent (in t+2).
Supply chain margin	TaXSiM	Due to a lack of this type of data, the simulation relies on TaXSiM's recommendations. According to the TaXSiM, the calculation of the supply chain margin percentages is distributed as follows: economy brands have an eight-percent margin, mid-range brands have a nine-percent margin, and premium brands have a 10-percent margin.
Producers' price	TaXSiM	Producers' price is constituted by the cost of production and the producers' profit margin. Based on the available information, TaXSiM estimates the producers' price for each segment with the current retail prices as a base and deducting the total taxes and margins.
Market segment share	Euromonitor data for North Macedonia	The data contain quantity of cigarettes sold in million sticks for each market segment and the total quantity of cigarettes sold. Shares for each market segment are calculated as follows: premium market share is 23 percent, mid-range market share is 49 percent, and economy market share is 29 percent.
Own-price elasticity	TaXSiM, Zubovic et al. (2019)	The first scenario assumes the estimated price elasticity by income group for North Macedonia from the regional study *Impacts of Tobacco Excise Increases on Cigarette Consumption and Government Revenues in Southeastern European Countries* (Zubovic et al., 2019) as elasticities by market segment. We use the price elasticity for the low-income group (-0.446) for the economy segment, the price elasticity for the middle-income group (-0.888) for the mid-range segment, and the price elasticity for the high-income group (-0.278) for the premium segment.

		In the second scenario we use the elasticities by income group of neighboring Bosnia and Herzegovina (B&H) (highest estimates): 1.411 for the low-income group, -0.929 for the middle-income group, and -0.709 for the high-income group. The third scenario incorporates average elasticities of the 2019 regional study noted above by Zubovic et al. Elasticities are estimated at -1.087 for the low-income group, -0.747 for the middle-income group, and 0.5 for the high-income group.
Cross-price elasticities	Chalak et al. (2023), Tauras et al. (2006), Delipalla et al. (2022) Different studies were consulted and simulations made with authors' consideration of the most realistic values.	Due to lack of data, considering the low own-price elasticity, and consulting the literature, it is assumed that the cross-price elasticity for the mid-range price segment with respect to the premium and economy segments is 0.1 and 0.035, respectively; cross-price elasticity for the premium market segment with respect to the mid-range and economy segments is 0.002 and 0.001, respectively; and cross-price elasticity for the economy market segment with respect to the premium and mid-range segments is 0.002 and 0.001, respectively.
Income elasticities	Zubovic et al. (2019), Chalak et al. (2023), Tauras et al. (2006), Delipalla et al. (2022)	For the first scenario, the estimated income elasticities by income group for North Macedonia from the regional study *Impacts of Tobacco Excise Increases on Cigarette Consumption and Government Revenues in Southeastern European Countries* (Zubovic et al., 2019) are used: 1.245 for the economy price segment, 1.124 for the mid-range price segment, and 0.583 for the premium price segment. For the second scenario, income elasticities estimated for Albania (Zubovic et al., 2019) are used because they are higher than the estimated income elasticities in North Macedonia (1.141 for the middle-income group, 1.728 for the low-income group, and 0.517 for the high-income group). In the third scenario, average income elasticities for Southeastern Europe by income group are used:

		0.966 for the middle-income group, 1.148 for the low-income group, and 0.636 for the high-income group.
Projected real GDP growth (%)	IMF forecasts	Official statistics data from IMF for GDP growth for North Macedonia, with an estimated annual growth of 3 percent
Smoking prevalence	Hristovska Mijovic et al. (2020)	Initial prevalence is 48.4 percent for 2019. The same is used as an estimation for 2023. For 2024 and 2025 it is calculated depending on price and prevalence elasticity changes.
Total adult population (ages 15+)	National Census 2021	Official data for the adult population in 2021 from the State Statistical Office
Number of cigarette packs consumed, by market segment	Customs administration, official data for issued control stamps for packs of cigarettes	Number of packs for all three market segments are calculated by multiplying the total legal quantity of packs sold with the market shares for all three segments.
Cigarette consumption TOTAL	Customs administration, official data for issued control stamps for packs of cigarettes, and authors' calculations	Total consumption includes both legal and illegal sales, where Q is total consumption of cigarettes, Q_l is legal consumption, and Q_{il} is the illicit consumption. The estimated share of the illicit market in the total number of cigarette packs sold is 1.9 percent.
Percentage of quitters who avoid premature death	Ranson et al. (2000)	Smoking prevalence in North Macedonia is estimated at 48.4 percent, while the assumed number of quitters who avoid premature death is 70 percent.
Prevalence elasticity	Zubovic et al. (2019)	Three scenarios are calculated. 1. In the first scenario, the prevalence elasticity estimated for North Macedonia, at -0.214, is used. 2. Second, the prevalence elasticity for B&H estimated at -0.563 is incorporated. 3. And third, the prevalence elasticity for Albania, estimated at -0.165, is used.

Illicit market size	Najdovska Trajkova et al. (2021)	The illicit trade for manufactured cigarettes in North Macedonia is estimated at 1.9 percent. The assumptions for the simulations are: • We assume that changes in the excise and consequently the price do not induce changes in the illicit market share. • For a sensitivity analysis, we also calculate the changes that would occur under the assumption of price elasticity of illicit trade of 0.02.
Tax pass-through	WHO's Tobacco Tax Simulation Model (WHO TaXSiM), June 2013	We assume a complete pass-through of the excise increase to the consumer prices.

Defining the main components and assumptions

Calculations and assumptions are made in accordance with the World Health Organization's Tobacco Tax Simulation Model (WHO TaXSiM). The first steps are decomposition of the retail sales price of manufactured cigarettes and defining the key market segments. North Macedonia has two types of excise taxes on cigarettes, E (Table 2). The specific excise E_s is a specific monetary value on a defined number of cigarette units, and it is equal to 3.053 denars per cigarette. Ad valorem excise E_a is a percentage of the value of the retail price (P_R) of the tobacco product, and it is equal to nine percent. Sometimes the rate of the ad valorem tax is also called the statutory rate, t_e.

$$E_a = t_e \cdot P_R$$

In cases where the combined excise duty on cigarettes $E = (E_s + E_a)$ is lower than 3.253 denars per piece, a minimum excise duty of 3.253 denars for the same quantity is applied.

Table 2. Excise tax for cigarettes in North Macedonia (in MKD)

In denars	Economy	Mid-range	Premium
Price of a cigarette pack	108.00	114.00	160.00
Specific excise per cigarette	3.05	3.05	3.05
Specific excise per pack	61.06	61.06	61.06
Ad valorem excise (9%)	9.72	10.26	14.40
Total (combined) excise per pack	70.78	71.32	75.46
Total (combined) excise per cigarette*	3.54	3.57	3.77

*In all three segments the combined excise tax is higher than the minimum tax of 3.253 denars per piece.

Value-added tax (V) is equal to 18 percent of the retail price $(v = 0.18)$. If R_M is the supply chain margin, P_p is the producer price, and E is total excise taxes, the amount of VAT per pack would be:

$$V = \left(P_p + R_M + E\right) \cdot v$$

The statutory rate v of VAT is converted into a percentage of the retail price:

$$v_p = \frac{v}{(1+v)}$$

and the VAT tax per pack is calculated as:

$$V = v_p \cdot P_R$$

According to the TaXSiM, the final cigarette price P_R that the consumers pay consists of:

$$P_R = P_p + R_M + T$$

where T is for a unit value of total taxes (excises and VAT) and R_M represents the supply chain margin. This percentage is commonly unknown to the public and governments. For simplicity, in this calculation the supply chain margin percentages (t_M), are distributed as follows: economy brands have an eight-percent margin, mid-range brands have a nine-percent margin, and premium brands have a 10-percent margin. The calculation is performed using the following formula for all three segments:

$$R_M = t_M \cdot P_R$$

Producers' price P_p is constituted by the cost of production and the producers' profit margin. This information, similar to profit margin, is not usually available in most countries. TaXSiM estimates the producers' price for each segment with the current retail prices as a base and deducting the total taxes and margins:

$$P_R = P_p - R_M - T$$

Market segments are defined according to Euromonitor. A detailed decomposition of cigarette prices and taxes by segments is presented in Table 1.

A further assumption is that the price elasticity of demand varies by price segment. The literature suggests that the demand/consumption of premium brands is less sensitive to price changes than the demand/consumption of mid-range and economy price brands (see, for example, Chalak et al., 2021; Tauras et al., 2006; Delipalla et al., 2022; WHO, 2013). In this study, we use three scenarios for the own-price elasticity of cigarette demand. We use the estimated average price elasticity for the whole population in North Macedonia (-0.446) from the 2019 regional study, *Impacts of Tobacco Excise Increases on Cigarette Consumption and Government Revenues in Southeastern European Countries,* for the

elasticity of the mid-range price segment. Elasticities for the other two segments are adjusted using the ratio between the own-price elasticities of the different price segments in Tauras et al. (2006), making it -0.502 for the economy segment, -0.446 for the mid-range segment, and -0.151 for the premium segment in the first scenario.

Because the estimated price elasticity in North Macedonia is low (Zubovic et al., 2019), in the second scenario we use the elasticities by income group of Bosnia and Herzegovina (which are the highest estimates in the region). These elasticities are -1.411 for the low-income group, -0.929 for the middle-income group, and -0.709 for the high-income group. The third scenario incorporates average elasticities of Southeastern Europe, estimated at -1.087 for the low-income group, -0.747 for the middle-income group, and 0.5 for the high-income group. Cross-price elasticities, particularly for different segments, are not always available for each country. Lacking cross-price elasticity estimates for North Macedonia, cross-price elasticities according to available empirical evidence are assumed (Tauras et al., 2006; Delipalla et al., 2022).

Assumed income elasticities are presented in detail in Table 1. They are calculated in the same manner as the price elasticity. For the first scenario, total income elasticity for the whole population (0.874) for the mid-range price segment is applied. The income elasticities for the premium and economy segments are estimated at 0.296 and 0.983, accordingly. To perform a sensitivity analysis for the second scenario, income elasticities estimated for Albania (Zubovic et al., 2019) are used (1.141 for the middle-income group, 1.728 for the low-income group, and 0.517 for the high-income group), as they are higher than the estimated income elasticities in North Macedonia. In the third scenario, average income elasticities for South-eastern Europe by income group are used: 0.966 for the middle-income group, 1.148 for the low-income group, and 0.636 for the high-income group.

Data on projected real GDP growth for 2023 are taken from International Monetary Fund forecasts, and for North Macedonia this forecast is 3.00 percent. Smoking prevalence in North Macedonia is estimated to be 48.40 percent, according to the research study, *Tobacco Consumption in North Macedonia* (Mijovic Hristovska et al., 2020).

Simulating the impact of tobacco tax policies

To estimate the total cigarette consumption, we use data on legal consumption (based on issued excise stamps) from the Customs Administration. The legal consumption in 2022 was 180,642,292 packs, or 3,612,845,840 cigarettes. Since the illicit market has previously been estimated at 1.9 percent of total consumption, total packs consumed (Q) are calculated as follows:

$$Q = Q_l/(1 - Q_{il}) = 180{,}642{,}292 \,/\, (1 - 0.019) = 184{,}140{,}970$$

Where Q is total consumption of cigarette packs, Q_l is the legal consumption and Q_{il} is the estimated share of the illicit market in the total number of cigarette packs sold. Only the legally sold cigarette packs are used in the calculation of the impact of an increase in excise on tax revenues, because tax is paid only for that part of the total consumption.

One of the assumptions of the model is that the retail price P_R will increase as a result of an increase in specific and ad valorem excise. We introduce three scenarios regarding the increase of the specific excise. In the first scenario, it is assumed that the specific excise will increase by 10 percent annually (if t is the base period, $t + 1$ is the first period with increased price) (Zubovic et al., 2019). We introduce two more scenarios with assumed increases in the specific excise of 30 percent and 50 percent, respectively. As the excise tax is very low in North Macedonia (significantly lower than EU requirements), and the retail price is also the lowest in the region, we apply percentage increases that would lead to a more substantial increase in the tax burden of the cigarette retail price.

In the model we assume a complete pass-through of the excise increase to the consumer prices. Additionally, we support the proposed higher than usual increase in tax with the findings of other studies (Jha et al., 2006) which suggest that—because the estimates of price elasticity for low- and middle-income countries are about double those estimated for high-income countries—significant increases in tobacco taxes in these countries would be effective in reducing tobacco use. As previously explained, the retail price is constructed by combining the producer price P_p, retail margin R_M, ad valorem excise E_a, specific excise E_s, and value-added tax V.

$$P_R = P_p + R_M + E_a + E_s + V$$

To estimate the final retail price, first we apply the percentage increase p_s^* on the specific excise E_s, which is currently 2.853 denars, to calculate the new higher specific excise E_s^*:

$$E_s^* = p_s^* \cdot E_s$$

To calculate the increased supply chain margin and producer price, it is assumed that they will increase with the same percentage as the assumed GDP growth, GDP_{real}. The calculations for the new supply chain margin R_M^* and the new producer price P_p^* are presented below:

$$R_M^* = \frac{1 + GDP_{real}}{R_M} \qquad P_p^* = \frac{1 + GDP_{real}}{P_p}$$

Value-added tax and ad valorem excise are calculated after the new retail price is calculated (calculations are done for three segments, we omit k subscripts for segments for brevity), since they are percentages calculated from the retail price. The new retail price P_R^* is calculated using the following formula:

$$P_R^* = \frac{(E_s^* + R_M^* + P_p^*)}{(1 - t_e - \left(\frac{v}{1+v}\right)}$$

For estimation of the percentage change in consumer price, the following formula is used:

$$\%\Delta P_R = \left(\frac{P_R^* - P_R}{P_R}\right) \cdot 100$$

After the new retail price is estimated, the value-added tax and ad valorem excise are calculated by applying the 18-percent and nine-percent levels, respectively.

To calculate the new and reduced consumption of packs (by segment) for $t + 1$, we first use the current estimated packs consumed for period t and distribute them by segment, applying the percentages for the income distribution. If k_1 is the economy segment, k_2 is the mid-range segment, k_3 is the premium segment, Q is total pack consumption for period t, and market shares for the economy, mid-range, and premium segments are marked ms_1, ms_2, and ms_3, respectively, then the pack consumption by segment Q_1, Q_2, and Q_3 are calculated as:

$$Q_k = Q \cdot ms_i$$

To estimate the quantities of new packs consumed, own-price elasticities, income elasticities, and prevalence elasticities by segment need to be assumed or estimated. For segments k_1, k_2, and k_3, price elasticities are marked as μ_{k_1}, μ_{k_2}, and μ_{k_3}, respectively. For the same segments, income elasticities are noted as I_{k_1}, I_{k_2}, and I_{k_3}, respectively. Prevalence elasticity PREV is the same for all segments.

The price change formula is presented in the previous text, $\%\Delta P_R$. For estimation of new packs consumed after the price increase $Q^*_{k_1}$, the following formula is used (for the first segment of economy price, k_1):

$$Q^*_{k_1} = Q_{k_1} \cdot (1 + I_{k_1} \cdot PE_{k_1} + CE_{e\ to\ m} \cdot \%\Delta P_{Rk2} + CE_{e\ to\ p} \cdot \%\Delta P_{Rk3} + GDP_{real} \cdot I_{k_1})$$

The procedure is repeated accordingly for the remaining segments. Total revenue from excise is a product of combined excise and packs consumed, total tax revenue is a product of total tax (combined excise + value-added tax), and total market value is a product of price per pack and packs consumed.

Simulating the impacts of tobacco tax policies on health

Higher prices of manufactured cigarettes may influence the reduction in smoking and prevent potential smoking-related diseases. It also reduces costs for treatment of patients with smoking-related diseases and causes a reduction in the number of premature deaths. The simulation is supposed to estimate the decrease in smoking prevalence and the number of smokers who avoid premature death. It starts with total consumption of cigarettes (in millions), which equals:

$$Q_t = Q \cdot 20 = 1{,}841{,}409{,}070 \cdot 20 = 3{,}682{,}819{,}400$$

where Q_t stands for total consumption of cigarettes in the base year and Q stands for total packs consumed.

Important variables used in this simulation are total adult population (15+) P_{15+}, which is $1{,}525{,}366$, overall prevalence elasticity, $PrevElac$, which is 0.197 (Zubovic et al., 2019), price elasticity of prevalence, which is – 0.214, and income elasticity of prevalence, which is 0.411. In other words, if both price and income increased at the same

time by 10 percent each, the overall impact would be an increase in consumption by 1.97 percent, due to a relatively stronger impact of income changes.

Another important coefficient is the one that estimates the reduction in consumption due to the illicit market. In the research from Najdovska Trajkova et al. (2021), the percentage of illicit trade, IT, is estimated at 0.019 for manufactured cigarettes. Total consumption of cigarettes for period $t+1$ equals:

$$Q_{t+1} = Q \cdot (1 - IT)$$

We assume that changes in the excise and consequently the price do not induce changes in the illicit market share. For a sensitivity analysis to check if increased illicit trade would substantially weaken the impact of a price increase on reducing smoking, we also calculate the changes that would occur under the assumption of price elasticity of illicit trade of 0.02.

The reduction in the smoking adult prevalence for period $\mathrm{t}+1$, $Prev_{t+1}$ is calculated with the following formula:

$$Prev_{t+1} = Prev_t \cdot (1 + PrevElac \cdot \%\Delta P_{Rt})$$

Where $\mathrm{Prev_t}$ is the smoking adult prevalence in the base year (48.4 percent), $PrevElac$ is the prevalence elasticity equal to 0.197, estimated in 2019 (Zubovic et al., 2019). For the second scenario, we use the prevalence elasticity estimated for Bosnia and Hercegovina. The price elasticity of prevalence is estimated at -0.563, and the income elasticity of prevalence is estimated at 0.426. Hence, the overall prevalence elasticity is -0.137. For the third scenario, we will use average prevalence elasticity for Albania. The price elasticity of prevalence is estimated at -0.165, and the income elatsicity of prevalence is estimated at 0.781. Hence, the overall prevalence elasticity is 0.616. The $\%\Delta\mathrm{P_{Rt}}$ is the percent of increase in the weighted average price for all three segments.

The number of smokers for period $t+1$, NS_{t+1} is a product of total adult population P_{15+} and the newly calculated prevalence rate $Prev_{t+1}$:

$$NS_{t+1} = P_{15+} \cdot Prev_{t+1}$$

The difference between the number of smokers before and after the tax increase represents the reduction in the number of smokers. A fraction of these smokers, ranging from 40 percent to 70 percent, will quit and thus avoid premature death. The number of smokers who avoid premature death, $SaPD$, equals the reduced number of smokers $(NS_t - NS_{t+1})$ multiplied by the percentage of smokers who would die prematurely, $\%PD$ (assumed at 40 percent), and by the percentage of quitters who avoid premature death, $\%Quitters$, assumed at 70 percent following the literature (Shimul et al., 2022):

$$SaPD = (NS_t - NS_{t+1}) \cdot \%PD \cdot \%Quitters$$

Smoking intensity SI_{t+1} is calculated using the following equation:

$$SI_{t+1} = \frac{Q_{t+1}}{NS_{t+1}}$$

The same calculation applies for the youth population. The difference is that instead of quitters, the result is related to number of future smokers who will not initiate smoking. The number of youth smokers in the base year was calculated using the number of the youth population (ages 0–14) and youth prevalence of 12.4 percent and is 38,607 (Global Youth Tobacco Survey (GYTS) conducted in 2016). The price elasticity of prevalence used to calculate smoking prevalence in the simulation years is -0.3, estimated in the 2023 working paper, *Impact of Cigarette Prices and Tobacco Control Policies on Smoking Initiation among Adolescents: Evidence from North Macedonia*. The same procedure as for the

adults was followed, with the only difference that in the calculations for the youth population the percentage of quitters who would avoid premature death is not included.

Results

The estimations based on the above-elaborated methodology provided the results presented in Table 3. The table includes the results for the total excise revenue and total tobacco tax revenue (excise + VAT) from each model. We assume three scenarios of specific excise increase (10 percent, 30 percent, and 50 percent) in the tobacco excise tax modeling, and, for each scenario, three models are estimated based on different assumptions of demand elasticity. The first model in each scenario is based on the elasticities calculated for North Macedonia in Zubovic et al. (2019), and this is the model that yields the highest excise tax revenue increases. The three models have very similar results, and this confirms the findings are substantial and robust. The increase in excise revenues for that model varies across the different scenarios in the range between 8.18 percent (for a 10-percent excise increase) and 22.44 percent (for a 50-percent excise increase) and the increase in total tax revenues varies between 7.8 (for a 10-percent excise increase) percent and 20.26 percent (for a 50-percent excise increase). This implies that there is room for a larger increase in the tobacco excise.

Table 3. Summary of the effects of excise tax increases on government revenue

	First scenario – 10% specific excise increase					
	Model 1		Model 2		Model 3	
Year	**Total excise revenue**					
	Amount (EUR 1,000)	Change (%)	Amount	Change (%)	Amount	Change (%)
2023	209,903	/	209,903	/	209,903	/
2024	227,105	8.20%	220,977	5.28%	223,533	6.49%
2025	245,684	8.18%	232,524	5.23%	237,996	6.47%
	Total tax revenue					
	Amount	Change (%)	Amount	Change (%)	Amount	Change (%)
2023	264,434	/	264,434	/	264,434	/

2024	285,052	7.80%	277,374	4.89%	280,607	6.12%
2025	307,295	7.80%	290,859	4.86%	297,756	6.11%
	Second scenario – 30% specific excise increase					
	Model 1		Model 2		Model 3	
Year	**Total excise revenue**					
	Amount	Change (%)	Amount	Change (%)	Amount	Change (%)
2023	209,903	/	209,903	/	209,903	/
2024	245,188	16.81%	223,569	6.51%	234,923	11.92%
2025	285,601	16.48%	236,776	5.91%	261,937	11.50%
	Total tax revenue					
	Amount	Change (%)	Amount	Change (%)	Amount	Change (%)
2023	264,434	/	264,434	/	264,434	/
2024	305,239	15.43%	278,461	5.30%	292,558	10.64%
2025	352,078	15.34%	292,108	4.90%	323,073	10.43%
	Third scenario – 50% specific excise increase					
	Model 1		Model 2		Model 3	
Year	**Total excise revenue**					
	Amount	Change (%)	Amount	Change (%)	Amount	Change (%)
2023	209,903	/	209,903	/	209,903	/
2024	256,995	22.44%	215,610	2.72%	238,236	13.50%
2025	312,131	21.45%	218,932	1.54%	267,764	12.39%
	Total tax revenue					
	Amount	Change (%)	Amount	Change (%)	Amount	Change (%)
2023	264,434	/	264,434	/	264,434	/
2024	318,020	20.26%	267,097	1.01%	294,978	11.55%
2025	381,214	19.87%	267,763	0.25%	327,270	10.95%

Source: Authors' calculations

The results from the simulation models estimating the effects of excise increases on health are presented in Table 4. More specifically, the table shows the reduction in the number of smokers and the resulting number of smokers who avoid smoking-related premature death under different assumptions for excise increases and price and income elasticity. We should note that here we assume no change in the share of the illicit market in total cigarette

consumption, kept constant at 1.9 percent. An increase in the illicit market is also considered; however, even with a certain increase in the illicit market, its share is still low and the beneficial effects of price increases on health persist. It is evident that an increase in the excise tax creates noticeable health benefits in reducing the number of smoking-related deaths and the smoking intensity across all models and scenarios.

As expected, a larger increase in the excise leads to more substantial health benefits. In this case, contrary to the effect on revenues, Model 2 provides the largest health benefits in terms of number of smokers who avoid premature death, due to the stronger effects on smoking prevalence from the price change. However, even the model with the lowest elasticity yields positive health outcomes, especially when a larger increase in the excise is introduced. This implies that increasing the tax burden of cigarettes is beneficial for public health. In addition, we calculate the change in smoking intensity caused by changes in the tobacco tax burden using an assumed price elasticity of the illicit market at 0.02 (see Appendix A1). The results change somewhat in terms of a smaller reduction of smoking intensity, however, the difference is not substantial due to the low share of the illicit market.

Table 4. Summary of the effects of excise tax changes on the number of smokers who avoid premature death

	Scenario 1 – 10% specific excise increase								
	Model 1			Model 2			Model 3		
	2023	**2024**	**2025**	**2023**	**2024**	**2025**	**2023**	**2024**	**2025**
Total consumption of cigarettes (millions of sticks)	3,683	3,634	3,585	3,682,819,409	3,535,920,520	3,392,613,893	3,682,819,409	3,576,523,976	3,471,934,717
Prevalence	48.40%	48.20%	47.99%	48.40%	46.92%	45.45%	48.40%	48.91%	49.42%
Number of smokers (in 1,000s)	738,277	735,235	732,054	738,277	715,641	693,331	738,277	746,106	753,911
Change in number of smokers		-3.043	-3.181		-22,636	-22,310		7,829	7,805
Change in number of smokers %		-0.41%	-0.43%		-3.07%	-3.12%		1.06%	1.05%
Number of smokers who avoid premature death		**-852**	**-891**		-6338	-6247		2192	2185
Average annual number of cigarettes smoked (per smoker)	4,988.40	4,942.79	4,897.02	4,988.40	4,940.91	4,893.21	4,988.40	4,793.58	4,605.23
Average daily number of cigarettes smoked (per smoker)d	13.67	13.54	13.42	13.67	13.54	13.41	13.67	13.13	12.62
Smoking intensity change		-45.61	-45.77		-47.48	-47.70		-194.81	-188.35
	Scenario 2 – 30% specific excise increase								
	Model 1			Model 2			Model 3		
	2023	**2024**	**2025**	**2023**	**2024**	**2025**	**2023**	**2024**	**2025**
Total consumption of cigarettes (millions of sticks)	3,683	3,343	3,021	3,683	3,047	2,5033	3,683	3,203	2,769
Prevalence	48.40%	46.79%	45.11%	48.40%	43.12%	38.15%	48.40%	47.81%	47.15%
Number of smokers (in 1,000s)	738,277	713,733	688,135	738,277	657,729	581,964	738,277	729,337	719,148

Change in number of smokers		-24,544	-25,598		-80,548	-75,765		-8,940	-10,189
Change in number of smokers %		-3.32%	-3.59%		-10.91%	-11.52%		-1.21%	-1.40%
Number of smokers who avoid premature death		-6,872	-7,168		-22,553	-21,214		-2,503	-2,853
Average annual number of cigarettes smoked (per smoker)	4,988.40	4,684.50	4,390.03	4,988,40	4,633.21	4,300.79	4,988,40	4,391.07	3,850.96
Average daily number of cigarettes smoked (per smoker d	13.67	12.83	12.03	13.67	12.69	11.78	13.67	12.03	10.55
Smoking intensity change		-303.90	-294.47		-355.19	-332.42		-597.32	-540.11
	Scenario 3 – 50% specific excise increase								
			Model 1			Model 2			Model 3
	2023	**2024**	**2025**	**2023**	**2024**	**2025**	**2023**	**2024**	**2025**
Total consumption of cigarettes (millions of sticks)	3,683	3,053	2,499	3,683	2,559	1,751	3,683	2,829	2,143
Prevalence	48.40%	45.37%	42.21%	48.40%	39.24%	31.21%	48.40%	46.70%	44.83%
Number of smokers (000)	738,277	692,086	643,922	738,277	598,538	476,117	738,277	712,361	683,865
Change in number of smokers		-46,191	-48,164		-139,739	-122,421		-25,916	-28,496
Change in number of smokers %		-6.26%	-6.96%		-18.93%	-20.45%		-3.51%	-4.00%
Number of smokers who avoid premature death		-12,933	-13,486		-39,127	-34,278		-7,256	-7,979
Average annual number of cigarettes smoked (per smoker)	4,988,40	4,411.09	3,881.26	4,988,40	4,275.19	3,677.56	4,988,40	3,970.76	3,133.17
Average daily number of cigarettes smoked (per smoker	13.67	12.09	10.63	13.67	11.71	10.08	13.67	10.88	8.58

Smoking intensity change		-577.31	-529.82		-713.20	-597.64		-922.85	-837.59

Source: Authors' calculations

Table 5 presents the results from the simulation of the health effects of a tax increase on the youth population, in terms of avoided premature deaths. An increase in the excise tax causes prevalence reduction, leading to a certain decline in the number of young smokers. This means that a certain number of young people would not start smoking. Taking into account Model 1, an increase in the excise tax leads to between 890 and 4,054 young people not initiating smoking in 2024. Without the tax change, it is assumed that 40 percent of them would eventually suffer premature smoking-related death. Thus, the policy of increasing tobacco tax contributes to important health benefits in terms of avoided smoking-related deaths among the youth, because a certain number of them would not start smoking.

Table 5. Summary of the effects of excise tax changes on the number of youth smokers who avoid premature death

	Scenario 1 – 10% specific excise increase								
Youth	**2023**	**2024**	**2025**	**2023**	**2024**	**2025**	**2023**	**2024**	**2025**
Number of young smokers	38,607	37,717	36,836	38,607	37,713	36,830	38,607	37,707	36,818
Prevalence	12.40%	12.11%	11.83%	12.40%	12.11%	11.83%	12.40%	12.11%	11.83%
Change in number of young smokers		-890	-881		-894	-883		-900	-889
Change in number of young smokers %		-2.31%	-2.34%		-2.31%	-2.34%		-2.33%	-2.36%
Number of young smokers who avoid premature death		623	616		626	618		630	622

	Scenario 2 – 30% specific excise increase								
Youth	**2023**	**2024**	**2025**	**2023**	**2024**	**2025**	**2023**	**2024**	**2025**
Number of young smokers	38,607	36,140	33,699	38,607	36,100	33,638	38,607	36,112	33,657
Prevalence	12.40%	11.61%	10.82%	12.40%	11.59%	10.80%	12.40%	11.60%	10.81%
Change in number of young smokers		-2,467	-2,442		-2,507	-2,462		-2,495	-2,456
Change in number of young smokers %		-6.39%	-6.76%		-6.49%	-6.82%		-6.46%	-6.80%
Number of young smokers who avoid premature death		987	977		1,003	985		998	982
	Scenario 3 – 50% specific excise increase								
Youth	**2023**	**2024**	**2025**	**2023**	**2024**	**2025**	**2023**	**2024**	**2025**
Number of young smokers	38,607	34,554	30,585	38,607	34,450	30,461	38,607	34,498	30,520
Prevalence	12.40%	11.10%	9.82%	12.40%	11.06%	9.78%	12.40%	11.08%	9.80%
Change in number of young smokers		-4,054	-3,968		-4,157	-3,989		-4,109	-3,979
Change in number of young smokers %		-10.50%	-11.48%		-10.77%	-11.58%		-10.64%	-11.53%

Number of young smokers who avoid premature death		1,621	1,587		1,663	1,596		1,643	1,592

Source: Authors' calculations

Limitations

One of the more challenging parts of the simulation model is calculating precise estimates per segment, particularly the price elasticities, income elasticities, and cross-price elasticities. The quality of the data influences the validity of the final simulations and calculations. While the income elasticities and price elasticities are already estimated in the previous study, *Impacts of Tobacco Excise Increases on Cigarette Consumption and Government Revenues in Southeastern European Countries*, the cross-price elasticities remain the weakest of the estimations. Nevertheless, even the cross-price elasticities used here are derived from well executed studies and are more than defensible for these purposes. Additionally, no average retail price per segment is available for North Macedonia, and we use the data for average retail prices of the cheapest, mid-range, and premium types of cigarettes, in MKD, provided from State Statistical Office. These data are not perfect but are the best available, defensible, and highly unlikely to affect the overall findings. The supply chain margin is also not available, and we borrow from the TaXSiM model to simulate the margins per different segment. For percentage of quitters who avoid premature death, we use a study published in 2000, but it refers to smokers in 1995. It is possible that these percentages have changed somewhat over time though there is no subsequent evidence suggesting we should use a different proportion.

Conclusions

Tax simulation modeling is a relatively straightforward, rigorous, and transparent way to show that an increase in cigarette taxes can contribute to many financial, social, health, and demographic benefits. Such modeling has been undertaken in many other countries and it has proven empirically that raising tobacco excise taxes is a very effective tool for reducing smoking prevalence, increasing public revenues, saving on health expenses due to reduction in smokers, and most importantly, saving lives. The last is very important, since North Macedonia has been experiencing demographic aging and severe emigration trends in the past decades, resulting in population decline and shortages in the qualified workforce. Having working-age people dying from entirely preventable tobacco-related deaths makes poor economic sense and strongly compels the government to tackle this issue.

The results of the working paper present supporting evidence for aligning tobacco control policies with EU requirements and provisions in the Framework Convention for Tobacco Control. The increase of the tobacco excise, to bring it in line with the EU and international best practices, will lead to reduced smoking prevalence rates, increased budget revenues, improved health, and saved lives. The government should impose larger tobacco excise increases in order to fulfil the requirements for alignment with the EU excise tax directive. The current excise tax levels need to increase 67 percent to reach the EU-required minimum of EUR 90 per 1,000 cigarettes.

In addition, the smoking prevalence in North Macedonia remains high: almost half of the adult population uses tobacco. High smoking prevalence results in high economic and health costs for the country. The price of cigarettes and their affordability in North Macedonia are the lowest in the region and the EU. The changes in excise taxes can affect both health and state budget revenues. Therefore, it is important to have evidence-based economic analysis predicting more precisely the impacts of changes to excise tax on public revenues and health.

Recommendations for improving tobacco control:

- A gradual increase in the specific excise tax and setting a reasonable but still aggressive timeline for reaching the EU-required level;
- Enhancing non-price tobacco control policies, including reintroducing the ban for smoking in closed public areas, will strongly mitigate both first-hand and second-hand smoking;
- Raising awareness among all population groups, especially youth, through comprehensive public and education campaigns on the health risks of tobacco use will likely help to decrease consumption.

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Appendix

Table A1. The effects of illicit trade reaction to price increase on smoking intensity (illicit trade price elasticity of 0.02)

	Scenario 2 – 30% excise increase								
	Model 1			Model 2			Model 3		
	2023	2024	2025	2023	2024	2025	2023	2024	2025
Initial illicit market	3,498,678	3,498,678	3,498,678	3,498,678	3,498,678	3,498,678	3,498,678	3,498,678	3,498,678
Illicit market elasticity	/	0.02	0.02	/	0.02	0.02	/	0.02	0.02
Change in illicit market	/	769,422	738,686	/	782,138	679,519	/	778,181	712,129
New illicit market	/	4,268,100	4,237,364	/	4,280,817	4,178,198	/	4,276,859	4,210,808
Total consumed packs	184,140,970	168,265,885	152,414,018	184,140,970	153,755,501	126,945,663	184,140,970	161,362,962	140,050,414
Total consumption of cigarettes	**3,682,819,409**	**3,365,317,702**	**3,048,280,355**	**3,682,819,409**	**3,075,110,028**	**2,538,913,259**	**3,682,819,409**	**3,227,259,235**	**2,801,008,287**
Illicit market share	1.90%	2.54%	2.78%	1.90%	2.78%	3.29%	1.90%	2.65%	3.01%
Prevalence	48.40%	46.79%	45.11%	48.40%	43.12%	38.15%	48.40%	47.81%	47.15%
Number of smokers	738,277	713,733	688,135	738,277	657,729	581,964	738,277	729,337	719,148
Change in number of smokers		-24,544	-25,598		-80,548	-75,765		-8,940	-10,189

Change in number of smokers %		-3.32%	-3.59%		-10.91 %	-11.52 %		-1.21%	-1.40%
Number of smokers who avoid premature death		-6,872	-7,168		-22,553	-21,214		-2,503	-2,853
Annual number of cigarettes smoked	4,988.40	4,715.09	4,429.77	49,88.40	4,675.34	4,362.66	4,988.40	4,424.92	3,894.90
Daily number of cigarettes smoked	13.67	12.92	12.14	13.67	12.81	11.95	13.67	12.12	10.67
Smoking intensity change		-273.30	-285.32		-313.05	-312.68		-563.47	-530.02

	Scenario 3 – 50% excise increase								
	Model 1			**Model 2**			**Model 3**		
	2023	**2024**	**2025**	**2023**	**2024**	**2025**	**2023**	**2024**	**2025**
Initial illicit market	3,498,678	3,498,678	3,498,678	3,498,678	3,498,678	3,498,678	3,498,678	3,498,678	3,498,678
Illicit market elasticity	/	0.02	0.02	/	0.02	0.02	/	0.02	0.02
Change in illicit market	/	1,264,425	1,146,480	/	12,96,626	968,937	/	1,281,649	1,066,774
New illicit market	/	4,763,104	4,645,158	/	4,795,305	4,467,616	/	4,780,327	4,565,452

Total consumed packs	184,140,970	154,505,580	127,232,454	184,140,970	130,307,773	90,351,641	184,140,970	143,524,031	109,663,275
Total consumption of cigarettes	**3,682,819,409**	**3,090,111,592**	**2,544,649,088**	**3,682,819,409**	**2,606,155,452**	**1,807,032,821**	**3,682,819,409**	**2,870,480,623**	**2,193,265,498**
Illicit market share	1.90%	3.08%	3.65%	1.90%	3.68%	4.94%	1.90%	3.33%	4.16%
Prevalence	48.40%	45.37%	42.21%	48.40%	39.24%	31.21%	48.40%	46.70%	44.83%
Number of smokers	738,277	692,086	643,922	738,277	598,538	476,117	738,277	712,361	683,865
Change in number of smokers		-46,191	-48,164		-139,739	-122,421		-25,916	-28,496
Change in number of smokers %		-6.26%	-6.96%		-18.93%	-20.45%		-3.51%	-4.00%
Number of smokers who avoid premature death		-12,933	-13,486		-39,127	-34,278		-7,256	-7,979
Annual number of cigarettes smoked	4,988.40	4,464.92	3,951.80	4,988.40	4,354.20	3,795.35	4,988.40	4,029.53	3,207.16
Daily number of cigarettes smoked	13.67	12.23	10.83	13.67	11.93	10.40	13.67	11.04	8.79
Smoking intensity change		-523.47	-513.13		-634.20	-558.85		-958.87	-822.37