Expediting Tobacco Taxation in Slovakia: More Gains, Fewer Pains

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Abstract

The paper investigates the fiscal and public health implications of adopting an expedited excise tax calendar for conventional tobacco cigarettes in Slovakia. Through a comparative simulation, the study evaluates the outcomes of the current bi-annual tax system versus a proposed annual increase schedule from 2024 to 2028. The findings indicate that the proposed tax calendar would substantially increase government revenues while significantly lowering smoking prevalence, particularly among vulnerable populations such as youth and low-income groups. By raising tobacco prices more frequently, the proposed system is projected to achieve greater public health benefits, including the prevention of numerous premature deaths and lower smoking initiation. These findings underscore the benefits of excise taxation as both a fiscal and public health tool, offering a framework that could be replicated by other Central and Eastern European countries struggling with tobacco affordability progress.

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Introduction

Excise tax on tobacco is generally recognized as a profoundly effective public health policy tool used for reduction in smoking prevalence and remedy of health risks associated with tobacco use. The World Health Organization promotes increasing excise taxes on tobacco products as one of the most cost-effective ways to reduce consumption, particularly in low- and middle-income countries (WHO, 2019). Increasing price of conventional cigarettes makes smoking less affordable, leading to reductions in consumption, especially among price-sensitive groups such as low-income households and youth (Chaloupka et al., 2011). Lower smoking prevalence has direct public health benefits, including fewer cases of tobacco-related diseases such as lung cancer or heart disease, which in turn decreases the overall fiscal expenditures on healthcare systems (IARC, 2011).

In addition to public health impact, tobacco taxation plays a vital role in fiscal policy and government revenues. Excise taxes on tobacco provide governments with a steady and predictable revenue stream, which can be reinvested into healthcare or other social programs or could be used to support broader fiscal consolidation efforts (Goodchild et al., 2018). In many countries, regular increases in these taxes offer a reliable source of funding for public services. Thus, the dual benefits of tobacco taxation – improving public health and securing fiscal stability – make it an important policy tool for governments facing the challenges of reducing smoking rates and managing state budget deficits. The Slovak government is currently facing exactly the same dual challenge, where public finances are especially in poor condition and the smoking prevalence achieves progress only with marginal steps.

Since 2021, Slovakia has made noticeable progress in tobacco excise tax increases after a long period of stagnation. However, despite increased revenue gains for state budget, smoking prevalence in Slovakia remains close to the European Union average (Eurobarometer, 2024), and further improvements are desired. The currently installed bi-annual tax increase system is expected to deliver some positive outcomes, however, there is a potential for even greater benefits through a more structured and frequent approach. This paper evaluates the impact of two possible excise tax regimes in Slovakia: the existing bi-annual system and a newly proposed annual increase system inspired by other successful countries. The proposed system, drawing on example of New Zealand, aims to accelerate reductions in smoking prevalence while improving government revenues by raising tobacco prices more frequently.

The theoretical framework supporting the paper is drawn from the price elasticity of demand for tobacco products, which assesses how responsive consumers are to changes in price. In every available account, research has shown that the

demand for tobacco is usually inelastic; however, its magnitude depends on consumer characteristics. It rises, in particular for the low-income groups and among the younger smokers (Chaloupka et al., 2011). The model of this simulation applies the principle of in-elasticity to determine how different tax hikes will affect smoking behaviour and government revenues. In fact, the expected findings are of great importance not only to the Slovakia but also to other CEE countries being confronted with the same public health and fiscal challenges. In addition, as Drope et al. 2024 point out, most of the countries of CEE are at a standstill in terms of affordability change because in the second part of the 2010s, most of these countries did not experience small or any excise tax increases. These countries could utilize the findings of this paper to mimic and implement similar tax system which would be addressing the problem of affordability on regular basis.

By comparing the outcomes of the current excise system with the proposed annual system, the paper offers evidence-based recommendations for policymakers seeking to balance public health objectives with fiscal priorities in Slovakia. Tobacco excise taxes continue to serve as an essential mechanism for governments striving to diminish smoking-related illnesses while concurrently realizing fiscal consolidation.

1. Literature Review

There is a broad stream of literature evaluating the link between the price and consumption of tobacco products in the world, as well as, in the Europe. Many such studies have focused on the price elasticity of the demand for tobacco, and all show that higher prices for tobacco lead to significant consumption reductions, particularly among price sensitive groups. Gjika et al. (2020) analyzed tobacco price elasticity in Albania using household-level data, finding a price elasticity of –0.57, indicating that tobacco demand is inelastic but still responsive to price increases. The authors suggest that gradual excise tax increases could further reduce smoking rates, particularly in low-income households and prevent the smoking initiation of youth. Similarly, Vladisavljevic et al. (2022) investigated price elasticity in six Western Balkan countries and found that in cases of manufactured cigarette price increases, smokers usually switch to cheaper tobacco products such as RYO tobacco. That emphasizes the need for harmonization of the excise taxes across the products to avoid product substitution and achieve wider public health gains.

Building on this, Gallus et al. 2006 studied price elasticity in countries across Europe. It was found that with a 10% increase in the prices of cigarettes, a fall in consumption by about 5% – 7% should be witnessed. The paper finds that price elasticity is higher in non-EU countries, which tend to have lower cigarette prices

and higher smoking prevalence. Further evidence comes from Stoklosa (2020), who explored cross-border cigarette purchases within the EU and found that price differences between neighbouring countries incentivize cross-border shopping. The study concludes that coordination and harmonization of cigarette prices across EU Member States would reduce cross-border shopping and improve the tobacco control policies effectiveness. Laverty et al. (2021) examined the relationship between cigarette price differentials and consumption across 23 European countries. They found that larger price differentials, such as those between premium and budget cigarettes brands, undermine the impact of excise tax increases by encouraging smokers to switch to cheaper brands. In countries with lower price differentials among individual brand segments the effectiveness of policy measures seems to be greater. Yeh et al. (2017) further supported these conclusions by examining the effects of cigarette price increases on consumption, tax revenues, and smoking-related deaths across 28 EU countries. The study found that a 10% price increase would lead to significant reductions in smoking prevalence, particularly in lower-income countries, while also generating substantial government revenue. A study from the Gulf Cooperation Council (GCC) countries (Delipalla et al., 2022) further underscore the success of tobacco taxation in reducing smoking rates, especially among low-income populations. Álvarez et al. (2020) considered the long-term relationship between cigarette prices and economic activity for the period 1957 – 2016 in Spain. They found that a reduction in cigarette consumption responds to an increase in price but also responds to economic cycles. The findings highlight the importance of considering economic cycle phase when designing and deploying tobacco control policies, as recessions may amplify the impact of price increases on smoking behaviour.

The research of tobacco price and income elasticity is also not forgotten in the Slovak area. Lichner and Ostrihoň (2024) show that Slovakian smokers, particularly in the budget segment, are highly sensitive to price increases, highlighting the potential for effective taxation to reduce smoking. König and Dováľová (2016) used the QUAIDS model to produce elasticity estimates for broader groups of consumer goods including alcoholic beverages and tobacco. Jamrich and Pokrivčák (2018) indicated that households with light cigarette consumption tend to decrease their consumption more than moderate and heavy smokers. The overall elasticity of Slovak households to price of conventional cigarettes was estimated to –0.92.

One of the most frequently studied aspects of evaluating tobacco consumption patterns for individual country in the literature is the fiscal aspect of tobacco consumption. Research by Badii (2024) in Ghana demonstrated that raising excise duties not only helped to decrease tobacco consumption but also generated substantial government revenues, which could be reinvested in healthcare or other

social programs. Similarly, Doran et al. (2010) found that in Vietnam, tobacco tax increases led to lower smoking prevalence and additional revenue gains of between 4.35 billion USD and 6.79 billion USD over a decade. In Indonesia, Triono (2017) found that despite negative impacts on domestic tobacco production, rising excise tax significantly boosted state budget revenues. Ali and Koplan (2010) further highlighted the positive fiscal impact of tobacco excise taxes in countries like the U.S. and U.K., where tax hikes helped reduce consumption while maintaining robust revenue streams.

Schafferer et al. (2018) conducted a simulation in 36 countries in Europe and found that a 10% excise tax increase led to a 3.1% reduction in cigarette consumption, but crucially, it generated an additional 14.69 billion USD annually in tobacco tax revenues. Kotsopoulos et al. (2015) supported these findings in Greece, where tax increases reduced smoking-related healthcare costs while also raising revenues, demonstrating the dual fiscal and health benefits of higher tobacco taxes. Bouw (2017) and Sunley (2009) both highlighted how continuous excise tax reforms in the European Union have helped countries maintain steady revenue streams, even as overall tobacco use declines. Sunley showed that a 10% price increase led to a 4% reduction in consumption in high-income countries and an 8% reduction in low- to middle-income countries, while governments continued to achieve growing excise revenues.

Excise tax increases on tobacco have been widely studied also from public health benefits aspect. By raising the price of tobacco products, governments effectively reduce their affordability, leading to lower consumption rates and preventing smoking-related diseases. On the example of Spain, López Nicolás et al. (2024) illustrates the risks of failing to maintain regular excise tax increases. Between 2014 and 2022, the lack of tax hikes made tobacco products more affordable. The study projected that raising Spain's minimum excise tax could reverse this trend, leading to significant revenue gains and preventing up to 210,000 premature deaths by 2028. On the example of Ukraine, Londar and Kozarezenko (2014) demonstrated that aligning excise taxes with EU standards could prevent between 1.0 and 1.9 million premature deaths by reducing smoking prevalence. Similarly, Kotsopoulos et al. (2015) have demonstrated that higher tobacco taxes not only lower smoking rates but also alleviate financial burdens on the healthcare system by reducing tobacco-related illnesses in Greece.

In the U.S., the ability of excise taxes to reach ambitious public health goals is proven in the simulation models that project significant reductions in mortality associated with smoking. Nargis (2023) found that systematic increases in state-level excise taxes could play a critical role in achieving the Healthy People 2030 goal of reducing smoking prevalence to 5%. This aligns with findings of Ahmad

and Billimek (2007), who compared the effects of increasing excise taxes with raising the legal smoking age. Their analysis showed that while both strategies have potential to reduce youth smoking, excise tax increases enables broader and faster public health benefits. Moreover, Filippidis et al. (2017) payed special attention to infant mortality, showing that higher cigarette prices are associated with lower infant mortality rates, while larger price differentials are linked to higher infant mortality.

Evolving tax policies that target not only traditional tobacco products but also risk-reduced alternatives, such as e-cigarettes and heated tobacco products, are emerging as important public health strategies. Pinto Hernández and Delgado Rodríguez (2023) demonstrated that strategic tax planning for these products can further reduce smoking-related harm, providing a more nuanced approach to tobacco control. By taxing risk-reduced products at lower rates, governments can encourage smokers to switch to less harmful alternatives. This approach of public health policy is widely discussed as some countries prefer harm-reduction approach and other put alternatives to the same level of taxation as conventional cigarettes.

While the approach to tobacco consumption reduction differs from country to country, the case of New Zealand serves as one of the pioneers in the world in area of smoking prevalence reduction. The paper also drawn inspiration from its approach to public health policy and tobacco control measures. New Zealand has successfully reduced smoking prevalence by implementing significant annual increases in tobacco excise taxes. Between 2011 and 2023, New Zealand saw a marked reduction in adult smoking rates from 16.4% to 6.8%, with even more pronounced decreases among youth smokers (ASH, 2022). By implementing annual tax hikes since 2010, New Zealand has made tobacco products progressively less affordable, which has directly led to a significant decline in smoking rates. Blakely et al. (2015) demonstrate that these tax increases have significantly contributed to gains in quality-adjusted life years and healthcare savings. Their research also shows that the tax hikes have been particularly impactful among disadvantaged groups, such as the Māori population. The broader context of tobacco control measures, as examined by Hampsher-Monk et al. (2024), reinforces the critical role of excise taxes in reducing the affordability and accessibility of tobacco products. Similarly, Li et al. (2017) emphasize that New Zealand's multi-year strategy of consistent tax increases has had a clear and measurable impact on reducing smoking prevalence, which has been further supported by public health campaigns and regulatory interventions. Rimmer (2021) further explores New Zealand's long-term strategy, embodied in the Smokefree 2025 Action Plan, which continues to rely on excise tax increases as a central component of its efforts to reduce smoking rates.

2. Methodology and Data

The simulation model employs data on consumption of tobacco products, price, excise tax to estimate the impact of tobacco tax increases on tobacco consumption, government revenues, and public health outcomes. The simulation is based on data for cigarette prices, tax structures, consumption rates, and elasticities, segmented into premium, mid-price, and economy brands. The detailed results of simulation for individual years are attached in Appendix.

Tobacco Pricing Model

The total retail price of a tobacco product (P) consists of the excise tax (ET), value-added tax (VAT), and the net-of-tax (NOT) component, representing industry revenue.

$$P = ET + VAT + NOT \qquad (1)$$

The excise tax (ET) includes two components: a specific tax (T_s), which is a fixed amount per pack, and an ad valorem tax (T_v) which is a percentage of the retail price:

$$ET = T_s + T_v \times P \qquad (2)$$

The model assumes two different versions of excise tax calendar (Table 1).

T a b l e 1

Tobacco Taxes Planned Increases over 2024 – 2028 (in EUR)

Current (bi-annual) excise calendar	2024	2025	2026	2027	2028
Specific excise tax / pack (EUR)	1.83	1.83	2.05	2.05	2.27
Ad valorem / pack (%)	25.0%	25.0%	25.0%	25.0%	25.0%
Minimum excise / pack (EUR)	2.96	2.96	3.32	3.32	3.68
VAT (%)	20%	23%	23%	23%	23%
Proposed (annual) excise calendar	**2024**	**2025**	**2026**	**2027**	**2028**
Specific excise tax / pack (EUR)	1.83	2.05	2.27	2.50	2.76
Ad valorem / pack (%)	25.0%	25.0%	25.0%	25.0%	25.0%
Minimum excise / pack (EUR)	2.96	3.32	3.68	4.11	4.59
VAT (%)	20%	23%	23%	23%	23%

Source: Authors based on Tobacco Act 106/2004 Coll.

The current bi-annual excise calendar operates with three planned increases in 2024, 2026, and 2028. The specific excise tax will increase from 91.3 EUR per 1,000 cigarettes in 2024 to 113,5 EUR per 1,000 cigarettes in 2028. The principle of the proposed excise calendar construction lies in expedited version of current excise calendar. It continues to rely on the pace of increases set in current excise

calendar, but instead of using timeframe of five years to get from 91.3 EUR to 113.5 EUR, the proposed version will achieve such increase within the three-year period. Even after these increases, it continues to rise based on average growth rate of specific excise from previous years (similarly to the strategy of New Zealand). That results in continuous growth of specific excise reaching in 2028 level of 138,1 EUR / 1,000 cigarettes. An ad valorem tax remains at 25%. The VAT rate used for estimating the year 2024 is 20%. However, as part of fiscal consolidation starting in 2025 and onward, a VAT rate of 23% is adopted.

The change in price ΔP due to excise tax increases is expected to affect the volume of tobacco products consumed. The volume of consumption of conventional cigarettes for year n is calculated by incorporating own-price elasticities (ϵ), cross-price elasticities (ϵ_{xy}), and income elasticities (η) for each market segment. The model allows for segment substitution only by one level avoiding change from premium brand to economy brand directly. The consumer would have no incentive for such action when the price differential between mid-priced and economy brands are small. The formulas for changes in consumption for the premium, mid-price, and economy segments are given as follows:

1. ***Premium segment****:*

$$Q_{n,\text{premium}} = Q_{0,\text{premium}} \times \left(1 + \epsilon_{\text{premium}} \times \frac{\Delta P}{P_0} \right) + \eta_{\text{premium}} \times \Delta NHEG \tag{3}$$

2. ***Mid-price segment****:*

$$Q_{n,\text{mid}} = Q_{0,\text{mid}} \times \left(1 + \epsilon_{\text{mid}} \times \frac{\Delta P}{P_0} \right) + \epsilon_{xy,\text{premium to mid}} \times \frac{\Delta P_{\text{premium}}}{P_{0,\text{premium}}} + \eta_{\text{mid}} \times \Delta NHEG \tag{4}$$

3. ***Economy segment****:*

$$Q_{n,\text{economy}} = Q_{0,\text{economy}} \times \left(1 + \epsilon_{\text{economy}} \times \frac{\Delta P}{P_0} \right) + \epsilon_{xy,\text{mid to economy}} \times \frac{\Delta P_{\text{mid}}}{P_{0,\text{mid}}} + \\ + \eta_{\text{economy}} \times \Delta NHEG \tag{5}$$

These equations utilize own-price elasticities based on Tauras et al., 2006; Delipalla et al., 2022; Lichner and Ostrihoň, 2024 for each segment (ranging from –0.45 for premium brands to –1.13 for economy brands), income elasticities, and cross-price elasticities, which account for the shift in consumer demand between different price segments. For instance, a 10% increase in premium brand prices is estimated to raise mid-price brand consumption by 8%, reflecting a cross-price elasticity of 0.8. The cross-price elasticities are derived from existing empirical

evidence (Tauras et al., 2006; Delipalla et al., 2022; Mugoša et al., 2023). The income elasticity originates in Lichner and Ostrihoň (2024) estimates. Table 11 with utilized elasticities within the model is attached in Appendix.

Government Revenue Estimation

The model calculates total government revenue from excise taxes and VAT by multiplying the new consumption quantity by the excise tax rates for each segment:

$$R_n = (Q_n \times ET) \times VAT \tag{6}$$

where R_n is the total revenue, Q_n is the new consumption quantity, and ET is the excise tax. The model accounts for the market share shift among segments, allowing for a detailed projection of revenue changes.

Public Health Impact Modelling

The second part of the model estimates the public health benefits resulting from reduced tobacco consumption due to price increases. The reduction in smoking prevalence (ΔSP) is modeled using prevalence elasticity (ϵ_p) derived from Lichner and Ostrihoň (2024), where a price increase leads to fewer smokers. The relationship is expressed as:

$$\Delta SP = \epsilon_p \times \frac{\Delta P}{P_0} \tag{7}$$

The public health benefits are modelled separately for adult smokers and for the youth. The number of adult smokers (AS_n) and youth smokers who avoid premature death is calculated based on the baseline population and prevalence elasticity. For adults:

$$AS_n = AS_0 \times \left(1 - \Delta SP\right) \tag{8}$$

And for youth, the number of potential future smokers deterred is:

$$YS_n = YS_0 \times \left(1 - \Delta SP_y\right) \tag{9}$$

The simulation assumes that 40% of smokers would die prematurely without intervention, and 70% of those who quit smoking due to price increases would avoid premature death (based on Tesche et al., 2023). The number of lives saved is therefore estimated by:

$$Lives\ Saved = \left(AS_n \times 0.7 \times 0.4\right) + \left(YS_n \times 0.4\right) \tag{10}$$

Data

There is no dedicated Tobacco Agency in Slovakia, so data on cigarette consumption are derived from Excise Tax Reports, which are available monthly from the Ministry of Finance SR. The Statistical Office of the Slovak Republic monitors selected cigarette brands prices as part of the consumption basket used for inflation measurement, while the overall weighted average price of cigarettes is published by the Financial Authority of the Slovak Republic. Due to the lack of official data on market segments, Euromonitor data are utilized for this purpose.

Year 2023 serves as the baseline year, with data on consumption and prices from that year forming the foundation. Projections are then made for the period from 2024 to 2028. Input data related to the cigarette price structure, including the average retail price per pack and market segments size, are based on the price of representants in consumption basket, weighted average price of cigarettes (WAP), and estimates of market segment sizes (Euromonitor, 2023). Information on excise taxes, VAT, and excise revenues come from the Excise Tax Reports provided by the Ministry of Finance SR, while projections for nominal household expenditure growth rates are drawn from the Ministry of Finance SR - Macroeconomic Forecast (June 2024).

The model operates with various parameters, including smoking prevalence, which focuses solely on the consumption of conventional tobacco cigarettes, with data sourced from a 2022 survey by the Public Health Authority of the Slovak Republic. In addition, it incorporates elasticities related to price, income, and cross-price effects, derived from both the authors' research and existing literature already described in Methodology section.

3. Results

The results of the simulation between two different excise tax regimes are presented here with a special attention paid to the differences in terms of projected government revenues from excise tax and VAT, the changes in weighted average prices of cigarettes, and the resulting tobacco consumption trends. The simulations show the significant potential for increased government revenues and reduced smoking prevalence, especially when considering the effects on adult and youth smoking behaviour. The year 2023 serves as a base year for the analysis and increase in the first year of simulation (2024) is shared in both excise tax calendars.

In the Figure 1, the projected excise tax and VAT revenue under the current and proposed excise tax systems are displayed from 2024 to 2028. The proposed system consistently generates higher revenues, culminating in an additional 51

million EUR by 2028 compared to the current system. Given the specifics of Slovak tobacco market, the proposed excise calendar development resembles almost linear trend, however, that is given by relatively unusual tobacco market structure in Slovakia (Hudcovský and Morvay, 2024) and industry growth of Net-of-Tax component which tends to take advantage of announced excise hikes and increase their NOT higher compared to years where no hikes are planned. In addition, it reflects the increased revenue potential of the proposed calendar due to its more frequent and larger tax hikes. The figure also highlights that even as tobacco consumption declines, the rise in taxes more than compensates for the reduced sales volume, demonstrating the fiscal effectiveness of the proposed regime.

F i g u r e 1

Estimated Excise Tax + VAT Revenue in Current and Proposed Excise Tax Calendar
(mil. EUR)
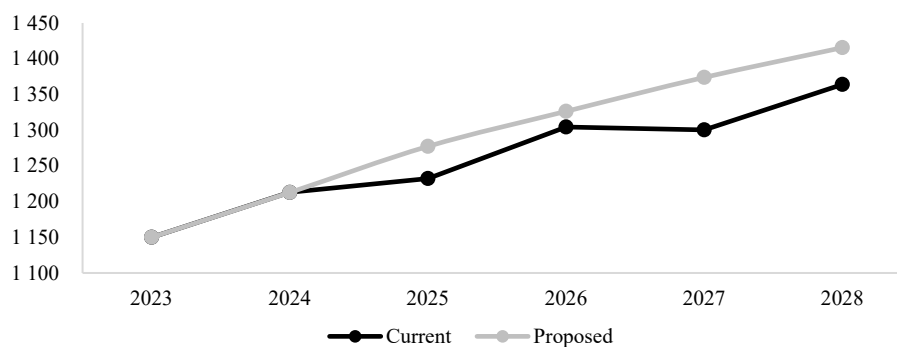
Source: Authors.

The WAP rises significantly under both scenarios, however, in the proposed excise calendar the price climbs from 5.10 EUR in 2024 to 7.39 EUR in 2028, compared to 6.53 EUR under the current system (Figure 2). The larger price increase in the proposed system is expected to contribute to a further reduction in smoking prevalence. Such increase directly affects the price affordability of conventional cigarettes which is area where Slovakia was lagging for a long time. Simply, the pace of cigarettes price increases is significantly higher than forecasted level of nominal household expenditures growth. This aligns with studies that show higher prices are one of the most effective deterrents for reducing tobacco use. (Chaloupka et al., 2011).

Building on the previous concept of cigarettes affordability decline, projected decline in tobacco consumption over the same period is displayed in Figure 3, with a sharper reduction under the proposed excise system. By 2028, tobacco consumption is expected to fall to 236.3 million packs under the proposed calendar, compared to 266.1 million under the current system. The steeper decline is a direct
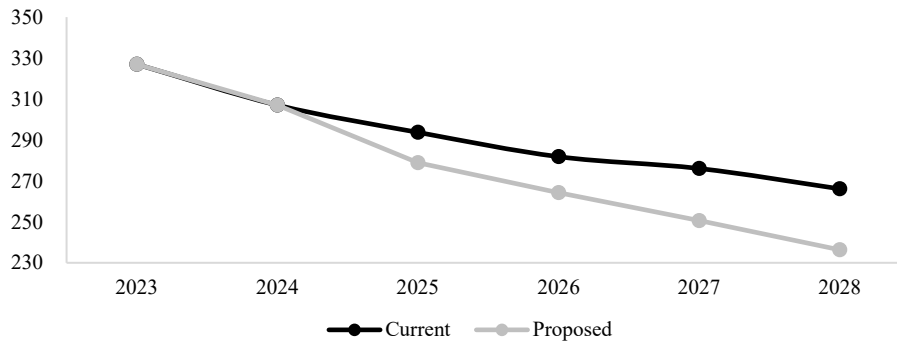
consequence of the higher tobacco prices under the proposed system, encouraging quitting or reduced consumption of active smokers.

F i g u r e 2

Estimated Weighted Average Price (WAP) for a Pack of Cigarettes Development (in EUR)
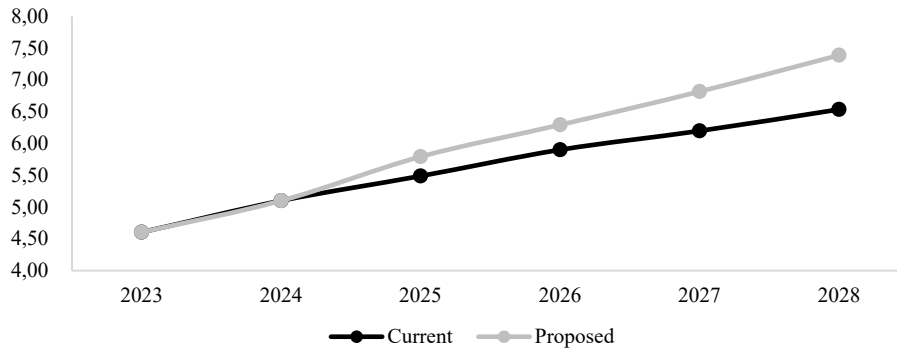
Source: Authors.

F i g u r e 3

Estimated Tobacco Consumption Development in Slovakia (in mil. packs)

Source: Authors.

The main differences between the two excise tax calendars from the consumer demand and fiscal perspective are described in Table 2. It compares the government revenues generated under both tax systems from 2024 to 2028. The proposed excise system results in 51.5 million EUR more in excise and VAT revenues. Although there is a reduction in the overall volume of tobacco consumed, the increased tax burden under the proposed system offsets the decline in consumption, leading to higher total revenues. The cumulative difference between two scenarios over the scope of five years in excise tax revenue only are amounting to 191 mil. EUR, which is significant stream of additional revenue particularly during the time of necessary fiscal consolidation.

T a b l e 2
Simulation Results and Difference between Current and Proposed Excise Calendar on Consumer Demand and Government Revenues in Slovakia (2024 – 2028)

Difference between 2024 and 2028						
Excise calendar	Price, pack EUR	Price, pack %	Quantity, packs	Quantity, packs %	Total excise revenue	Excise + VAT revenue
Current	1.43	28.1%	–40 856 115	–12.5%	86 954 591	151 220 494
Proposed	2.29	44.9%	–70 637 317	–23.0%	137 050 557	202 674 269
Difference	**0.85**	**16.7 pp**	**–29 781 317**	**–9.7 pp**	**50 095 966**	**51 453 775**

Source: Authors.

In addition to fiscal benefits and lower smoking prevalence, the excise tax hikes would transform also to the public health benefits (Table 3). Under the proposed calendar, the number of adult smokers is reduced due to price increases by 80,166 with 22,446 premature deaths averted. This represents a nearly 60% improvement over the current system, reflecting the enhanced public health impact of more frequent tax increases.

T a b l e 3
Simulation Results between Current and Proposed Excise Calendar on Public Health – Adults

Excise calendar	Reduction adult prevalence	Fewer adult smokers	New adult smokers	Fewer adult deaths	New adult deaths
Current	–6.6%	–50 256	709 736	–14 072	289 925
Proposed	–10.5%	–80 166	679 826	–22 446	281 550
Difference	**–3.9 pp**	**–29 910**		**–8 375**	

Source: Authors.

In the last part of the simulation, the public health benefits are estimates for the cohort of people which will determine the future of smoking in the country – youths. Table 4 points out that the proposed system leads to a 21.1% reduction in youth smoking prevalence by 2028, compared to an 13.2% reduction under the current system. This results in additional 11,627 deterred youth smokers and prevents 4,651 premature deaths. The significant difference between the two systems illustrates the heightened sensitivity of younger smokers to price changes, and the proposed system's greater potential to deter youth smoking.

T a b l e 4
Comparison of Simulation Results between Current and Proposed Excise Calendar on Public Health – Youth

Excise calendar	Reduction youth prevalence	Fewer youth smokers	New youth smokers	Fewer youth deaths	New youth deaths
Current	–13.2%	–19 536	128 183	–7 815	51 273
Proposed	–21.1%	–31 164	116 556	–12 465	46 622
Difference	**–7.9 pp**	**–11 627**		**–4 651**	

Source: Authors.

The simulation results show that implementation of proposed excise tax calendar instead of current system would prevent a total of 13,026 premature deaths, including both adults and youth. This number is highly significant, as it e.g., exceeds the population size of the median city in Slovakia in 2021 by one third (9,777). Furthermore, this figure is over six times the number of deaths caused by lung cancer in Slovakia in 2023 (2,108 – SO SR, 2024).

The purpose of this simulation was to highlight the strong advantages of the expedited excise tax calendar implementation, demonstrating its ability to effectively generate increased government revenues while simultaneously reducing tobacco consumption. The approach ensures that there are no gaps in revenue collection from the side of government, even with the more aggressive tax hike schedule. Additionally, the proposed system shows a more pronounced impact on reducing smoking prevalence.

4. Discussion

While the results of the analysis highlight the strong side and effectiveness of the proposed excise tax calendar, still, there are some areas which needs to be addressed for a more comprehensive understanding. The analysis utilizes the assumption of constant price elasticity of demand over time. While the results indicate a significant reduction in smoking due to rising prices, the elasticity of tobacco demand may change over time, especially as fewer smokers remain and those who continue smoking may be less price-sensitive. While we are aware of such limitation, currently, there is no available data on the case of Slovakia which would differentiate the shift in consumption behaviour in individual years. The results of Lichner and Ostrihoň (2024) are estimated from HBS survey 2020 – 2021.

Another assumption affecting the results is no change in the illicit tobacco market. As taxes increase and tobacco prices rise, there is a risk of an increase in the consumption of illicit or non-taxed tobacco products, particularly in cross-border regions or among low-income smokers.

The reason for assuming the level of illicit tobacco market constant is in absence of relevant estimates for Slovakia on this topic or in the region of CEE. Evidence from international cases reveals mixed outcomes regarding the impact of excise tax increases on illicit trade. In Brazil, Iglesias (2016) found that tax hikes significantly reduced smoking prevalence with minimal illicit market growth, primarily due to strong enforcement. In contrast, Nguyen et al. (2020) analysed Vietnam's market, where tax increases led to a rise in illicit trade, highlighting the importance of integrating anti-smuggling measures alongside tax reforms. On the EU level, the evidence exists that higher taxes are associated with a measurable

increase in illicit activity. Prieger and Kulick (2018) estimate that a 1 EUR increase per pack raises the illicit market share by 5 to 12 percentage points and increases illicit cigarette sales by 25% to 120%. This effect is particularly evident in cross-border regions where price differentials incentivize illicit purchases. However, the estimated range of increase is too broad to be directly incorporated into the model for Slovakia, potentially leaving room for further refinement and expansion in future research. While this paper draws its inspiration in the case of New Zealand, it is necessary to admit that assumption of constant illicit market is easier to adopt in the geographically isolated New Zealand than in the Europe. Same applies to cross-border shopping which could become a factor if the implementation would be non-negotiated or coordinated with neighbouring countries. This factor New Zealand did not have to take into account.

Moreover, the model focuses solely on conventional tobacco cigarettes and excise taxes, without considering potential product substitution, particularly with the growing use of e-cigarettes, vaping products, and other risk-reduced alternatives. As tobacco prices rise, some smokers may shift to these alternatives, which could have distinct public health and revenue implications. Stoklosa et al. (2016) provide strong evidence of this behaviour within the European Union, showing significant cross-price elasticity estimates for e-cigarettes ranging from 3.6 to 4.55 in response to rising cigarette prices. In contrast, studies in the USA report lower cross-price elasticities: Zheng et al. (2017) estimate 1.9, while Cotti et al. (2022) report 1.1. This indicates that the substitution effect is more pronounced in the EU than in the USA, likely due to differences in tax coverage. In Europe, the products under investigation were not subject to excise taxes during that period (2016) as new excise taxes on alternative products were introduced only in subsequent years.

Notably, the Slovak government has already taken steps to extend excise tax coverage to alternative products, with implementation set for 2025. This move will likely weaken the substitution effect between traditional cigarettes and alternatives, downplaying a limitation in the current model. However, the fiscal impact of this new excise tax and the resulting cross-price elasticity can only be evaluated in the coming years, once sufficient data become available for analysis.

Conclusions

The findings of this paper demonstrate the substantial fiscal and public health benefits of adopting a more aggressive excise tax calendar for tobacco products in Slovakia. Compared to the current bi-annual excise tax system, the proposed annual tax increases would generate higher government revenues, with projections indicating an additional 51 million EUR in 2028.

Moreover, the analysis shows significant reductions in tobacco consumption, particularly among groups of consumers who are price-sensitive. These reductions would lead to fewer premature deaths and improved health outcomes, reinforcing the value of excise tax policies as an effective tool for tobacco control.

The broader implications of these findings extend beyond Slovakia and hold particular relevance for other Central and Eastern European (CEE) countries that are struggling with increasing tobacco affordability. Many CEE countries have been slow to implement aggressive tax policies (Drope et. al., 2024), leading to higher cigarette affordability and associated public health costs. By demonstrating the dual benefits of fiscal gains and reduced smoking prevalence, this paper provides a strong case for these countries to adopt similar tax policies and argue for expedited annual increases. Implementing regular, substantial excise tax increases can help reduce tobacco use, alleviate healthcare burdens, and generate much-needed government revenue during the time of tight fiscal consolidation.

Furthermore, the findings highlight the lack of research available in areas addressing potential challenges in Slovakia, such as the illicit tobacco trade, product substitution with e-cigarettes or heated tobacco, and the evolving elasticity of demand for tobacco products over time. These factors should be incorporated into future policy models. Nevertheless, the evidence from this analysis suggests that sustained excise tax increases remain one of the most effective strategies for reducing smoking rates and improving public health across diverse economic contexts, including in CEE nations. The proposed excise tax calendar offers a powerful evidence and advocate for both fiscal and public health improvements, not only in Slovakia but across the wider region. By leveraging the lessons from this paper, also other CEE countries can take significant strides toward reducing tobacco affordability, lowering smoking prevalence, and improving public health outcomes. With careful and coordinated policy design and continued commitment towards lowering smoking prevalence, excise tax hikes can play a critical role in achieving these goals.

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A p p e n d i x

T a b l e 5

Excise Tax Change Impacts on Government Revenues –
Simulation Results, Current Excise Calendar

Weighted average	Price / pack	Quantity, packs pcs	Total excise revenue	Excise + VAT revenue	Market value
2024	5.10	307 011 003	951 929 909	1 212 815 120	**1 565 311 267**
2025	5.49	293 696 835	930 898 855	1 232 247 499	**1 611 560 141**
2026	5.90	281 839 793	993 446 034	1 304 357 011	**1 662 697 834**
2027	6.20	276 092 316	980 424 395	1 300 390 253	**1 711 121 758**
2028	6.53	266 154 889	1 038 884 500	1 364 035 615	**1 738 851 611**
% change 2028 vs. 2024					
Difference	**28.1%**	**−13.3%**	**9.1%**	**12.5%**	**11.1%**

Source: Authors.

T a b l e 6

Excise Tax Change Impacts on Government Revenues –
Simulation Results, Proposed Excise Calendar

Weighted average	Price / pack	Quantity, packs pcs	Total excise revenue	Excise + VAT revenue	Market value
2024	5.10	307 011 003	951 929 909	1 212 815 120	**1 565 311 267**
2025	5.79	278 849 330	975 389 815	1 277 380 703	**1,614,994,751**
2026	6.29	264 250 581	1 015 487 567	1 326 371 833	**1,662,554,989**
2027	6.82	250 607 787	1 054 517 382	1 373 905 379	**1,708,031,464**
2028	7.39	236 373 572	1 088 980 466	1 415 489 389	**1,746,112,934**
% change 2028 vs. 2024					
Difference	**44.9%**	**−23.0%**	**14.4%**	**16.7%**	**11.6%**

Source: Authors.

T a b l e 7

Effects of Excise Tax Increase on Public Health –
Adults Simulation Results, Current Excise Calendar

Current excise calendar (2024 – 2028) – Adults	
Price increase	28.1%
Reduction in adult smoking prevalence	**−6.6%**
Fewer adult smokers	**−50 256**
New adult smokers	**709 736**
Fewer adult deaths	**−14 072**
New adult deaths	**289 925**

Source: Authors.

T a b l e 8

**Effects of Excise Tax Increase on Public Health –
Adults Simulation Results, Proposed Excise Calendar**

Proposed excise calendar (2024 – 2028) – Adults	
Price increase	44.9%
Reduction in adult smoking prevalence	**–10.5%**
Fewer adult smokers	**–80 166**
New adult smokers	**679 826**
Fewer adult deaths	**–22 446**
New adult deaths	**281 550**

Source: Authors.

T a b l e 9

**Effects of Excise Tax Increase on Public Health –
Youth Simulation Results, Current Excise Calendar**

Current excise calendar (2024 – 2028) – Youth	
Price increase	28.1%
Reduction in youth smoking prevalence	**–13.2%**
Fewer youth smokers	**–19 536**
New youth smokers	**128 183**
Fewer youth deaths	**–7 815**
New youth deaths	**51 273**

Source: Authors.

T a b l e 10

**Effects of Excise Tax Increase on Public Health –
Youth Simulation Results, Proposed Excise Calendar**

Proposed excise calendar (2024 – 2028) – Youth	
Price increase	44.9%
Reduction in youth smoking prevalence	**–21.1%**
Fewer youth smokers	**–31 164**
New youth smokers	**116 556**
Fewer youth deaths	**–12 465**
New youth deaths	**46 622**

Source: Authors.

T a b l e 11

Elasticities Utilized within the Model

Segment	Own-price elasticity	Cross-price elasticity	Income elasticity
Premium	–0.45	0.80	0.52
Mid-price	–0.82	0.25	0.94
Economy	–1.13		1.29

Source: Authors based on Lichner and Ostrihoň (2024) and Tauras et al. (2006) and Delipalla et al. (2022) and
Mugoša et al. (2023).