

Estimation of Own-Price and Expenditure Elasticities of Cigarette Demand by Income¹

Executive Summary

Drawing on multiple estimates of price and expenditure (serving as a proxy for income) elasticities, distinct by household income group, the study aims to provide a detailed assessment of the response of Slovak smokers or would-be smokers to increases in cigarette prices. This response is then included in a hypothetical simulation of an increase in the cigarette specific excise tax by 10 percent. Apart from quantifying the overall effects of such a policy measure on Slovak demand and the public budget, the analysis also provides insight into potential changes in the income distribution of smokers, as well as into the division of the tax burden among the income groups from such a tax increase.

Based on the alternative simulation results, a 10-percent specific duty increase would be sufficient to prohibit further growth of cigarette consumption driven by rising living standards (as measured by household total consumption expenditures), while providing an additional almost 7 percent in cigarette tax revenue.

If curbing cigarette demand at current levels is the only goal of policy makers, then a 10-percent increase in the cigarette specific duty would be sufficient to achieve this target. However, a larger increase would generate even more new tax revenues and cause a larger decline in consumption. The benefits of the latter include higher economic productivity and lower health costs for the government and households. On average, low- and middle-income households would benefit disproportionately more.

Given the differences in the responsiveness to rising cigarette prices, it is expected that most of the additional tax burden would be carried by high-income households, as an increased excise tax would cause a drop in the shares of both middle- and low-income smokers of total cigarette consumption.

Background and Objective

Recent increases in the taxation of tobacco products in Slovakia proved to be relatively successful. The cumulative increase in specific duty for cigarettes between 2018 and 2023 reached more than 36 percent, while during the same period of time consumption of manufactured cigarettes decreased by approximately 16 percent. However, the results of a special Eurobarometer survey *Attitudes of Europeans towards tobacco and*

¹ The information summarized in this policy brief is derived from a working paper titled *Estimation of Own-Price and Expenditure Elasticities of Cigarettes Demand by Income Groups* conducted by the Institute of Economic Research in Bratislava, Slovakia.

electronic cigarettes point towards an increasing share of daily hand-rolled cigarette smokers between waves of the survey collected in 2017² and 2023³ (increase from 10 percent to 13 percent).

The purpose of studying available data on households' consumption is to provide up-to-date evidence about the elasticities of tobacco consumption among Slovak households grouped by income level. Results of the estimations should serve as inputs for further research and evidence-based policy making, especially with respect to the simulation of tobacco tax increases' impacts on different types of households in Slovakia. The households are split⁴ into three income groups according to the average income per household member. Multiple estimations of the elasticities by income groups enable the assessment of the possible social impacts of tobacco taxation.

Results

To provide elasticity estimates, two distinct methodologies were employed: the two-part model (2PM) and the quadratic almost-ideal demand system (QUAIDS) approach. The results from the 2PM approach served as a robustness check for the QUAIDS approach. A detailed methodological overview can be found in our previous results.⁵ Utilizing these methodological approaches and data from the Household Budget Survey (waves 2021 and 2022) collected by the Statistical Office of the Slovak Republic, it was possible to estimate own-price and expenditure elasticities for the total population and three distinct income groups (low, middle, and high).

² European Commission. (2017). Special Eurobarometer 458. Attitudes of Europeans towards tobacco and electronic cigarettes.

³ European Commission. (2023). Special Eurobarometer 539. Attitudes of Europeans towards tobacco and electronic cigarettes.

⁴ The sampling weights of households in the HBS survey were taken into account.

⁵ Lichner, I., & Ostrihoň, F. (2024). [Estimation of price and income elasticity of demand for tobacco cigarettes in Slovakia](#) [Tobacconomics Working Series]. IER SAS.

Figure 1. Total cigarette consumption elasticities (own-price and expenditure) based on QUAIDS estimates, by income group



Source: Authors' estimates based on 2021 and 2022 Slovak HBS data

The most pronounced reaction to price increases in terms of reduced consumption is in middle-income households. However, this result should be interpreted with caution, as its foundations should partially reflect recent trends among smokers. In 2017, the share of current e-cigarette users was zero according to Eurobarometer data, while in 2023, this proportion rose to 3 percent, and an additional 4 percent of Slovak respondents claimed that they are daily users of heated tobacco products. On the other hand, the results suggest that the low-income group has the smallest reaction to an increase in income (proxied by household expenditures), in terms of increasing consumption.

Table 1. Impact of 10% specific duty increase on consumption and public finance

		Consumption			Tax revenue			
Income group	Share in total consumption	Baseline ^{mp}	Scenario ^{mp}	Change%	Baseline ^{me}	Scenario ^{me}	Change%	Change ^{me}
Low	34.7%	108.8	105.3	-3.3%	260.6	273.7	5.0%	13.1
			[99.4; 111.3]			[258.4; 289.5]		
Middle	29.7%	93.3	89.5	-4.1%	223.4	232.8	4.2%	9.4
			[84.9; 94]			[221.9; 245.7]		
High	35.6%	111.5	113.6	1.9%	268.4	296.8	10.6%	28.4
			[109.6; 117.7]			[286.4; 307.5]		
Total		313.6	308.3	-1.7%	752.4	803.3	6.8%	50.9
			[299.9; 316.8]			[782.3; 826.5]		

Note: Superscript mp refers to millions of packs and me refers to millions of €. Values in brackets represent lower and upper quartiles of estimated indicators' distributions.

Source: Authors' calculations

Based on the estimated price and expenditure elasticities, it is possible to approximate the reactions of smokers to price and economic developments. In this exercise, we employed a Monte Carlo approach to account for uncertainty in estimated elasticities via the addition of randomly selected values based on the standard deviation of estimated coefficients. With an expected 10-percent increase in the specific excise tax on cigarettes and 2.7-percent annual growth in household expenditures, the results suggest that such an increase would be sufficient to curb the total consumption, except for the high-income group. At the same time, the increase in taxation would generate additional budget revenues for fiscal stabilization of the currently unfavorable budget situation in Slovakia.

The key takeaways from these findings are:

1. Increasing the specific excise tax on cigarettes has the potential to slow or even reverse the proliferation of cigarette consumption as well as to provide additional public revenue.

Lower consumption: Specific excise taxes on cigarettes inducing increases in cigarette prices appear to be capable of preventing an increase in total cigarette consumption.

Additional budget revenue: By utilizing the measure of a 10-percent specific excise tax increase, the public budget can be expanded by an additional 50 million euros.

2. The most price sensitive income group is in the middle of the distribution.

Most elastic reaction: The middle-income households appear to be the most responsive to changes in cigarette prices (that is, more likely to consume less).

Possible switch to substitutes: This unusually strong reaction could be partly driven by the recent rise in availability of alternatives to traditional cigarettes. Better surveillance is needed to answer this question, and excise taxes on these alternatives will need to be raised to address increases in consumption of these other harmful products.

3. High-income households smoking expenditures typically react least to the increases in cigarette prices.

Majority of the additional tax burden on high-income households: Since other income groups are more responsive to the changes in cigarette prices and more likely to decrease consumption (by quitting, not starting, or smoking less), it is expected that high-income households would bear most of the additional tax burden created by this policy measure.

High affordability: Although the responsiveness to real total expenditure growth for the high-income group of households is not as intense as in the case of middle-income households, negligible sensitivity of high-income households to

price changes results in more dramatic proliferation of cigarette consumption due to greater affordability.

Policy Recommendations

If the policy goal is to reverse the expansion of cigarette use in Slovakia, then increasing the specific excise tax on cigarettes by more than the existing pace of change⁶—for example, by 10 percent—is needed to prevent additional growth of total cigarette consumption. However, larger tax increases would generate greater decreases in consumption, while also growing excise tax revenues even more.

Additional revenues from increased excise taxes can be partly allocated to tobacco control, education, and awareness-raising programs. Those measures should complement tobacco excise tax increases, as the affordability of cigarettes (such as for high-income households) might limit their impacts for discrete groups. Such measures should also focus on youth perceptions of addictiveness and harmfulness of smoking as important risk factors of smoking initiation.⁷

Acknowledgments

The Institute of Economic Research of the Slovak Academy of Sciences has been working in cooperation with the Economics for Health program at Johns Hopkins University (JHU) to conduct economic research on tobacco taxation in Slovakia. JHU is a partner of the Bloomberg Initiative to Reduce Tobacco Use. The views expressed in this document cannot be attributed to, nor do they represent, the views of JHU or Bloomberg Philanthropies.

Suggestions by Jeffrey Drope and Ana Mugoša to earlier versions of this brief are gratefully acknowledged.

⁶ In the years 2018–2023 only once was the duty increased by more than 10%, specifically in 2021 by approximately 15%.

⁷ Atem, F.D., Bluestein, M.A., Chen, B., Harrell, M.B., Messiah, S.E., Kuk, A.E., & Pérez, A. (2024). Application of inverse weighting analysis to assess the association of youth perceptions with the age of initiation of tobacco products. *Frontiers in Public Health*, 12, 1203631. doi: 10.3389/fpubh.2024.1203631