tobaccotaxation
Economic Research Informing Tobacco Taxation Policy

Impacts of Tobacco Excise Increases on Cigarette Consumption and Government Revenues in Southeastern European Countries

Regional study

Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia

2019

Disclaimer

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Scientific Editors

Jovan Zubović, Ph.D. Institute of Economic Sciences, Belgrade, Serbia

Marko Vladisavljević, Ph.D. Institute of Economic Sciences, Belgrade, Serbia

Contributing Authors

Executive Summary:

Jovan Zubović, Ph.D. Institute of Economic Sciences, Belgrade, Serbia

Chapter 1 & 2:

Marko Vladisavljević, Ph.D. Institute of Economic Sciences, Belgrade, Serbia

Chapter 3:

Aida Gjika, Ph.D. Development Solutions Associates, Tirana, Albania

Edvin Zhllima, Ph.D. Development Solutions Associates, Tirana, Albania

Drini Imami, Ph.D. Development Solutions Associates, Tirana, Albania

Chapter 4:

Dragan Gligorić, Ph.D. Faculty of Economics, University of Banja Luka, Banja Luka, Bosnia and Herzegovina

Ljubiša Mićić, M.A. Faculty of Economics, University of Banja Luka, Banja Luka, Bosnia and Herzegovina

Dragana Preradović, M.A. Faculty of Economics, University of Banja Luka, Banja Luka, Bosnia and Herzegovina

Anđela Pepić, M.A. Entrepreneurship and Technology Transfer Center, University of Banja Luka, Banja Luka, Bosnia and Herzegovina

Chapter 5:

Besnik Prekazi, M.A. Democracy Plus, Prishtina, Kosovo

Erëza Pula, MSc. Democracy Plus, Prishtina, Kosovo

Chapter 6:

Natasha Najdova Trajkovska, Analytica, Skopje, North Macedonia

Chapter 7:

Ana Mugoša, Ph.D. The Institute of Socioeconomic Analysis, Podgorica, Montenegro

Mirjana Čizmović, Ph.D. The Institute of Socioeconomic Analysis, Podgorica, Montenegro

Tanja Laković, Ph.D. The Institute of Socioeconomic Analysis, Podgorica, Montenegro

Milenko Popović, Ph.D. The Institute of Socioeconomic Analysis, Podgorica, Montenegro

Chapter 8:

Marko Vladisavljević, Ph.D. Institute of Economic Sciences, Belgrade, Serbia

Mihajlo Đukić, Ph.D. Institute of Economic Sciences, Belgrade, Serbia

Olivera Jovanović, M.A. Institute of Economic Sciences, Belgrade, Serbia

Jovan Zubović, Ph.D. Institute of Economic Sciences, Belgrade, Serbia

Chapter 9:

Jovan Zubović, Ph.D. Institute of Economic Sciences, Belgrade, Serbia

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Executive summary

Consumption of tobacco products, especially cigarettes in Southeastern Europe (SEE) imposes a significant economic burden on households and society in general. This report examines increases in the price of cigarettes through tobacco excise increases and their associated impacts on tobacco consumption, household expenditures, and tax burdens in different income groups as well as the impact of these increases on government revenues.

Using secondary data from household budget surveys (HBS) for periods ranging from 3 to 12 years, depending on data availability, in six countries (Albania, Bosnia and Herzegovina (B&H), Montenegro, North Macedonia, Kosovo, and Serbia), this research estimates the price and income elasticity of smoking prevalence and intensity, both for the full population and by income group.

For all countries studied, this research finds that price increases achieved through an increase in tobacco excises would result in lower consumption, higher budget revenues, and positive redistribution effects. In order to maximize the effectiveness of tobacco taxation policies, country specifics such as income growth, different elasticities, and behavioral responses of different income groups should be considered when designing policy. The findings are outlined in greater detail below:

- **Increasing excises (that results in the increase of cigarette prices) will result in lower cigarette consumption**

Results suggest that in all countries studied, a price increase of cigarettes will result in lower cigarette consumption. Therefore, if the excise increase leads to a price increase, tobacco consumption in the region will decrease. In most of the countries, the decrease in consumption stems from both a decrease in smoking prevalence and a decrease in the consumption of cigarettes by those who smoke. Prevalence elasticities range from as much as -0.636 in Montenegro to -0.165 in Albania, while in Kosovo prices do not impact the decision to smoke. Total elasticities range from -1.065 in Montenegro to -0.387 in Kosovo. The income elasticities range from 0.595 in North Macedonia up to 1.113 in Albania. Given that income elasticities in all countries studied are high, the response of consumers to excise increases will depend on the rate of income growth. Therefore, when designing the excise increase, policymakers should take into account the expected growth of income in the country. In other words, the increase of excises will result in lower consumption of cigarettes if it reduces the affordability of cigarettes.

- **An increase in cigarette excises will result in an increase in government revenue**

In addition, the change in government income from taxes levied on cigarettes is simulated for a scenario in which retail prices would increase either by changing the excise tax or by simultaneously changing the tax and producers' price. In all the countries the price increase would result in increased budget revenue.

The change in budget revenue would be the highest in Kosovo, with an estimated increase of 26 percent as a result of a price increase of 25 percent, followed by Serbia and Albania with over 17 percent increased revenues. The lowest increase in budget revenues could be expected in B&H, due to a very high price elasticity, where an increase in the specific excise of 25 percent (which would lead to a 17 percent price increase) would result in a 2.5 percent increase in budget revenues. In the long-run, further positive fiscal effects could be expected since the decrease in cigarette consumption will likely lower health expenditures related to the harmful effects of cigarettes.

These research findings suggest that claims about the negative impact of excise increase on budget revenues fueled by the industry are not based on rigorous evidence. Thus, even if a narrow analysis is applied, focusing strictly on budgetary impact, there are still positive fiscal effects.

- **In most of the countries studied, an increase in cigarette excises would have an additional redistributive effect.**

Total demand elasticities among low-, middle-, and high-income households have proven to be significantly different. In most countries, low-income households have the highest price elasticity, and high-income households have the lowest. As a result, the cigarette price increase is followed by the largest reduction in consumption in low-income households. Unlike the middle- and high-income groups, low-income households also reduce their total expenditures on cigarettes which also has positive effect on their living standard. In the long-run, further redistributive effects could be expected, as lower consumption of cigarettes will benefit the health of low-income households and decrease their expenditures for tobacco-related illnesses. On the other hand, policy makers should also bear in mind that low-income households are at the same time the most sensitive with regard to changes in their income. Research results show that the income increase would be associated with a comparatively higher increase in consumption within the low-income group. Therefore, improved taxation policy should be designed to include eventual changes in income.

These research results refute the fallacy, often promoted by the tobacco industry, about regressive effects of tobacco taxes. Research in all countries shows that tobacco excise increases would have a progressive effect as the additional tax burden is the lowest for low-income households and the highest for most high-income households, whereas in some countries the share of budget expenditures for cigarettes among low-income households is actually decreased.

1 Introduction

This report presents the research findings from the second research year of the project "*Accelerating Progress on Effective Tobacco Tax Policies in Low- and Middle-Income Countries*". The research was undertaken in six middle-income countries in Southeastern Europe (SEE): Albania, Bosnia and Herzegovina (B&H), Kosovo, North Macedonia, Montenegro, and Serbia. The research was conducted in 2019. The same research methodology was used in all the countries and applied on secondary data from the Household Budget Survey (HBS), thereby providing a comparative analysis for all the countries. The research includes three topics of analysis, performed as follows:

1. Using HBS data, estimate the cigarette price elasticity of demand on the extensive (in other words, prevalence elasticity) and the intensive margin (in other words, conditional demand (intensity) elasticity);
2. Using HBS data, estimate the cigarette price elasticity of demand by income group;
3. Simulate the impact of an increase in tobacco excise and price on consumption and government revenue.

This report builds on the theoretical framework of the two-part model developed by Mullahy and Manning[1]. This model estimates the overall demand elasticity as a (corrected) sum of two elasticities: prevalence elasticity and conditional demand (in other words, intensity) elasticity. The prevalence elasticity is estimated via a logit model. The Deaton model and Generalized Linear Model (GLM) are used for the estimation of conditional demand (intensity). The GLM is used as a robustness check (detailed explanation of the Deaton model and the general methodology is presented in chapter 2).

First, the described analyses are performed separately for each country on the overall sample of households. The sample of households is then split into three equal groups: low-, middle-, and high-income groups with the same analyses performed on income subsamples and then, results are compared. Finally, the estimated elasticities are utilized to simulate the effect of price increases on overall cigarette consumption and government revenues.

The remaining part of the report is structured as follows. Chapter 2 describes the methodology used in the analysis, while chapters 3-8 present and discuss the results by country. The report concludes with chapter 9. Supporting tables from chapters 3-8 are included in the appendix, which is available on the online project web page (http://tobaccotaxation.org/).

[1] Manning, W. G., and J. Mullahy. (2001) "Estimating Log Models: To Transform or Not to Transform?" *Journal of Health Economics* 20, no. 4: 461–494.

2 Data and methodology

This chapter describes the data and methodology used in the report. More precisely, it outlines the methodology used to estimate the price participation and intensity (conditional) elasticity of cigarettes. In addition, this chapter discusses the methodology for the estimation of price elasticity at different income levels. The estimates are then used to simulate the impact of a price increase on consumption and government revenue. The same econometric models and simulation methods are applied in all the countries. However, due to slight differences in available data and country specifics, there are minor variations in model specification and years of available data.

All analyses use microdata from HBS data to estimate the price and income elasticities of cigarette use. HBS, an annual survey, provides detailed information on household consumption, as well as on individual characteristics of household members. The price elasticities (and the effects of other variables) are estimated at the household level because information on cigarette consumption is collected for the household as a whole. Table 2.1 reports the available years for the analysis in each country.

Table 2.1: Household Budget Survey data available for each country

Country	Years available
Albania	2014-2017
Bosnia and Herzegovina	2007, 2011, 2015
Kosovo	2007-2017
Montenegro	2006-2015 and 2017
North Macedonia	2015-2017
Serbia	2006-2017

The methodology applied in each of the research topics is described below.

2.1 Estimation of the price elasticity of demand

Cigarette consumption is often characterized by a mixed distribution that is partly discrete and partly continuous. More precisely, cigarette consumption is characterized by a large proportion of non-smokers, for which the variable describing the consumption takes a zero value and the remaining outcomes that are strictly positive. More formally, the distribution can be expressed as

$$y=0,\ n = 0, 1, \dots ni$$

$$y>0,\ n = ni+1, ni+2, \dots nN \qquad (1)$$

The distribution reflects the fact that when faced with the market prices and their own budget constraints and given the utility that they derive from cigarettes used, households are facing two decisions. The household first decides whether to smoke or not smoke (extensive margin). If the household decides to smoke, they then decide how many cigarettes to smoke (intensive margin).

The literature suggests a two-part model to independently model the two decisions[2]. This model is well suited for cigarette use, as the proportion of non-smokers (y=0) globally is high. The World Health Organization (WHO) estimates the proportion of smokers to be approximately 21 percent. [3] The first part of the model estimates cigarette prevalence. It estimates the probability of observing positive tobacco consumption (vs. no consumption), conditional on the set of independent variables. The model is typically estimated by a parametric binary probability model, such as logit or probit. The second part of the model deals with the intensity (level) cigarette consumption. The model estimation is conditional on $y_i>0$, where the dependent variable is typically a linear function of independent variables. Therefore, it can be estimated via an ordinary or a generalized linear model.

The main variables that enter both models are price and income. These two variables provide the basis for the calculation of price elasticity, income elasticity of cigarette prevalence and the intensity of cigarette use. Since HBS data do not contain the prices of cigarettes, unit values are used as a proxy for prices. The unit values are calculated as the ratio between total household expenditure on cigarettes (in local currency) and total household consumption on cigarettes (in cigarette packs). However, a potential identification problem arises by using this proxy because of the joint determination of cigarette demand and price as well as because of unobserved heterogeneity across regions. This problem is resolved by calculating prices as municipality[4] averages and controlling for an extensive set of control variables and region fixed effects. Additionally, total household consumption is used as a proxy for household disposable income, as information on income is not consistently available in all the countries.

As the models are estimated separately and independently, the total price and income elasticity is calculated as the corrected sum of the prevalence and the conditional demand (intensity) elasticity, that is, (the method for each component and the aggregation correction is presented in more detail below).

Aside from prices (that is, the average municipality unit value) and income (that is, total household consumption), the models include a set of covariates, consisting of household characteristics (share of men and adults in the household, maximum or mean level of education and activity of the household members), region and settlement fixed effects and variables representing institutional changes relevant to cigarette consumption. Next, the models estimating the prevalence and then the intensity elasticity of cigarette use are presented.

[2] Belotti, F., Partha D., Manning W. G., and Norton E., C. (2015): "Twopm: Two-Part Models." *Stata Journal* 15, no. 1: 3–20.

[3] World Health Organization. (2017): *WHO report on the global tobacco epidemic, 2017: monitoring tobacco use and prevention policies.* World Health Organization.

[4] A primary sampling unit is used if the municipality identifier is not available. This applies to prevalence and GLM models, while the Deaton model initially uses unit values as a dependent variable in the first stage equation. In the second stage unit values are used to purge out household characteristics. These are then also aggregated to the municipality or primary sampling unit level.

2.1.1 Estimation of the prevalence elasticity

The first part of the model analyzes whether the price of tobacco impacts the decision of a household to smoke, conditional on the set of independent variables. This decision is typically modeled by using the binary choice model. The nature of the dependent variable is the main difference between a binary choice and the classical linear regression model. Instead of modeling a continuous variable in the binary choice models, the probability that the dependent variable y_i takes value one, which represents the households with positive cigarette expenditure/consumption, versus value zero, which represents the households with zero consumption, is modeled. Consequently, instead of a linear combination of independent variables, a (nonlinear) function of that linear combination is used to explain the probability that a household has positive tobacco expenditures. The most commonly used functions are probit and logit, and in this case, a logit specification is used.

More formally, the following model is estimated:

$$Y = P(y_i > 0) = f(\beta_1 p_i + \beta_2 i_i + \Gamma' X) \qquad (2)$$

where y_i is cigarette consumption of the household *i*. Y is an indicator variable taking value 1 if household consumption is positive; p_i and i_i are prices and total household consumption, respectively. *X* represents the vector of covariates used in the analysis. After the estimation model is defined, a maximum likelihood procedure is used to fit the coefficients to the logit model.

The logit model assumes that the linear combination of the independent variables $z = \beta_1 p_i + \beta_2 i_i + \Gamma' X$ is related to the dependent variable via the logit function $f(z) = e^z/(1 + e^z)$. Coefficients β_1 and β_2, as well as the vector of the coefficients Γ, do not represent the marginal effects and have no clear interpretation. For binary choice models, the marginal effects are not constant, but are a function of all independent variables in the model, as the first derivative of the function is also a function of the probability density. The probability density is a function of the linear combination of all independent variables in the model. Therefore, the marginal effects of the price are calculated as

$$ME_p = \Delta P(y_i > 0)/\Delta p_i = f(z) * \beta_1 \qquad (3)$$

and is interpreted as the increase in the likelihood that the household has positive cigarette expenditures for a unit increase in price. The marginal effects for the other variables in the model are analogously calculated; the first derivative is taken with respect to the variable of interest. As before, the derivative is a function of the linear combination of all independent variables in the model[5].

Finally, the price elasticity of cigarette prevalence is calculated as

$$\xi_{p1} = ME_p(\bar{p}/\bar{Y}) \qquad (4)$$

where $\bar{p}$, and $\bar{Y}$ are the average price and prevalence, respectively. The interpretation of the elasticity is that if the prices increase by 1 percent then the probability of positive cigarette

[5] Green, W. H. (2008): Handbook of Econometrics. *Applied Econometrics*, 2, 413-556.

consumption at the household level increases by ξ_{p1} percent. The interpretation of these effects is, at the level of average prices and the average level of all the variables in the model. The income (that is, total household consumption) elasticity is calculated in a similar fashion.

For a more intuitive understanding of the model results, marginal effects expressed in terms of the percentage point change in prevalence resulting from a percentage change in prices are also calculated. This indicator is calculated as

$$\xi_{p1,pp} = ME_p * \bar{p} \quad (5)$$

The interpretation of the indicator is as follows: for a 1 percent increase in price, the probability that the household will have positive cigarette consumption will increase by $\xi_{p1,pp}$ percentage points.

2.1.2 Estimation of the conditional demand (intensity) elasticity

For the estimation of conditional demand (intensity) elasticity the Deaton demand model[6] is used, with the GLM as a robustness check. Deaton is the preferred model because it relies on Deaton's consumer theory, and also provides a built-in identification strategy and controls for so-called quality shading and measurement error. These characteristics of the Deaton model make the estimates more robust and precise than the GLM estimates.

Deaton model

The Deaton demand model is a consumer behavior model in which total expenditure on goods is defined as a product of quantity, quality, and prices. Therefore, the household utility function is augmented as it includes quality of the good. Given its definition as the ratio between the total expenditure and the quantity purchased, the unit value represents the product of quality and price[7]. As the model assumes that all households within a cluster (typically a small territory unit, such as municipality or village) face the same market price, within-cluster variations in purchases depend only on total household expenditure and characteristics that reflect the variation in quality, while cross-cluster variations in purchase are due to genuine price variations, among other factors.

The starting point of the Deaton model is comprised of two equations: [8]

$$w_{hc} = \alpha^0 + \beta^0 lnx_{hc} + \gamma^0 . z_{hc} + \theta lnp_c + (f_c + u_{ch}^0) \quad (6)$$

$$lnv_{hc} = \alpha^1 + \beta^1 lnx_{hc} + \gamma^1 . z_{hc} + \psi lnp_c + u_{hc}^1 \quad (7)$$

[6] Deaton, A. (1988): Quality, quantity, and spatial variation of price. *American Economic Review*, 78 (3), 418–430.
[7] John, R. M. (2008): Price elasticity estimates for tobacco products in India. *Health Policy and Planning*; 23(3), 200-209.
[8] Deaton, A. (1997): *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy.* Johns Hopkins University Press, Baltimore.

where indices *h* and *c* represent households and clusters, respectively. The left hand-side variables in equations (8) and (9) are w_{hc} – share of the household budget spent on cigarettes (in percentages) and the natural logarithm of v_{hc} – cigarette unit values. On the right hand-side of both equations, there is x_{hc} – total expenditures of the household *h* in cluster *c*, z_{hc} – other household characteristics, p_c – price of the cigarettes in cluster c, while u_{ch}^0 and u_{hc}^1 represent the error term.

Finally, in equation (1) f_c are the cluster level effects on the budget share, which are assumed to be uncorrelated with the price effect on the budget share. [9] Since the prices are not observed, the parameters θ and ψ cannot be directly estimated from equations (8) and (9). However, the assumption that market prices do not vary within the cluster (hence the absence of the index *h* next to prices) enables consistent estimates of the remaining parameters. Therefore, the usage of the cluster deviation-from-the-mean approach cancels the effect of prices from the equations. We estimate the parameters by including cluster-fixed effects (dummy variables for each cluster) in the regression, which yields identical estimates as deviation-from-the-mean approach. [10]

In the unit value equation (equation 9), coefficient β^1 represents the expenditure elasticity, while ψ represents the price elasticity in unit values. When cigarette prices change, assuming a constant budget, households can either decrease their cigarette consumption or switch to a less expensive brand to keep their consumption at the same level. The latter is referred to as quality shading. If there is no quality shading, the value of ψ would be equal to one (as the change of the unit value would correspond to change of the price) and β^1 would be approximately equal to zero. On the other hand, in the presence of quality shading, ψ will be less than one (unit value change will be slower than the change of the price) and β^1 would be approximately equal to zero.

The second stage uses the estimates from the first stage to remove the effects of total household expenditure, and other household characteristics from the budget shares and the unit values. Variables constructed in this way are then used to create cluster averages of budget shares and unit values, which in accordance with equations (8) and (9) can now be written as

$$y_c^0 = \alpha^0 + \theta ln p_c + f_c + u_c^0 \qquad (8)$$

$$y_c^1 = \alpha^1 + \psi ln p_c + u_c^1 \qquad (9)$$

The estimation of the parameter θ, which represents the price semi-elasticity is not feasible since the price is not directly observed. However, Deaton's model uses the presence of price in both equations to establish a relationship between budget shares and unit values. The

[9] John, R. M. (2008): Price elasticity estimates for tobacco products in India. *Health Policy and Planning*; 23(3), 200-209.

[10] Frisch, R., and F. V. Waugh. (1933): Partial time regression as compared with individual trends. *Econometrica* Vol. 1, No. 4, 387-401.

result is parameter ϕ, a hybrid of price and quality elasticity. Deaton proves that $\phi = \psi^{-1}\theta$. [11]

In the third stage, the weak separability assumption is introduced. Given the budget share is defined as the product of the quantity of cigarettes and unit value divided by total expenditures, parameter θ can be estimated as:

$$\hat{\theta} = \hat{\phi}/[1 + (w - \hat{\phi})\frac{\hat{\beta}^1}{\hat{\beta}^0 + w(1-\hat{\beta}^1)}] \qquad (10)$$

where $\hat{\beta}^1$ and $\hat{\beta}^0$ are coefficients estimated in equations (8) and (9), while *w* is the average value of the budget share. The value of $\hat{\psi}$ is then equal to $\hat{\phi}^{-1}\hat{\theta}$. From there, price elasticity of demand can be estimated as:

$$\hat{\epsilon}_p = \left(\frac{\hat{\theta}}{w}\right) - \hat{\psi} \qquad (11)$$

Similarly, since equation (8) has budget shares instead of the logarithm of quantity, parameter β^0 does not estimate the expenditure elasticity. Instead, the total elasticity of expenditure can be estimated as:

$$\hat{\epsilon}_i = 1 - \hat{\beta}^1 + (\frac{\hat{\beta}^0}{w}) \qquad (12)$$

Following John [12]symmetry restrictions are imposed to increase the precision of the parameter estimates. Furthermore, the system incorporates a composite commodity variable that accounts for all other purchased goods. Due to the calculation procedure, standard errors of price elasticity cannot be taken directly from the regression analyses. Instead, the standard errors of the estimated price elasticity are calculated by using the bootstrapping procedure with 1000 replications.

Estimation of the conditional demand (intensity) elasticity via GLM

For the households that have positive cigarette expenditures, the number of cigarette packs smoked per month is modeled as a linear function of the independent variables. Therefore, the model is estimated as follows:

$$E(y_i \,|y_i > 0) = \alpha_1 p_i + \alpha_2 i_i + \Theta' X \qquad (13)$$

where, as before, y_i is cigarette consumption of household *i*, p_i and i_i are prices and total household consumption, respectively. *X* represents the vector of other covariates used in the analysis. The interpretation of the coefficients α_1, α_2 and the coefficients vector Θ is straightforward. They represent the marginal effects of the independent variables. The model is typically estimated via ordinary least squares (OLS) or GLM. The dependent variable is generally represented in the log form as it helps to stabilize non-constant error variance (that is, heteroscedasticity). However, it is necessary to re-transform the coefficients to in-

[11] Deaton, A. (1997): *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy.* Johns Hopkins University Press, Baltimore.

[12] John, R. M. (2008): Price elasticity estimates for tobacco products in India. *Health Policy and Planning*; 23(3), 200-209.

terpret them as marginal effects. The downside to this method is that during the re-transformation, prediction bias may be introduced into the conditional demand.

Manning and Mullahy propose that the second part of the model is estimated via GLM, which does not require the assumption of homoscedasticity or normality.[13] GLM is estimated by the maximum likelihood method. GLM estimates the following model:

$$g\{E(y_i \,|y_i > 0)\} = \alpha_1 p_i + \alpha_2 i_i + \Theta' X \,,\; y \sim F \qquad (14)$$

where g{.} is the so-called "link function". The link function describes the relationship that the dependent variable and the linear combination of the predictors have. The type of link function that should be used in GLM is tested via the Box-Cox test. [14] Since the GLM does not assume a constant variance, within the model a function F is defined as the distributional family that is used to describe the relationship between the variance and mean. When the link function is determined, the Modified Park test is used to find the best approximation of the dependent variable variance.

A standard practice in health economics is to use GLM with gamma family and a log link function. This combination has been proposed to be a more robust alternative to a semi-log regression specification. [15] The difference between the OLS and GLM methods is that the OLS estimator estimates E[ln y $|\boldsymbol{x}$]. Once obtained, the OLS coefficients require retransformation. The GLM estimator estimates ln[$E(y|\boldsymbol{x})$], and therefore estimates the marginal effect directly, thereby circumventing the prediction bias issue present in the OLS method. The GLM estimator is consistent even if the variance distribution is not properly defined and does not assume homoscedastic errors. After the model estimation, we calculate the conditional (intensity) elasticity of cigarettes quantity demanded as

$$\xi_{p2} = ME_p(\bar{p}/\bar{y}) \qquad (15)$$

where $\bar{p}$, and $\bar{y}$ are the average price and quantity of cigarettes consumed by households with positive consumption respectively. The interpretation of conditional demand elasticity is that if the price increases by 1 percent, cigarette consumption would decrease by ξ_{p2} percents, assuming that the smoking participation decision does not depend on the price. Income (that is, total household consumption) elasticity is calculated in a similar way.

2.1.3 Estimation of the total demand elasticity

In previous chapters, the methodology of the estimation of the prevalence and the conditional demand (intensity) elasticity was explained. Although the literature suggests that these two decisions can be modelled independently[15], total elasticity cannot be calculated as simple sum of the two elasticities. Instead, this sum needs to be corrected for the fact that a change in the smoking prevalence can attenuate or enlarge the effect of the conditional de-

[13] Manning, W. G., and J. Mullahy. (2001) "Estimating Log Models: To Transform or Not to Transform?" *Journal of Health Economics* 20, no. 4: 461–494.
[14] Box, G. E., & Cox, D. R. (1964). An analysis of transformations. *Journal of the Royal Statistical Society: Series B* (Methodological), 26(2), 211-243.
[15] Manning, W. G., Basu A:, and Mullahy J. (2005): "Generalized Modeling Approaches to Risk Adjustment of Skewed Outcomes Data." Journal of Health Economics 24, no. 3: 465–88

mand (intensity) elasticity. In order to make this more clear, an example is provided with the formula that converts the two elasticities into total elasticity.

Assume that the total population of country XYZ is 10 million people, that that country has a prevalence rate of 40 percent, and that conditional average consumption per person is 25 cigarettes per day (including only those people who smoke). This means that about 4 million people smoke, and total consumption amounts to 100 million cigarettes per day. This situation is presented in table 2.2. column baseline.

Also assume that the prevalence price elasticity in a country is -0.3, while the conditional demand (intensity) elasticity is -0.5. This means that if the prices increase by 1 percent, the prevalence would be lower by 0.3 percent (that is, to 39.88 percent), while the consumption per person would be lower by 0.5 percent (that is, to 24.875 cigarettes per day). This decrease the number of people smoking to 3.988 million (that is, by 0.3 percent), but the total consumption calculated as the product of new prevalence and consumption would decrease by -0.7985 percent, which is less than a simple sum of two elasticities of 0.8 percent. Therefore, due to the prevalence change, a total change in consumption will not be a simple sum of the two elasticities, so the change in prevalence should be corrected for when adding up the change in consumption.

Table 2.2: Hypothetical example for the calculation of the total demand elasticity

		Baseline	Price increases by 1%	% change
Total population	1	10,000,000	10,000,000	
Prevalence	2	40.0%	39.88%	-0.30%
Consumption per person (in cigarettes)	3	25	24.875	-0.50%
Number of people smoking	4=1*2	4,000,000	3,988,000	-0.30%
Total consumption	5=4*3	100,000,000	99,201,500	**-0.7985%**

More formally the total elasticity can be calculated according to the following formula:

$$\xi_p = \xi_{p1} + (1 + \xi_{p1}) * \xi_{p2} \qquad (16)$$

Where ξ_{p1} represents the prevalence elasticity, ξ_{p2} represents the conditional demand (intensity) elasticity and ξ_p represents the total elasticity, if all the elasticities are expressed as percentages.

2.2 Estimation of elasticities at different parts of the income distribution

As mentioned in the introduction, the second part of the analyses estimates the price and income elasticity of demand by income group. Income groups are constructed based on total household consumption (a proxy for income) per capita. Given the relatively small sample size in some countries, three income groups are created: low-income, middle-income, and

high-income. As in all the countries, several waves of HBS is used, and the division into three income groups is done for each year, so that an equal number of households belongs to each of the three groups in all years.

After dividing the sample into three income groups, prevalence elasticity is estimated using a logit model and conditional demand (intensity) elasticity using the Deaton model, followed by use of the above formula for total elasticity to calculate total elasticity by income group.[16]

2.3 Simulation of price and excise increase on consumption and government revenue

Finally, within topic 3, the estimated price and income elasticities are used to simulate the impact of price and excise tax increase on consumption and government revenue. As mentioned in the introduction, the total price and income elasticities are calculated as a corrected sum of prevalence elasticity and intensity (that is, conditional demand) elasticity from the Deaton model. In both cases, the elasticities are used when applying the models to the overall sample.

The starting point of the analysis is cigarette consumption, which is obtained from the administrative data on cigarette packs for the year for which the latest HBS is available (a more detailed data source description will be given in each country chapter). In order to account for the impact of an increase in income on consumption, the following inputs are used: total HBS real expenditure growth (a proxy for income growth) based on the ratio between the total expenditure in the year t+1 and the total expenditure in the year t, where t is the latest year when HBS is available[17]. Three scenarios are simulated, presenting the estimated impact of three alternative price increases: of 10, 25, and 50 percent.

In order to calculate a change in quantity demanded (or consumption), the following formula is applied:

$$D_{t+1} = D_t(1 + \xi_p * \Delta p[\%] + \xi_i * \Delta i[\%]) \qquad (17)$$

where D_{t+1} is the new demand, D_t is the demand in year *t*, ξ_p and ξ_i are price and income elasticities, while $\Delta p[\%]$ and $\Delta i[\%]$ represent the percentage increases of real prices (which are set arbitrarily at 10, 25 and 50 percent) and real income (fixed, calculated as a ratio between the total consumption in the year *t+1* and the total consumption in the year *t*, where *t* is the latest year when HBS is available).

The calculation of a change in government revenue stemming from taxes on cigarettes is done in two steps. In the first step, for year *t*, the excise and VAT is calculated for a single cigarette pack according to the current taxation rules in each country and this rule is applied to the weighted average price of cigarettes in the country in year *t*. The change in price that

[16] The prevalence model, as well as the GLM for estimation of the conditional demand (intensity), uses the price proxy calculated based on the unit values from the overall sample. Therefore, all households, regardless of the income groups they belong to, are "facing" the same price.

[17] Although the data from the year t+1 are not available in all the countries this information can be found in the statistical reports.

would occur in year *t+1* is simulated, and the impact that this would have on excise and VAT in each country for year *t+1* is calculated. Where the country has a specific excise rate, the increase in the specific excise from the year *t* to year *t+1* will be at the same rate as the increase of the price (that is, by 10, 25 and 50 percent in the three simulation scenarios).

In the second step, for the year *t*, the total excise and VAT is calculated as a product of the excises and VAT charged on the single pack (price at the average weighted price level) according to the prices and taxation rules from the year *t*, and total demand from the administrative data from the year *t*. For the year *t+1*, similarly, the total excise and VAT is calculated as a product of the excises and VAT charged on the single pack according to the increased prices and taxation rules from the year *t+1*, and the simulated demand calculated in the equation (15). Data is presentenced in euros so that they are more easily comparable across six countries in the SEE region.

2.3.1 Simulation of the impact of price on demand and expenditures of income groups

Finally, the impact of a price change on cigarette demand and expenditure on cigarettes for each of the income groups is calculated. The simulation strategy is similar to the one for the overall sample and based on the estimated elasticities (the methodology for the estimation of the elasticities is explained in section 2.2.). The starting point of the analysis is the cigarette consumption in each of the income groups. As the administrative data are not available for each of the income groups, HBS data for the last year available is used to calculate the share of cigarette consumption of each income group in total country consumption. These shares are multiplied by the total consumption from administrative data to derive the estimated consumption of each of the income groups.

The total expenditure growth of each of the income groups is calculated as an increase in the total expenditure between the last two years of the HBS data available (2016 and 2017). The scenario in which prices increase by 25 percent is simulated as a middle increase among the previous solutions. In order to arrive at the demand change for each of the income groups, equation (17) and the data for each of the income group is used. The change in expenditure for each income group is calculated as the difference in products of weighted average price and the demand for each income group in year t and year t+1 in which the prices increase by 25 percent.

3 Albania

Albania has one of the highest smoking prevalence rates in the region, with tobacco consumption as one of the most significant health concerns of the population, especially for low- and middle-income households. Despite existing tobacco control policies combining price and non-price measures, Albania has still one of the lowest tax levels on cigarettes compared to other Western Balkan and European Union (EU) countries.

A tax increase on tobacco is a win-win solution: the country could be healthier and wealthier. Using an empirical analysis at the household level in Albania over the period 2014-2017, this study demonstrates the effectiveness of price-based policy measures in reducing tobacco consumption. Despite some arguably potential economic benefits produced by tobacco such as tax revenues, its economic benefits are only observed in the short run. The empirical results show that a price increase of 25 percent, resulting from a 43.6 percent specific excise tax increase, would lead to a decrease of cigarette consumption by 15.0 percent, and on the other hand increase government revenue by 17.9 percent (29.7 million euros). The expected increase is more than one-third of the current total revenue collected from tobacco excises. With that in mind, the Government of Albania should increase specific excise duty on cigarettes from 49 euros per 1000 sticks in 2019[18] to 70 euros in 2020.

Different income groups react differently to price and income changes. The results differ between different income groups in terms of both income and price elasticity. More specifically, the empirical results suggest that low-income households are highly affected by price increases. Thus, for this group, increased taxes would cause a sharp decrease in tobacco consumption accompanied by a slight increase in government revenues. For middle- and high-income households, the reduction of tobacco consumption is lower, but the revenues generated from these groups as a result of price increases are higher relative to the low-income group.

This chapter presents prevalence and conditional price and income elasticities of demand for cigarettes in Albania using Household Budget Survey (HBS) data. The analysis consists of two approaches. Firstly, all households are pooled to estimate the elasticities without distinguishing between income groups. Then, households are divided into three income groups and the analysis is conducted separately for each.

3.1 Data and descriptive statistics

To estimate the elasticity of cigarette demand, this study uses the HBS as a pooled cross-sectional data from the years 2014 to 2017. HBS is nationally representative (28,748 households over 4 years) – and covers urban and rural areas across the 12 prefectures of Albania. As to the number of observations per year, it is noted that the year 2017 has the largest number of observations; more precisely, the number of observations in years 2014, 2015, 2016 and 2017 are 6,542, 7,334, 7,353 and 7,519 respectively.

[18] 6,000 ALL per 1000 sticks: Law No. 98/2018 dated 3 December 2018 on Additions to Law No. 61/2012 on Excise Taxes is published on Official Gazette No. 187 dated 28 December 2018 and becomes effective from 1 January 2019 (https://qbz.gov.al)

A note of caution is in order when referring to the elasticities estimated in this analysis as they do not include cut tobacco and cigars. While data on the quantity of cut tobacco are not reported in HBS, households reporting on the quantity and expenditures on cigars represent only 0.25 percent of total households.

Before explaining the estimation results of price and income elasticities of cigarette demand, some descriptive statistics are provided to better understand the heterogeneity of the data in different years. As reported in Table 1, the average number of cigarettes smoked per household over years (2014-2017) appears to be within the range of 17-20, with a slight increasing trend from 2016 to 2017. Though, in all the years, the average number of cigarettes smoked per household appears to be below 20. In comparison to other countries, Albanian households, as reported in HBS, smoke fewer cigarettes than those in the region.[19] Smoking prevalence decreased, from 38.7 percent in 2014 to 31.7 percent in 2017. Average household expenditures on cigarettes decreased from 2014 to 2016, 14,709.5 ALL[20] and 13,382.3 ALL respectively, though in 2017 the average real household expenditure on cigarettes increased significantly to 15,212.1 ALL.

Table 3.1: Cigarette consumption in Albania

Year	Smoking prevalence (% of households)	Average number of cigarettes smoked (pack per household)[1]	Average real household expenditure on cigarettes [1, 2]	Average price[3, 4]
2014	38.7	17.38	14,726.38	2,249.86
2015	31.6	18.95	13,843.73	2,270.08
2016	31.3	18.39	13,380.41	2,312.57
2017	31.7	19.46	15,212.12	2,350.65

Source: Institute of Statistics in Albania, HBS data, 2014-2017.
[1] Conditional on having positive expenditure on cigarettes.
[2] Variables are deflated by dividing the household expenditure by the CPI of the respective year
[3] Prices are expressed in old Albanian Leks, same as in HBS; 1 old Albanian Leks= 0.1 Albanian Leks.
[4] Prices are proxied by average ratio of reported household expenditure of cigarettes and purchased quantity.

3.2 Two-part model

In addition to other factors that may explain a household's cigarette quantity consumed, this study also takes into account policy changes in Albania during 2014-2017, such as Law No. 76/2014, one of the most significant tobacco control laws in Albania, which limited smoking in public places. The following section discusses the prevalence and conditional elasticity results from the empirical analysis.

3.2.1 Prevalence elasticity

Following the traditional approach of the two-part model, this study separately models the propensity of smoking, or smoking prevalence (participation elasticity) and the intensity of

[19] Tobacco Taxation (2019) National Studies. http://tobaccotaxation.org/research.php?cID=26&lng=srb
[20] ALL denotes Albanian Leks.

smoking, or the quantity of cigarettes consumed by those who smoke (intensity elasticity). Using diagnostics through various tests (see the online appendix for details), specifications 4 and 6 have been selected for the analysis and presented in this chapter, but the discussion of the results is focused only on specification 6.

As shown in Table 3.2 below, the prevalence price elasticity is estimated at -0.165, and income elasticity at 0.781. This means that a 10 percent price increase would reduce smoking prevalence by 1.65 percent, while a 10 percent increase in income would increase it by 7.81 percent.

In terms of determinants of smoking prevalence, larger households and households with larger shares of men, adults, and self-employed members have a relatively higher smoking prevalence. On the other hand, households in the south of the country and those with secondary education tend to have lower smoking prevalence.

Table 3.2: Price and income elasticity of smoking prevalence

Indicators	Model 4		Model 6	
Price	-0.103	(0.110)	-0.165*	(0.089)
Income	0.544***	(0.019)	0.781***	(0.030)

Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculation based on data from the Institute of Statistics in Albania, HBS data, 2014-2017.

3.2.2 Conditional intensity elasticity

Despite the superiority of the Deaton method (see Chapter 2 for more details), this chapter reports results from the generalized linear model (GLM) because of the stronger statistical significance, both by income group and overall elasticity. The estimated results, presented in Table 3.3, indicate that a 10 percent price increase decreases the quantity of cigarettes consumed by 2.7 percent. However, a 10 percent increase in income would lead to a 3.3 percent increase in smoking intensity among those who smoke.

Table 3.3: Price and income elasticity of smoking intensity

Indicators	Model 4		Model 6	
Price	-0.369	(0.145)	-0.268***	(0.101)
Income	0.332***	(0.029)	0.330***	(0.0293)

Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculation based on data from the Institute of Statistics in Albania, HBS data, 2014-2017.

3.2.3 Total price and income demand elasticity

The total price elasticity is a composite elasticity of participation and conditional elasticity. The results in Table 3.4 below show a total price elasticity of -0.432, falling within the range of estimated price elasticity in low- and middle-income countries. This means that a 10 percent increase in the price of cigarettes would decrease the total demand for cigarettes by 4.3

percent. Conditional price elasticity (-0.267) contributes the most to the total demand elasticity, whereas participation price elasticity (-0.165) contributes relatively less. In other words, a reduction in consumption due to a price increase would happen relatively more through a reduction in smoking intensity than through a reduction in the number of smokers.

Similarly, the total income elasticity of 1.113 means that as income increases by 10 percent, total cigarette consumption increases by 10.1 percent. Because participation elasticity contributes the most to total income elasticity, an increase in income by 10 percent causes more people to start smoking (7.8 percent) relative to an increase in the amount of cigarettes consumed (3.2 percent).

Table 3.4: Total demand elasticity

Elasticity	Indicators	Model 6	
Total Demand Elasticity	Price	-0.432***	(0.1106)
	Income	1.113***	(0.0367)
Prevalence Elasticity	Price	-0.165*	(0.0893)
	Income	0.781***	(0.0300)
Conditional Intensity Elasticity	Price	-0.267***	(0.1007)
	Income	0.329***	(0.0292)

Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.
Source: Authors' calculation based on data from the Institute of Statistics in Albania, HBS data, 2014-2017.

3.3 Price elasticity by income group

Taking into account the distinction among households by income level, price and income elasticities are also estimated by three income groups: low-, middle-, and high-income groups are formed based on total household expenditure per capita, used as a proxy for household income.

3.3.1 Demand trends by income group

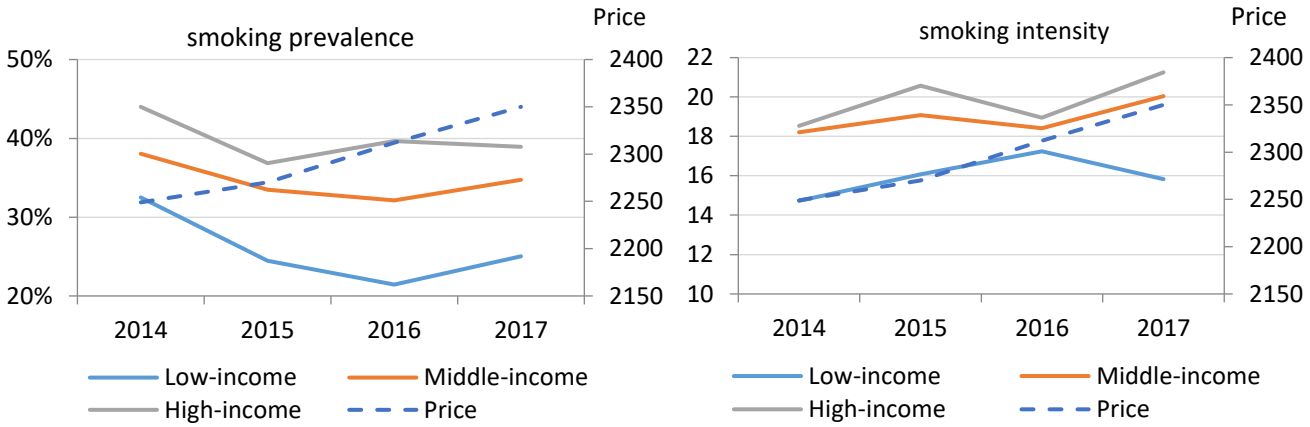
Smoking prevalence and smoking intensity trends by income group are presented in Figure 3.1. The low-income group has the lowest smoking prevalence and intensity compared to the other two groups. With the constantly increasing price of cigarettes, smoking prevalence in low- and middle-income groups show a decreasing trend until 2016 and then an increase in 2017. While in 2017, smoking prevalence among the low-income group slightly decreased.

In terms of smoking intensity, the low-income group shows an increase until 2016, after which it declines, while the middle- and high-income groups show an overall increase in smoking intensity.

As to the structure of HBS for 2017, the high-income group has the largest share in the 2017 HBS (39.8 percent), whereas low-and middle-income groups occupy 25.1 percent and 35.1 percent of the total households, respectively. The average monthly total household expendi-

ture for the low-, middle-, and the high-income group was is 4,920 ALL, 7,204 ALL, and 10,830 ALL, respectively. The low-income group has the highest share of spending on cigarettes (7.6 percent), in comparison to middle- and high-income groups with 6.7 percent and 5.4 percent, respectively.

Figure 3.1: Smoking prevalence and smoking intensity trends by income group



Source: Authors' calculation based on data from the Institute of Statistics in Albania, HBS data, 2014-2017.

Notes: Smoking prevalence is defined as the share of the households with positive tobacco consumption while smoking intensity represents the number of cigarettes packs a household with positive expenditures on cigarettes smoked per month. Cigarette prices are defined as municipality/year average cigarettes' unit values (ratio between total expenditure and quantity) and expressed in real terms.

3.3.2 Prevalence elasticity

Smoking prevalence among the low-income group seems to be the most responsive to changes in price and income (Table 3.5). For these households, a 10 percent price increase results in a 9.2 percent decrease in smoking prevalence, while a 10 percent increase in income results in a 10.7 percent increase in smoking prevalence. The high-income group shows lower responsiveness to changes in price than the low-income group, while the middle-income group does not seem to be responsive to price. Increases in income have the highest impact on the low-income group and the lowest impact on the high-income group.

Table 3.5: Prevalence and conditional elasticities by income group

Indicators	Low-income Households		Middle-income households		High-income households		All households	
Prevalence elasticity								
Price	-0.920***	(0.243)	-0.232	(0.149)	-0.352**	(0.170)	-0.165*	(0.0893)
Income	1.070***	(0.072)	0.758***	(0.089)	0.307***	(0.043)	0.781***	(0.0300)
Conditional demand (intensity) elasticity								
Price	-0.281**	(0.138)	-0.147	(0.123)	-0.358***	(0.134)	-0.267***	(0.1007)
Income	0.651***	(0.071)	0.380***	(0.077)	0.209***	(0.026)	0.329***	(0.0292)

Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.
Source: Authors' calculation based on data from the Institute of Statistics in Albania, HBS data, 2014-2017.

3.3.3 Conditional intensity elasticity

With regard to conditional intensity elasticity, low- and high-income households have inelastic demand for tobacco, with price elasticities of -0.281 and -0.358, respectively (Table 3.5). This means that when faced with a 10 percent price increase, low-income households will decrease the quantity of cigarettes consumed by 2.8 percent, while high-income households respond with a 3.5 percent lower consumption. The analysis finds no evidence that the cigarette consumption of the middle-income households responds to price, but there is evidence that it does respond to changes in income. Similar to smoking prevalence, a 10 percent income increase has the highest impact on cigarette consumption in the low-income group (6.5 percent), and the lowest in the high-income group (2.1 percent).

3.3.4 Total price and income elasticity

Once both prevalence and conditional elasticities are taken into account, Figure 3.2 shows the total price and income elasticity by income group. This figure shows that low-income households are by far the most responsive to price and income increases. A 10 percent increase in price reduces cigarette consumption in these households by 12 percent, while a 10 percent increase in income increases it by 17.3 percent.

Figure 3.2: Total, prevalence, and conditional elasticities by income group

Source: Authors' calculations based on data from the Institute of Statistics in Albania, HBS data, 2014-2017

3.4 Impact of price increase on consumption and government budget

Albania levies a specific excise tax on tobacco at 49 euros per 1000 sticks (2019),[21] far below the minimum excise tax required by EU regulation. The government revenue from tobacco (including excises and value-added tax (VAT)) in 2018 was estimated at 167.2 million euros, based on the 2017 baseline scenario when the specific excise tax was 44 euros per 1000 cigarette sticks. Table 1 shows that a 25 percent price increase, which would result from a 43.6 percent increase in the specific excise, would have a considerable impact on both reducing tobacco consumption and generating additional government revenue.

Table 3.6. Impact of a 25 percent cigarette price increase on consumption and government revenue

Income group	Consumption			Revenues		
	Baseline (2018)[1]	Scenario (2019)[1]	Change (%)	Baseline (2018)[2]	Scenario (2019)[2]	Change (%)
Low	35.8	26.1	-27.1%	41.9	42.3	1.1%
Middle	50.1	47.7	-4.8%	58.6	77.3	32.1%
High	57.0	47.6	-16.4%	66.7	77.2	15.9%
Total	**142.9**	**121.4**	**-15.0%**	**167.2**	**196.7**	**17.9%**

[1] In million packs; [2] In million euros

Source: Authors' own calculations based on data from the Ministry of Finance and Economy (2018)

Based on the simulations detailed in Table 3.6 above, a price increase of 25 percent would lead to a decrease in consumption by 15.0 percent, and an increase in government revenues by 17.9 percent or 29.7 million euros. The expected additional amount is more than one-third of the current revenue collected from the tobacco excises.

Breaking down this effect by different income groups, the results suggest that the low-income group would experience the highest reduction in consumption (27.1 percent), while the government would still collect 1.1 percent of additional revenues (around 0.5 million Euros). The reduction in consumption of the middle- and the high-income group is 4.8 percent and 16.4 percent, respectively, and the corresponding increase in government revenues would be 32.1 percent and 15.9 percent, respectively, or around 29.3 million euros from both groups together. While tobacco taxes are usually criticized for being regressive for low-income households, the results show that the additional tax burden on the low-income group would be the lowest and it would rather shift to the middle- and high-income group, increasing the progressivity of the tax system.

[21] 6,000 ALL per 1000 sticks: Law No. 98/2018 dated 3 December 2018 on Additions to Law No. 61/2012 on Excise Taxes is published on Official Gazette No. 187 dated 28 December 2018 and becomes effective from 1 January 2019 (https://qbz.gov.al).

4 Bosnia and Herzegovina (B&H)

Increasing the specific excise tax on tobacco can decrease cigarette consumption. Analysis using various increased rates of the specific excise tax shows a positive effect on the reduction of cigarette consumption, while at the same time, a slight increase in public revenues.

Changes in income and tobacco prices have different effects on different socioeconomic groups. While the high-income group recorded the highest increase (2.3 percentage points) in their budget share on cigarettes (from 2.9 percent to 5.2 percent) between 2007 and 2015, the middle- and low-income groups still spent the highest share of their budgets on cigarettes (6.2 percent and 5.9 percent, respectively, in 2015). This suggests that tax and price increases should be significantly high to more than compensate for income increases to reduce the affordability of cigarettes.

Significant tax and price increases can have a positive health impact, while contributing to public revenues. Analysis shows that a 10 percent specific excise tax increase would result in an almost 7 percent price increase, which would reduce consumption by almost 5 percent and increase revenues by almost 3 percent. A more aggressive excise tax increase of 25 percent would have a much stronger effect on consumption by reducing it by 15.5 percent, while government revenues from tobacco would see a slight increase of 2.5 percent. This suggests that the benefits of increasing prices and specific excise are high both for society and the national budget.

Low-income households would benefit the most from higher tobacco taxes and prices. A specific excise tax increase of 25 percent, which would translate into a 17.5 percent price increase, would decrease consumption of tobacco the most in the low-income group (22.1 percent) compared to the middle- and high-income groups (14.0 percent and 10.3 percent, respectively). Because low-income households spend a relatively larger share of their budget on tobacco, this reduction in consumption would not only contribute to better health, but it would also reduce their tax burden, and therefore increase the progressivity of the tobacco tax system in B&H. Moreover, this would allow reallocation of their limited budgets from tobacco to spending on basic necessities (for example, food, clothing, housing, education, fuel, etc).

4.1 Data and descriptive statistics

This analysis uses micro level data obtained from HBS in B&H in 2007, 2011 and 2015. The sample contains 21,424 households, of which 9,953 are smoking households. Clusters are defined based on the information on municipalities and years, in other words, the cluster is defined as a municipality *x* in the year *t*. According to this definition 404 clusters are generated, which contain 21,424 households. In each cluster, on average, there are about 53 households.

HBS provides detailed information of the household members, socioeconomic characteristics of households, participation of households in the labor market, housing conditions, level and structure of household expenditures, and poverty analysis. Additionally, HBS also contains information on municipalities in which the surveyed households reside but does not contain

information on the primary sampling unit to which households belong. As the data does not include cigarette prices, the price is calculated as the average unit value on the municipality level for each year. Unit values are calculated as a ratio of monthly household expenditure on cigarettes and the number of cigarette packs purchased by the household during a month.

Table 4.1: Cigarettes use in B&H: prevalence, expenditures, number of cigarettes smoked

Year	Smoking prevalence (% of households)	Average number of cigarette packs (per household)[a]	Average real household expenditure on cigarettes [a b]	Average price[22] [a b]
2007	57.4%	37.37	57.55 BAM	1.58 BAM
2011	48.4%	32.34	76.52 BAM	2.37 BAM
2015	33.8%	22.85	83.88 BAM	3.65 BAM

Source: Authors calculation based on HBS

[a] Conditional on having positive expenditure on cigarettes.

[b] Variables deflated by CPI to 2015 values.

Table 4.1 shows that the share of households that reported positive purchases of cigarettes (that is, smoking households) significantly declined from 57.4 percent in 2007 to 33.8 percent in 2015. Moreover, the number of cigarette packs consumed per household decreased from 37.37 to 22.85, or by 38.85 percent. At the same time, the unit value of cigarettes, which is used as a proxy for cigarette prices, increased from 1.58 BAM (0.81 EUR[23]) to 3.65 BAM (1.87 EUR), or by about 130 percent.

Table 4.2 shows comparative statistics from HBS data on consumption and spending on cigarettes and cut tobacco. The number of households which reported positive purchases of cut tobacco increased significantly in 2015 compared to 2017. Also, the average budget share on cut tobacco has increased rapidly in the observed period but its share is far below the budget share on cigarettes.

Table 4.2: Consumption of cut tobacco and cigarettes

Year	Total number of households surveyed	Number of households who reported consumption of cigarettes	Number of households who reported consumption of cut tobacco	Average budget share on cigarettes	Average budget share on cut tobacco[24]
2007	7126	4094	29	2.13%	0.0066%
2011	7048	3412	99	2.50%	0.0197%
2015	7250	2447	842	1.92%	0.2199%

Source: Authors calculation based on HBS

[22] Average price is proxied by an average ratio of reported household expenditure of cigarettes and purchased quantity of cigarettes.

[23] Exchange rate in B&H is fixed at 1 EUR = 1.95583 BAM.

[24] The budget share on cigarettes and cut tobacco is calculated as ratios of monthly household expenditure on cigarettes and cut tobacco, respectively, and the total monthly household expenditure. Then, a simple average is calculated to obtain the average shares of the budget which households spend on cigarettes and cut tobacco.

4.2 Two-part model

In this analysis, prevalence elasticity is estimated using the logit method, while for conditional elasticity two methods are used: Deaton method (Deaton, 1988) and generalized linear model (GLM). Results from the GLM model are used as a robustness check for conditional elasticity. The Deaton model is the preferred method because while the Deaton model and the GLM model uses unit value as a price, the Deaton model corrects for the potential drawbacks of using unit value as a proxy for price. Thus, the conclusions of this study are based on the results from Deaton method.

B&H adopted the Law on Tobacco of Bosnia and Herzegovina in 2010, which introduced stricter conditions in the field of tobacco production and trade. As a result, a dummy variable which equals 1 for year 2011 is used in the analysis. Later in December 2015, B&H adopted a Code on Commercial Communications, which prohibited all forms of commercial communications related to cigarettes and other tobacco products. However, taking into account that this policy measure was enacted prior to and after the period of analysis, no dummy variable is introduced to account for the policy change in 2015.

Based on the trends presented in Table 4.2, there is strong reason to believe that households in B&H are likely substituting between cigarettes and cut tobacco. This factor should be accounted for in the analysis, but due to a lack of relevant information on purchased quantities of cut tobacco, the analysis focuses only on cigarettes. This is one of the limitations of this study.

4.2.1 Prevalence elasticity

According to several tests outlined in tables in the appendix, the best model specifications are model 2 and model 4 with the results outlined in Table 4.3.

Table 4.3. Prevalence elasticities

Variable	Model 2		Model 4	
Price	-0.586***	(0.060)	-0.563***	(0.051)
Income	0.373***	(0.027)	0.374***	(0.027)

Price and income elasticities are statistically significant and have expected signs. The obtained elasticities from the model 4 show that an increase in cigarettes prices by 1 percent leads to a decrease smoking prevalence by 0.563 percent. Higher household income by 1 percent increases the propensity to smoke by 0.374 percent.

The probability that household members smoke is higher if the number of household members is higher as well as if the household has higher shares of men. The adult ratio has no significant impact on the probability of smoking, which is unexpected. Households in the South region of B&H have a greater propensity to smoke. Additionally, pensioners and the self-employed have lower propensities to smoke compared to the unemployed.

4.2.2 Conditional (intensity) elasticity

Deaton model

In this part, conditional elasticities are estimated using the Deaton method[25] with the estimate from the GLM model presented as a robustness check.

Table 4.4: Conditional demand (intensity) elasticity using Deaton's method

Variable	Conditional elasticity	
Price	-0.458***	(0.037)
Income	0.426***	(0.017)

Cluster robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The estimated price elasticity of demand for cigarettes is statistically significant at the level of 1 percent and amounts to -0.46 (Table 4.4). This means that if cigarette prices in B&H increased by 10 percent, the quantity demanded for cigarettes would decrease by 4.6 percent. Also, income elasticity of demand for cigarettes is significant at the level of 1 percent. If income increases by 10 percent, the quantity of cigarettes demanded would increase by 4.3 percent.

GLM Model

The models tested in this part (models 2 and 4) are the same as those tested for the purpose of calculating prevalence elasticities.

Table 4.5: Conditional demand (intensity) elasticity using GLM method

Variable	Model 2		Model 4	
Price	-0.582***	(0.053)	-0.567***	(0.046)
Income	0.414***	(0.019)	0.413***	(0.019)

Cluster robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Detailed estimation results are presented in the table B14 in the appendix.

According to the results, the price of cigarettes has a statistically significant and negative impact on the quantity of cigarettes consumed. Also, higher income leads to the higher quantity of cigarettes smoked in all tested models. If the households are larger, they consume more cigarettes while higher shares of men and adults in the household increase the quantity of cigarettes consumed. While the level of urbanization has no impact on the quantity of cigarettes consumed, regional location does. Households with self-employed members and members with higher education levels smoke less than other household types.

[25] The estimation results of unit value of cigarettes and budget share equation are presented in the table B12 in the appendix.

Price and income elasticities regarding conditional elasticity are statistically significant. From the obtained elasticities from model 4, it can be concluded that an increase in cigarettes prices by 10 percent leads to a decrease in quantity of cigarettes consumed by 5.7 percent (Table 4.5). Higher household income by 10 percent would increase the quantity of cigarettes consumed by 4.2 percent.

4.2.3 Total price and income demand elasticity

The overall price elasticity of smoking is very high. An increase in cigarette prices by 10 percent leads to a decrease in cigarette consumption by 10.2 percent (Table 4.6). Roughly, about 55 percent of the negative effect of price growth on the overall demand comes from a decrease in smoking prevalence and 45 percent from the decrease in the quantity of cigarettes consumed by those who smoke. However, an increase in income by 10 percent leads to an increase in cigarette consumption by about 8.0 percent.

Table 4.6: Total demand elasticity (logit model -Model 4 and Deaton method)

	Elasticity	Logit model - Model 4 and Deaton method	
Prevalence Elasticity	price	-0.563***	(0.051)
	income	0.374***	(0.027)
Conditional intensity elasticity	price	-0.458***	(0.037)
	Income	0.426***	(0.017)
Total demand elasticity	Price	-1.018	
	Income	0.802	

Cluster robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.3 Price elasticity by income group

The objective of this part is to estimate the responsiveness in cigarette consumption of households from different income groups to changes in price and income. Households are divided into three groups based on the total household expenditure per capita, which is a proxy for household income. Then, cigarette demand trends are analyzed to estimate cigarette price and income elasticity by income group.

4.3.1 Demand trends by income group

Average real household expenditures in the observed period increased significantly, but high-income households reported the highest absolute increase (Table 4.7). The high-income households smoked, on average, relatively more than the low-income households. The budget share on cigarette purchases is relatively higher for households in the low-income group than for the others.

Smoking prevalence decreases in all income groups as cigarette prices increase, and the decrease in prevalence is higher among households in the high-income group, which is in line with the expectation (Figure 4.1). Also, the difference in smoking prevalence increases over time as cigarette prices increase. The situation is the same for smoking intensity trends by income group. High-income households smoked a higher quantity of cigarettes during the

observed period, compared to middle- and low-income households. The quantity of cigarettes consumed decreased as the price of cigarettes increased. In addition, the differences in the quantities of consumption between different income groups increased over time as cigarette prices increased. Reductions in prevalence and intensity were more pronounced in the low-income group compared to middle- and high-income groups. This trend is more pronounced in the years after introducing specific excise on cigarettes in 2009.

Table 4.7: Cigarette use in B&H: household demand statistics per income group

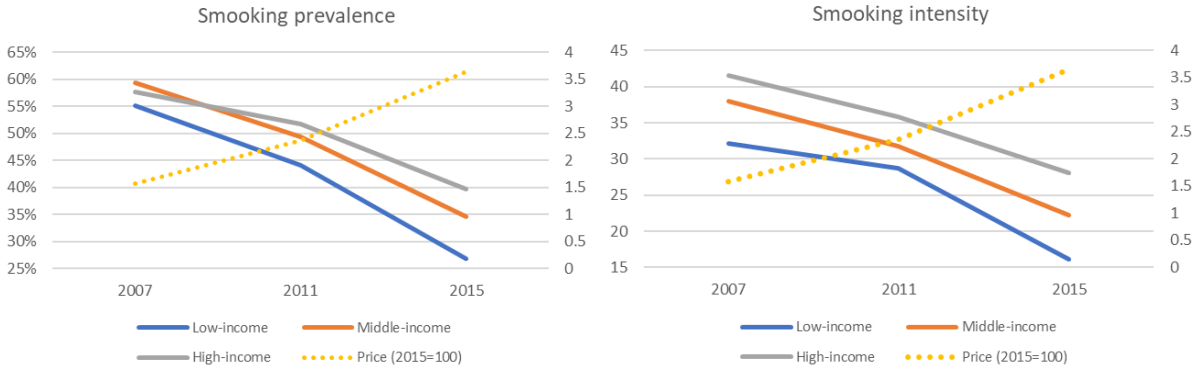
Income group	Year	Average number of cigarette packs (per household) [1]	Average real household expenditure on cigarettes [1 2]	Average price (average real unit value) [1 2]	Average budget share on cigarettes [1]	Average income per household member [1]
Low	2007	32.14	43.91	1.37	4.61%	252.20
	2011	28.75	64.04	2.23	6.54%	257.83
	2015	16.18	57.49	3.55	6.18%	251.27
Middle	2007	37.97	56.90	1.50	3.71%	473.19
	2011	31.76	74.32	2.34	5.04%	477.16
	2015	22.17	80.66	3.64	5.86%	457.97
High	2007	41.59	71.25	1.71	2.87%	977.03
	2011	35.81	89.24	2.49	4.13%	972.21
	2015	28.06	104.61	3.73	5.20%	928.67

Source: Authors calculation based on HBS

[1] Conditional on having positive expenditure on cigarettes.

[2] Variables deflated by CPI to 2015 values.

Figure 4.1: Smoking prevalence and smoking intensity trends by income group



Notes: Smoking prevalence is defined as the share of the households with positive tobacco consumption, while smoking intensity represents the number of cigarettes packs a household with positive expenditures on cigarettes per month. Cigarette prices are defined as municipality/year average cigarettes' unit values (ratio between total expenditure and quantity) and expressed in real terms (2015=100).

4.3.2 Prevalence elasticity

Prevalence elasticities by income group show that the smoking participation of the low-income group is the most responsive to price changes - a 10 percent price increase would

result in a reduction in smoking prevalence by 8.1 percent in the low-income group, in comparison to 5.5 percent and 3.5 percent, in the middle- and high-income groups, respectively.

Table 4.8: Prevalence and intensity elasticities by income group

	Low-income households		Middle-income Households		High-income households		All households	
Prevalence elasticity (logit model)								
Price	-0.810***	(0.072)	-0.546***	(0.063)	-0.354***	(0.059)	-0.563***	(0.051)
Income	0.422***	(0.055)	0.397***	(0.085)	0.358***	(0.042)	0.374***	(0.027)
Conditional demand (intensity) elasticity (Deaton's model)								
Price	-0.606***	(0.051)	-0.385***	(0.033)	-0.355***	(0.065)	-0.458***	(0.037)
Income	0.477***	(0.057)	0.383***	(0.081)	0.376***	(0.036)	0.426***	(0.017)
Total elasticity								
Price	-1.411		-0.929		-0.708		-1.018	
Income	0.901		0.782		0.735		0.802	

Notes: *** p<0.01, ** p<0.05, * p<0.1

4.3.3 Conditional intensity elasticity

The results show that an increase in cigarette prices has the strongest effect on the quantity consumed by smokers who smoke in the low-income group – an increase in cigarette prices of 10 percent would decrease their cigarette quantity demanded by 6.1 percent. The corresponding change in the high-income group would be 3.6 percent.

The corresponding estimates produced by the GLM method are higher in all three income groups, which is not surprising. Given that HBS does not provide information on market prices, unit values (ratio of spending on cigarettes and quantity) are used as a proxy for market prices. As a result, problems, such as the so called "quality shading" are not addressed (see Chapter 2) when the GLM method is applied. Nevertheless, estimates from both methods suggest that lower income groups are more responsive to price changes. The differences between Deaton and GLM method are lower for income elasticities (Table 4.9).

Table 4.9: Conditional intensity elasticity – GLM and Deaton method comparation

	Low-income households		Middle-income households		High-income households		All households	
Deaton method								
Price	-0.606***	(0.051)	-0.385***	(0.033)	-0.355***	(0.065)	-0.458***	(0.037)
Income	0.477***	(0.057)	0.383***	(0.081)	0.376***	(0.036)	0.426***	(0.017)
GLM method								
Price	-0.753***	(0.069)	-0.598***	(0.045)	-0.411***	(0.057)	-0.567***	(0.046)
Income	0.480***	(0.048)	0.277***	(0.062)	0.314***	(0.029)	0.413***	(0.019)

Notes: *** p<0.01, ** p<0.05, * p<0.1

4.3.4 Total price and income elasticity

The low-income group responds relatively more than others to changes in prices, both in terms of smoking participation and smoking intensity as well as to changes in income (Figure 4.2). A 10 percent price increase would reduce consumption of low-income households by 14.1 percent, as opposed to 9.3 percent and 7.1 percent for middle- and high-income households, respectively. Similarly, a 10 percent increase in income would increase consumption of the low-income group by 9 percent, in comparison to 7.8 percent and 7.4 percent for middle- and high-income households, respectively.

Figure 4.2: Price and income elasticities by income group

4.4 Impact of price increase on consumption and government revenue

Government revenue from cigarette taxation in B&H comes from three different taxes: a specific excise tax, an ad valorem tax, and the value-added tax. After its introduction in the second half of 2009, the specific excise tax has increased by around € 0.077 annually, from € 0.077 per pack in 2009 to € 0.84 per pack in 2019. The ad valorem excise tax has remained at the same level of 42 percent of the retail price.

Based on the available administrative data and the elasticities above, the table below outlines the impact of an increase in the specific excise tax and cigarette price on cigarette consumption and government revenue from tobacco assuming three scenarios of an increase in specific excise: 10 percent, 25 percent, and 50 percent.

Data on quantity of cigarette consumption comes from the Indirect Taxation Authorities of B&H, which is based on the number of sold excise stamps. The official 2019 IMF (International Monetary Fund) projected real GDP growth of 2.8 percent,[26] and the WARP (weighted average relative price) of 4.95 BAM (€ 2.53) are also included in the calculation.

[26] https://www.imf.org/en/Countries/BIH

Table 4.10 shows that a 10 percent increase in the specific excise tax, which would translate to an approximate 7 percent price increase, would reduce consumption by almost 5 percent and generate almost 3 percent additional revenues. A more aggressive increase of 25 percent would have an even stronger impact on consumption while revenues would still increase.

Table 4.10 Projected change in cigarette consumption and government revenue

			Consumption		Revenues	
			# of packs	% change	Euro	% change
Baseline			224,070,000		492,241,817.1	
Scenario	Specific tax increase	Resulting price increase				
	10%	7%	213,197,820	-4.9%	505,963,251.4	2.8%
	25%	17%	189,341,976	-15.5%	499,444,979.7	1.5%
	50%	35%	149,582,236	-33.2%	460,528,527.3	-6.4%

Source: Authors' calculations

A more detailed look by income group allows a more precise projection of a change in consumption and revenues. As the administrative data on cigarette consumption by income group is not available, shares in total consumption by income group in the 2015 HBS data was applied to the quantity of consumed cigarettes in 2019 (from the Indirect Taxation Authorities of B&H). According to the HBS 2015 data, the high-income group consumed the largest share of cigarettes (40.0 percent), while the low-income group consumed the lowest (25.8 percent) (Table 4.11).

Table 4.11 Projected impact of a 25 percent specific excise tax increase on consumption and government revenue by income group

Share in consumption (2015)		Consumption			Revenues		
		Baseline	25% increase	% change	Baseline	25% increase	% change
Low	*26%*	57,899,688	45,120,208	-22.1%	€ 127,195,286	€ 119,017,778	-6.4%
Middle	*34%*	76,564,719	65,843,043	-14.0%	€ 168,199,029	€ 173,680,331	3.3%
High	*40%*	89,605,593	80,391,579	-10.3%	€ 196,847,503	€ 212,056,360	7.7%
Total	100%	224,070,000	191,354,829	-14.6%	€ 492,241,817	€ 504,754,469	2.5%

Source: Authors' calculations

The simulation shows that the low-income group would experience the greatest reduction in consumption (22.1 percent), which would also reduce their tax burden by 6.4 percent. However, while middle- and high-income groups would also reduce consumption, the tax collection from these two groups would increase and more than compensate for the reduction in revenues from the low-income group, which would lead to an overall revenue gain of 2.5 percent (Table 4.11).

5 Kosovo

Most governments levy taxes on tobacco products for two reasons: to discourage consumption for better public health outcomes, and to generate additional government revenues. In Kosovo, increasing tobacco excise taxes would have a positive effect, especially given that the demand for cigarette consumption is relatively high. This research analyzes the effect of tobacco prices on government revenues and smoking prevalence and can be utilized in the design and plan of public health policy.

The Statistics Agency of Kosovo reports that only 16 percent of adults smoke. However, this may be underestimated as other sources report a much higher level of smoking prevalence. The analysis of this research relies on Household Budget Survey (HBS) data from 2007-2017, which indicates that more than 40 percent of households in Kosovo smoke cigarettes. The objective of this study is to analyze the responsiveness of cigarette consumption to tobacco tax increases in households from different income groups in Kosovo. Given the recently observed serious shortcomings in the implementation of the legislative initiatives,[27] the results of this study can be used by policy makers towards implementing comprehensive tobacco control policies.

Smoking prevalence in Kosovo is very high. HBS data show that more than 40 percent of households in Kosovo smoke cigarettes. During 2010-2012, the percentage of households that reported cigarette consumption was even more than 50 percent.

While the average price of cigarettes has been increasing, it is still very low. In 2007 the average price per pack of cigarettes was EUR 1.04, while by 2017 it had only increased to EUR 1.52 per pack. With such low prices it is not surprising that smoking prevalence has not declined during this period.

Higher prices of cigarettes could reduce consumption by reducing smoking intensity among people who smoke. Although this study finds no evidence of an impact of a price change on smoking prevalence, a 10 percent increase in price would lead to a reduction of 3.9 percent in the quantity of cigarettes consumed by those who smoke.

Tobacco taxation policy is the most effective way to reduce tobacco consumption and should be considered as cornerstone in tobacco control. Until now, legislative policies and initiatives in Kosovo did not result in changes in demand for tobacco. However, the results of this study show that tax and price measures can be very effective in achieving both health and revenue objectives.

A price increase of 25 percent would not only reduce tobacco consumption but also generate additional government revenues. The simulation results suggest that an increase in the average market price per pack of cigarettes by 25 percent (from EUR 1.94 to EUR 2.42)

[27] Kosovo Advocacy and Development Center. (2014). Raporti mbi zbatimin e "Ligjit për Kontrollin e Duhanit periudha tetor 2014" në Kosovë. Retrieved from http://bit.ly/35iXDyc

would result from a 47.8 percent specific excise tax increase (from EUR 43 to EUR 63.6). This would reduce consumption by 11.1 percent and increase government revenues by around 26 percent, or additional revenues of approximately 42 million euros. Low- and middle-income households would benefit the most, as a 25 percent price increase would reduce their cigarette consumption by 16.3 and 18.4 percent, respectively. Under the same assumptions going forward, the Kosovo Government should in 2020 increase specific excise to EUR 69.5 from EUR 47 in 2019.

5.1 Data and descriptive statistics

To empirically estimate the price elasticity of demand for cigarettes in Kosovo, this study uses data from HBS for 2007-2017. The sample is representative of all 38 municipalities in Kosovo, with a total of 26,311 households. The number of observations per year is roughly similar, averaging at 9.1 percent per year, with a slight difference for year 2009 which has the largest number of observations, namely 2,897 observations or 11.01 percent.

Table 5.1 shows that the average number of cigarettes consumed per household fluctuates slightly between 40-43 packs of cigarettes[28] over the observed period. The highest average number of cigarettes smoked per household is recorded for years 2009 and 2012. Similarly, smoking prevalence within households also fluctuates, from 41.1-53.4 percent. It should be noted that from 2008 to 2009 smoking prevalence dropped by 6.1 percentage points.[29]

Table 5.1 Cigarette consumption in Kosovo, 2007-2017

Year	Smoking prevalence (% of households)	Average number of cigarettes smoked (pack per household per month) [1]	Average real household expenditure on cigarettes [1 2]	Average price[1 2 3]
2007	48.2%	41.3	37.9	1.038
2008	47.8%	40.2	36.4	0.99
2009	41.1%	43.1	41.1	1.228
2010	52.1%	40.0	41.6	1.136
2011	50.9%	40.6	43.3	1.135
2012	53.4%	43.2	51.3	1.261
2013	49.0%	41.6	48.1	1.226
2014	49.7%	42.4	49.7	1.234
2015	46.9%	42.0	51.3	1.344
2016	45.2%	40.8	54.7	1.430
2017	46.3%	41.9	61.45	1.529

[1] Conditional on having positive expenditure on cigarettes;[2] Variables deflated by CPI to 2007 values; [3] Proxied with unit value (ratio of household cigarette expenditures over the cigarette quantity).
Source: Authors' calculations, Kosovo Agency of Statistics, 2007-2017

[28] HBS in Kosovo does not collect data on other types of tobacco, therefore, these figures include only packs of cigarettes.

[29] Apart from having a higher number of observations, HBS in 2009 also included a larger number of households who reported zero consumption of cigarettes in comparison to other years. Precisely, the average share of households who reported no cigarette consumption in 2007-2017 HBS was 51.7 percent, whereas the share of households with no tobacco consumption in year 2009 was 58.82 percent. Thus, the percentage of households with reported positive purchase of cigarettes dropped in 2009 to 41.18 percent, which was below-the 11-year average of 48.28 percent. However, this change did not influence our results.

On the other hand, average real household expenditures on cigarettes showed an increasing trend from 2007-2017, from EUR 37.9 to EUR 61.5, which is accompanied by the increased trend in prices of cigarettes for the same period.

Based on HBS data for Kosovo on municipalities and years, clusters for this study are defined as the municipality in a given year. Given that HBS does not report market prices, this study uses unit value as a proxy for price, calculated as the ratio of household cigarette expenditures over the cigarette quantity, which is then averaged over clusters. Thus, prices used for this study represent the average unit values of cigarettes by municipality and year.

5.2 Two-part model

The two-part model allows for independent analysis of the response of a decision to smoke and the smoking intensity of those who smoke. The two-part model separately estimates participation elasticity or smoking prevalence and conditional (intensity) elasticity. Participation elasticity is estimated using the logit model, and conditional elasticity is estimated using the Deaton model with the generalized linear model (GLM) used as a robustness check.

This study accounted for policy changes in Kosovo, precisely Law No. 04/L-156 on Tobacco Control, which entered into force in early 2013. The law prohibits smoking in public and open areas, work environments, and means of public transport. It also prohibits the advertisement, promotion, and sponsorship of tobacco products. A dummy variable has been created to account for these policy changes, however, due to its insignificance in all specifications, it has been dropped from the analysis.

5.2.1 Prevalence elasticity

Table 5.2 shows the results from 4 different models used to estimate the prevalence elasticity. Based on the diagnostics, Model 3 is the preferred model for estimating the price and income elasticity in Kosovo for prevalence elasticity. The three other models give similar price elasticities, indicating robust results independent of specification changes. The results suggest that smoking prevalence is not affected by prices. It should be noted that apart from the expected coefficient and sign, price elasticity is insignificant at all levels, and across all models.

Table 5.2 Price and income elasticities of smoking prevalence

	Model 1		Model 2		Model 3		Model 4	
Price	-0.119	(1.081)	-0.334	(1.011)	-0.123	(1.080)	-0.328	(1.011)
Income	0.190***	(0.034)	0.212***	(0.036)	0.212***	(0.038)	0.212***	(0.036)

Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations

On the other hand, smoking prevalence is impacted by changes in income. The price elasticity of income (with total household expenditure as a proxy) has an almost identical elasticity estimation across all 4 models. As expected, Model 3 yields an elasticity of 0.212, suggesting

that if the households have a 10 percent increase in income, all things being equal, smoking prevalence increases by 2.1 percent. As the income elasticity of demand is between zero and one, this suggests that cigarettes can be regarded as a necessity good.

5.2.2 Conditional intensity elasticity

In the table below, estimates obtained by the Deaton model are presented as the main estimates, and different GLM estimates as the robustness check (Table 5.3). Model 3 is again the best model for estimating the conditional intensity elasticity among those who smoke.

Table 5.3 Price and income elasticity of smoking intensity

	Deaton model		Generalized Linear Model (GLM)					
			Model 2		Model 3		Model 4	
Price	-0.387***	(0.123)	-0.193**	(0.066)	-0.200**	(0.071)	-0.164***	(0.066)
Income	0.568***	(0.027)	0.190***	(0.019)	0.195***	(0.019)	0.195***	(0.019)

Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations

Smoking intensity is impacted by both changes in price and income. A 10 percent price increase reduces smoking intensity of those who smoke by 3.87 percent, while a 10 percent increase in income increases consumption by 5.68 percent. GLM estimates for model 3 are slightly lower than those obtained by applying the Deaton method, which is not surprising given the difference in market price proxy used in these two methods.

5.2.3 Total price and income demand elasticity

The total elasticity is obtained by adding up prevalence and intensity elasticities as explained in Chapter 2. Because the price elasticity of smoking prevalence is not statistically significant, the total price elasticity equals the elasticity of smoking intensity. The results below in Table 5.4 indicate that a 10 percent increase in price would reduce consumption of cigarettes by around 3.9 percent. At the same time, a 10 percent increase in income would increase consumption by 7.8 percent. Estimated total impact based on GLM estimates would be slightly lower but given that the Deaton is the superior method when using HBS data, the analysis is continued with Deaton estimates.

Table 5.4 Total demand elasticity

		Deaton model		GLM (Model 3)	
Total demand elasticity	Price[1]	-0.387***		-0.200***	
	Income	0.779***		0.407***	
Participation Elasticity	Price	-0.123	(1.080)	-0.123	(1.080)
	Income	0.212***	(0.038)	0.212***	(0.038)
Conditional intensity elasticity	Price	-0.387***	(0.071)	-0.200***	(0.071)
	Income	0.568***	(0.019)	0.195***	(0.019)

[1] Since price elasticity of smoking prevalence is estimated to be statistically insignificant, total elasticity equals to conditional elasticity.
Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations

5.3 Price elasticity by income group

5.3.1 Demand trends by income group

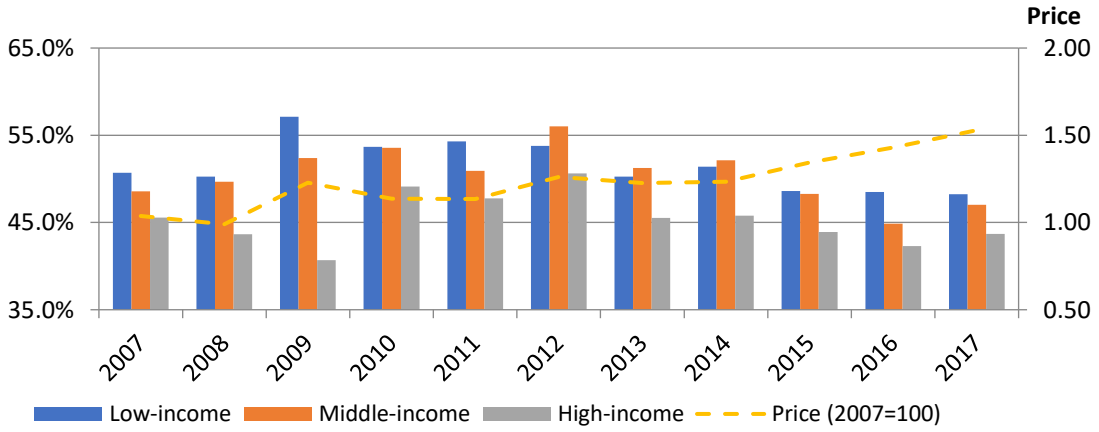
To analyze the responsiveness of different income groups, the sample is divided into three groups, as explained in Chapter 2. Figures 5.1 and 5.2 show trends in prevalence and smoking intensity by income group, as well as price per pack of cigarettes, in real terms. The average price per pack of cigarettes has gradually increased from EUR 1.03 in 2007 to EUR 1.53 EUR in 2017.

Total average monthly spending per household is EUR 636.9, while in the low-, middle-, and high-income group it was EUR 466.5, EUR 637.5, and EUR 806.9, respectively. In terms of spending on cigarettes, the low-income group spent the highest share of their budget on cigarettes (8.9 percent), followed by the middle-income group (7.4 percent), and high-income group (6.6 percent). On average, households spent around 7.6 percent of their budget on cigarettes.

Smoking prevalence by income group was mostly stable between 2007 and 2011 (Figure 5.1). In 2009 smoking prevalence of the low-income group was at its highest at 57.1 percent, while prevalence of the high-income group was at its lowest at 40.7 percent. From 2011 to 2017, smoking prevalence for the three income groups mostly declined. Moreover, during the period 2015-2017 when prices recorded a relatively high increase, smoking prevalence decreased.

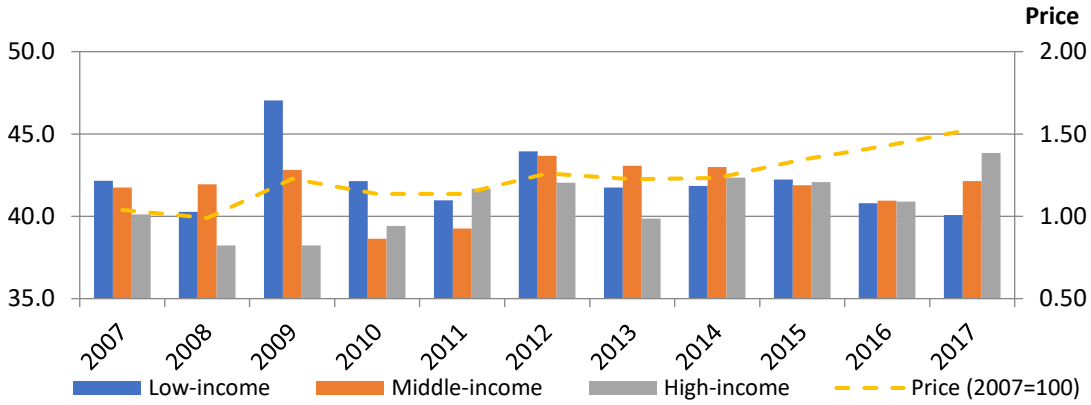
However, in terms of smoking intensity (Figure 5.2), the three income groups showed a different trend. Smoking intensity of all three income groups has mostly been stable, with a modestly increasing trend for the middle- and high-income groups.

Figure 5.1 Smoking prevalence by income group[1]



[1] Price on the right axis
Source: Authors' calculations
Note: Smoking prevalence is defined as the share of the households with positive tobacco consumption, while smoking intensity represents the number of cigarettes packs a household with positive expenditures on cigarettes per month. Cigarettes prices are defined as municipality/year average cigarettes' unit values (ratio between total expenditure and quantity) and expressed in real terms (2007=100).

Figure 5.2 Smoking intensity by income group[1]



[1] Price on the right axis
Source: Authors' calculations
Note: Smoking prevalence is defined as the share of the households with positive tobacco consumption, while smoking intensity represents the number of cigarettes packs a household with positive expenditures on cigarettes smoked per month. Cigarettes prices are defined as municipality/year average cigarettes' unit values (ratio between total expenditure and quantity) and expressed in real terms (2007=100).

5.3.2 Prevalence elasticity

The estimation of price and income elasticity by three household income groups is presented in Table 5.5. The results show that prevalence price elasticity is statistically insignificant for all three income groups. On the other hand, the prevalence income elasticity is significant for middle- and high-income groups, suggesting that among these households, a 10 percent income increase increases consumption by 2.6 percent and 2.1 percent, respectively (Table 5.5).

High-income households with a higher share of adults and males have higher demand for cigarettes compared to the other two income groups. Also, high-income households with more members have a higher demand compared to low-income households. Regarding the variable household type, employed members of high-income households have the highest prevalence.

Table 5.5 Prevalence and intensity elasticity, by income group

	Low-income households		Middle-income households		High-income households		All households	
Prevalence elasticity								
Price	-0.658	(0.909)	0.004	(1.074)	0.467	(1.233)	-0.123	(1.080)
Income	0.097	(0.088)	0.266***	(0.318)	0.213***	(0.074)	0.212***	(0.038)
Conditional demand (intensity elasticity)								
Price	-0. 532**	(0.217)	-0. 630**	(0.254)	-0. 294	(0.486)	-0. 387***	(0. 123)
Income	0.668***	(0.090)	0. 626***	(0. 123)	0. 405***	(0. 056	0.568***	(.0277)

Note: *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations

5.3.3 Conditional intensity elasticity

Table 5.5 shows estimated price and income elasticities across the three different income groups and suggests that only the cigarette consumption of low- and middle-income households responds to changes in price. The middle-income group is the most responsive to price changes, with a conditional price elasticity of -0.630. This means that faced with a 10 percent price increase, middle-income household demand for cigarettes decreases by 6.3 percent compared to an average 3.8 percent decrease by all households.

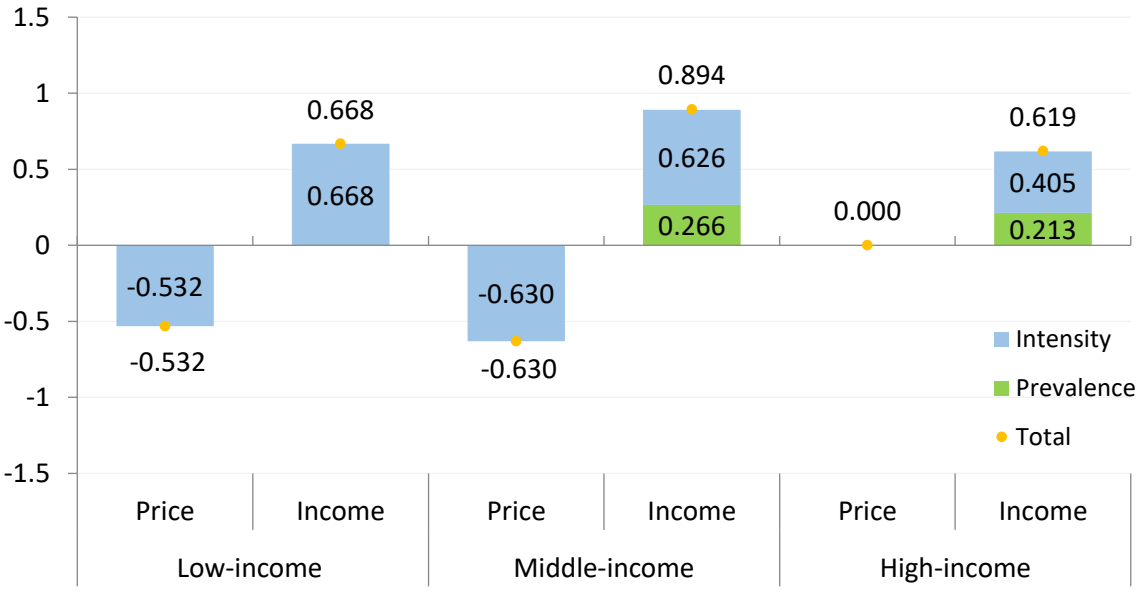
On the other hand, income elasticities are also higher for low- and middle-income households, while lower for high-income households. An increase of 10 percent in income for low- and middle-income households would result in a higher demand by 6.6 percent and 6.2 percent, respectively.

It should be noted that in terms of sign and significance, price and income elasticities across three different income groups give similar results from both Deaton and GLM. Nevertheless, both price and income intensity elasticity from the Deaton model for the three income groups have a stronger effect on demand for cigarettes compared to the results obtained through GLM.

5.3.4 Total price and income elasticity

Figure 5.3 below portrays the price and income elasticities and their totals by the three income groups. Total price elasticity is the highest for the middle-income group, followed by low-income group. For these two groups, prevalence price elasticities were insignificant thus total price elasticities are the same as conditional price elasticities. For the high-income group because both prevalence and conditional price elasticities are insignificant, the total price elasticity for the high-income group equals zero.

Figure 5.3: Prevalence and intensity elasticity by income group



Source: Authors' calculations

The highest total income elasticity is observed for middle-income households, followed by low- and high-income households. Specifically, a 10 percent increase of household income yields an 8.9 and 6.6 percent increase of the demand for cigarette consumption for medium and low-income groups, respectively, and a 6.1 percent increase in demand for the high-income group.

Unlike price elasticity, prevalence income elasticity is significant for the middle-and high-income groups, while intensity income elasticity is significant for all three income groups. These results suggest that smoking can be considered as a normal good among the three income households. In addition, they are consistent with the fact that high-income households are less responsive to an income increase compared to low- and middle-income households.

5.4 Impact of price increase on consumption and government revenues

This study performs a simulation exercise for the total sample size and for the three income groups in order to estimate the impact that an increase of price by 25 percent has on cigarette consumption and total government revenues. The baseline year to carry out this simulation is 2017 - the last year of HBS data used in this study. For price elasticity, the simulation uses the sum of the prevalence, conditional (intensity), and total price elasticities explained above. The real consumption growth rate for Kosovo is 1.8 percent for the year 2017 from national accounts data. Other data used for this simulation includes the consumption of cigarette packs from Kosovo Customs, the weighted average price per pack of cigarettes, the excise rate in the baseline year and value-added tax rate (VAT) of 18 percent, and shares of total consumption and real income growth for the three income groups. To achieve a 25 percent price increase, the baseline (2017) excise rate in Kosovo should have increased by 47.8 percent, specifically from EUR 43 to EUR 63.6 in 2018. Under the same assumption, the statutory rate in 2019 of EUR 47 per 1000 cigarette sticks should increase to EUR 69.5 in 2020.

Table 5.6 shows that a 25 percent increase in price would decrease cigarette consumption by 11.1 percent. The low- and middle-income groups would benefit the most from the price increase with 16.3 and 18.4 percent reduced consumption, respectively. At the same time, the government would collect around 26.2 percent additional revenues, or around 42 million euros.

Table 5.6 Projected impact of 25 percent price increase on consumption and government revenues

	Consumption (packs)			Revenues (EUR)		
Income group	Baseline[1]	Scenario[1]	Change	Baseline[2]	Scenario[2]	Change
Low	46.0	38.5	-16.3%	€ 53.2	€ 63.3	18.9%
Middle	47.2	38.5	-18.4%	€ 54.6	€ 63.2	15.9%
High	45.5	46.4	1.7%	€ 52.7	€ 76.1	44.4%
Total	138.8	123.5	-11.1%	€ 160.5	€ 202.6	26.2%

[1] In million packs;
[2] In million euros
Source: Authors' calculations

6 North Macedonia

With around 40 percent of adults smoking, smoking prevalence in North Macedonia is among the highest in the world. Despite an approximate 20 percent increase in price between 2015 and 2017, smoking prevalence remained stable due to very low prices of cigarettes of around EUR 1.3 per pack. At the same time, the number of cigarettes consumed, or smoking intensity, has just slightly declined from 30.5 packs per household per month in 2015 to 28.2 in 2017.

Higher cigarette prices can reduce both smoking prevalence and consumption of cigarettes among smokers. The results of this study suggest that a 10 percent price increase would decrease smoking prevalence by 2.14 percent. Most of this change would occur in low- and middle-income households. Similarly, smoking intensity among those who smoke would decline by around 2.3 percent.

Increases in income would increase both smoking prevalence and intensity. A 10 percent increase in income would, on average, increase the quantity of cigarettes consumed by 8.7 percent. Low- and middle-income households would respond the most to this change, with more than 10 percent increase in consumption, mostly because around 5 percent of households would start consuming cigarettes.

A price increase, through higher excise taxes, would not only reduce consumption, but also generate significant additional revenues. A 25 percent increase in specific excise, which would result in 17 percent price increase, would reduce consumption by 8.1 percent and increase government revenues by 12.6 percent.

6.1 Data and descriptive statistics

This research examines the responsiveness of people's decision of whether to smoke or not and how many cigarettes to consume when faced with price and income changes. The research uses HBS[30] data between 2015 and 2017. An overall change in cigarette consumption can result from two changes - change in the number of smokers expressed by the prevalence rate and change in the conditional intensity of smoking of those people who smoke[31].

The analysis includes approximately 2,800 households per year, which adds up to precisely 8,593 households for the observed three-year period. HBS data provides only information on consumption of cigarettes, while other types of tobacco products, such as cut tobacco, cigarillos, and vaping or electronic cigarettes are not included. As it is likely that some tobacco users may substitute between different types of tobacco, cigarette consumption may be impacted by not only its own prices but also price of other tobacco products. However, this analysis is not able to account for this potential substitution effect due to a lack of data. Nevertheless, despite this limitation, this study provides very valuable information for the design of effective tobacco tax policy in North Macedonia.

[30] HBS data is collected by the Statistical Office of North Macedonia (SONMK).
[31] Chaloupka F, Warner KE, Cuyler A, Newhouse J. (2000). The economics of smoking. In: Handbook of Health Economics, 1; 2000. pp 1539–1627

Recent trends suggest that, even though moderate, there has been a negative relationship between cigarette prices and consumption in North Macedonia. As Table 6.1 below shows, while the average price per pack of cigarettes increased from 2015-2017 by almost MKD 17, or by almost 23 percent, consumption of cigarettes has declined 7.5 percent, or, on average, by 2.3 packs per household per month. Prevalence has, however, not changed much. This moderate change in consumption is most likely due to relatively low prices of cigarettes, averaging at only around EUR 1.3 per pack.

Table 6.1: Cigarettes consumption in North Macedonia

Year	Smoking prevalence percent)[1]	Average number of cigarettes packs (per household, per month)[2]	Average real[3] monthly household expenditure on cigarettes [1 3] (in MKD)	Average real price[1 2 3 4] (in MKD)
2015	40.5%	30.5	2226.6	73.14
2016	39.7%	29.1	2333.9	80.41
2017	39.5%	28.2	2550.4	89.67

Source: Authors' calculations based on HBS data for North Macedonia.
[1] Percent of households who report consumption of cigarettes in total number of households in the HBS data.
[2] Average consumption (in packs) per month of households who report consumption of cigarettes.
[3] In 2005 values.
[4] Average real price is proxied by an average ratio of reported household expenditure of cigarettes and purchased quantity (i.e. average unit value).

6.2 Methodology

Analysing the responsiveness of prevalence and cigarette consumption to changes in price and income assumes estimation of respective elasticities. The analysis employs the two-part model (see Chapter 2 for more details). Firstly, the price and income elasticity of prevalence and smoking intensity for all households is estimated, and then the households are divided into three income groups (low-, middle-, and high-). The analysis also controls for other factors that may impact a household's decision on smoking participation and smoking intensity, such as demographic factors. As no new tobacco control policy was introduced in North Macedonia during the observed period, there are no legislative changes included in the analysis.

6.2.1 Prevalence and conditional elasticity for all households

Table 6.2 shows that a 10 percent increase in price would reduce smoking prevalence by 2.1 percent, and smoking intensity by 2.3 percent, while a 10 percent increase in income would increase prevalence by 4.1 and smoking intensity by 4.7 percent.

Table 6.2: Price and income elasticities of smoking prevalence and intensity

Prevalence Elasticity	Price Elasticity	-0.214*	(0.123)
	Income Elasticity	0.411***	(0.026)
Conditional intensity elasticity	Price Elasticity	-0.232*	(0.026)
	Income Elasticity	0.465***	(0.024)
Total demand elasticity	Price Elasticity	-0.446	
	Income Elasticity	0.874	

Source: Authors' calculations based on HBS data for North Macedonia.
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 For Deaton model bootstrapped standard errors in parentless.

For smoking intensity, two methods are used to estimate the price and income elasticity of smoking intensity. Estimates from the Deaton model are presented in Table 6.2 as the main estimates. The estimates from the generalized linear model (GLM), which are used as a robustness check (see Chapter 2 for more details), are a bit lower but close in magnitude, with total price elasticity of -0.362 and total income elasticity of 0.776. It is not surprising that the estimates from these two methods are somewhat different. As Chapter 2 explains, given a lack of data on market prices paid by each household, unit values are used. While the Deaton method is able to isolate any impact of personal characteristics on brand choices (such as quality of cigarettes), the GLM model is not able to do so.

6.2.2 Total price and income demand elasticity

Once prevalence and intensity elasticity are observed together, a 10 percent increase in price decreases consumption by 4.5 percent, and a 10 percent increase in income would increase it by 8.8 percent (Table 6.2). 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 4.3 percent, due to a relatively stronger impact of income changes. This points out the importance of larger price increases to more than offset the impact of higher income on consumption.

6.3 Price and income elasticity by income group

In this section, cigarette demand trends and cigarette price and income elasticity are analyzed by income group. The households are grouped based on the total household expenditure per capita per month, which is used as a proxy for household income. As Table 6.3 shows, the high-income group spends, in total, more than 3.3 times more than the low-income group on cigarettes. At the same time, the low-income group spends 4.7 percent of their budget on cigarettes, while the high-income group spends only 2.4 percent. As evidence from other countries suggests, with such high spending on cigarettes by the low-income households, there is likely a crowding out of spending on basic necessities, both food and non-food[32].

Table 6.3: Cigarette consumption and spending by income group

	Low-income group	Middle-income group	High-income group
Average income (in MKD)	15,043	25,857	49,538
Average share in cigarettes consumption	28.9 percent	32.9 percent	38.2 percent
Average expenditure on cigarettes (in MKD)	712.47	920.23	1207.40
Average share of cigarette expenditure in total household budget	4.7 percent	3. 6 percent	2.4 percent

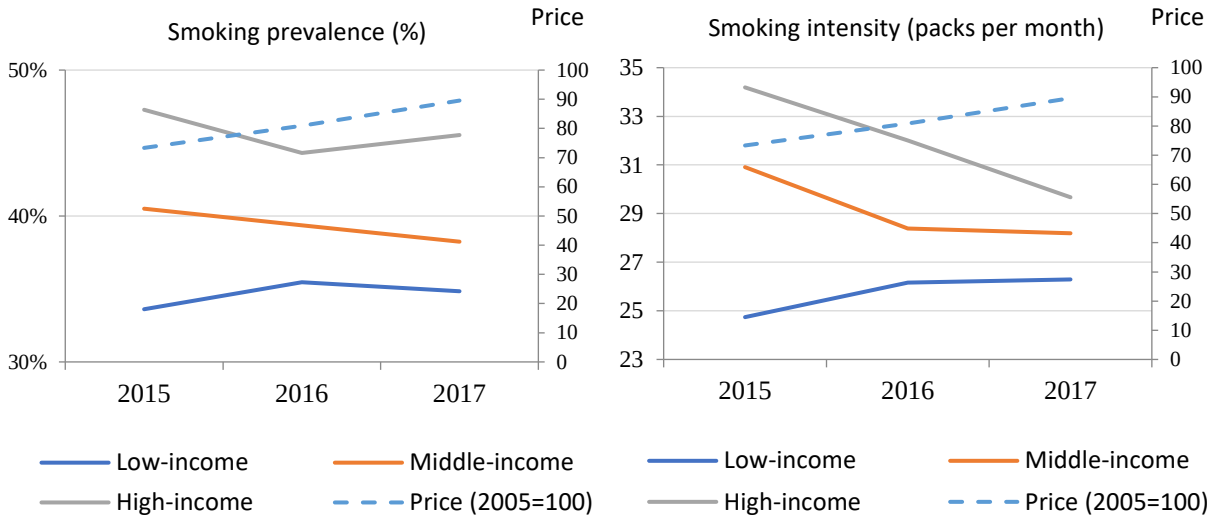
Source: Authors' calculations based on HBS data for North Macedonia.

[32] Husain MJ, Datta BK, Virk-Baker MK, Parascandola M, Khondker BH (2018). The crowding-out effect of tobacco expenditure on household spending patterns in Bangladesh. PLoS ONE 13(10): e0205120. https://doi.org/10.1371/journal.pone.0205120; Do YK, Bautista MA. (2015). Tobacco use and household expenditures on food, education, and healthcare in low-and middle-income countries: a multilevel analysis. BMC public health. 2015; 15(1), 1098.; John RM. (2008). Crowding out effect of tobacco expenditure and its implications on household resource allocation in India. Social Science & Medicine. 2008 Mar;66(6):1356–67.

6.3.1 Demand trends by income group

As Figure 6.1 shows, while the middle-income group has seen a continued declining trend in smoking prevalence between 2015 and 2017, in line with an increase in price, the trend in smoking prevalence of the low- and high-income groups has been unstable. At the same time, smoking intensity in the high-income group has been steadily declining, while for the low-income group, smoking intensity has been increasing.

Figure 6.1: Smoking prevalence and smoking intensity trends by income group (2015-2017)



Source: Authors' calculations based on HBS data for North Macedonia.
Notes: Smoking prevalence is defined as the share of the households with positive tobacco consumption, while smoking intensity represents the number of cigarettes packs a household with positive expenditures on cigarettes smoked per month. Cigarettes prices are defined as psu/year average cigarettes' unit values (ratio between total monthly expenditure on cigarettes and quantity) and expressed in real terms (2005=100).

6.3.2 Prevalence and intensity elasticity

The results shown in Table 6.4 suggest that smoking prevalence among low- and middle-income households responds to changes in price. Thus, a price increase of 10 percent reduces smoking prevalence by 4.5 percent in low-income households and by 4.9 percent in middle-income households. On the other hand, cigarette price does not seem to be a relevant factor for a smoking decision of high-income households. Unlike the price, income seems to be a relevant factor in all income groups in deciding whether to smoke or not, but with a different magnitude. The low- and middle-income groups respond to a change in income quite similarly, and more than the high-income group, with an income elasticity around 0.5. Thus, if their income increases by 10 percent, smoking prevalence among low- and middle-income households will increase by about 5 percent.

In Table 6.4, the price elasticity of smoking intensity for low-income households is not significant, suggesting that these households do not respond to price in determining the quantity of cigarettes they consume. On the other hand, middle- and high-income households respond to higher prices by reducing the quantity of cigarettes they smoke. Thus, a 10 percent increase in price would reduce consumption by 4.4 and 2.8 percent for the middle- and high-

income groups, respectively. Responsiveness to changes in income is, as expected, the highest for low-income households where a 10 percent increase in income increases cigarette consumption by 7.4 percent.

Table 6.4: Price and income elasticities of smoking prevalence and intensity by income group

	Low-income group		Middle-income group		High-income group		All households	
Prevalence elasticity								
Price Elasticity	-0.446*	(0.243)	-0.495**	(0.220)	0.189	(0.184)	-0.214*	(0.123)
Income Elasticity	0.496***	(0.077)	0.524***	(0.126)	0.336***	(0.057)	0.411***	(0.026)
Conditional demand (intensity) elasticity								
Price Elasticity	0.581	(0.400)	-0.441*	(0.518)	-0.278*	(0.398)	-0.232*	(0.026)
Income Elasticity	0.745***	(0.101)	0.597***	(0.170)	0.246***	(0.065)	0.465***	(0.024)

Source: Authors' calculations based on HBS data for North Macedonia.
Notes: *** p<0.01, ** p<0.05, * p<0.1; standard errors in parentheses; for Deaton model – bootstrapped standard errors in parentheses.

6.3.3 Total price and income elasticity

Figure 6.2 below suggests that, on average, a 10 percent increase in cigarette price would reduce consumption by 4.5 percent in the low-income group, 9.4 percent in the middle-income group, and 2.8 percent in the high-income group.

Figure 6.2: Price and income elasticities of prevalence and intensity of smoking by income group

Source: Authors' calculations based on HBS data for North Macedonia.

At the same time, a 10 percent income increase would increase consumption by 12.4, 11.2 and 5.8 percent in the low-, middle-, and high-income group, respectively. This high-income

elasticity coefficient, which is larger than 1, suggests that cigarettes can be considered as luxury good, for low- and middle-income groups in North Macedonia.[33]

6.4 Impact of price increase on consumption and government revenues

This section presents a simulated impact of cigarette specific tax and price change on quantity demanded and government revenues. It gives the projected consumption and revenues for 2018, based on the 2017 baseline scenario based on the full sample of all households, and a simulation by income group.

Following are the assumptions of the simulation:

- Cigarette tax paid sales in 2017 was 4.290 million sticks, obtained from the tax authority based on the number of sold excise stamps. While the number of sold excise stamps may not represent the actual consumption, it represents the base for collecting tax revenues.
- Real consumption growth was 2.4 percent in 2017.[34] Given that official records on real consumption growth rates by income group is not available, real growth rates in consumption by income group from HBS (2015-2017) is used. The real growth rate of private consumption in the low-income group was -3.14 percent, -1.03 percent for the middle-income group, and 12.41 percent for the high-income group. The first scenario assumes an average 2.4 percent growth rate in private consumption for all three income groups, and the second scenario assumes different real growth rates.
- In the absence of the official weighted average price on cigarettes, the price of the most sold brand, according to WHO website[35] is used. In 2018, it was MKD 79 or EUR 1.28 using the official average exchange rate in 2017 of MKD 61.49 per EUR.
- The specific excise tariff in 2017 was MKD 2.053 per stick. (EUR 0.033 per stick) Ad valorem excise was 9 percent of the retail price (EUR 0.006 per stick), VAT was 18 percent per cigarette pack price (EUR 0.010 per stick). The resulting total tax burden was, therefore, EUR 0.78 per pack, or 60.94 percent of the retail price.

Three scenarios of excise tax increase (10, 25, and 50 percent) are presented with the resulting price increase using the full sample with all households (Table 6.5). For example, a 25 percent specific excise tax increase (equivalent to price increase of around 17 percent) would lead to a reduction in overall consumption by 5.6 percent, and an increase of 15.7 percent in government revenue. This reduction in consumption would result from a reduction in smoking prevalence by 3.6 percent, and a reduction in smoking intensity of 3.9 percent of those who smoke. As data on other types of tobacco is not available, it is not possible to determine whether some if this change may be due to a substitution to other types of tobacco products.

[33] Tarantilis F, Athanasakis K, Zavras D, Vozikis A, Kyriopoulos I. (2015). Estimates of price and income elasticity in Greece. Greek debt crisis transforming cigarettes into a luxury good: an econometric approach, BMJOpen2015;5:e004748.doi:10.1136/bmjopen-2013004748

[34] https://www.imf.org/en/Publications/CR/Issues/2019/01/28/Former-Yugoslav-Republic-of-Macedonia-2018-Article-IV-Consultation-Press-Release-Staff-46559

[35] https://www.who.int/tobacco/surveillance/policy/country_profile/mkd.pdf?ua=1

Table 6.5: Projected overall change in consumption and revenues for different increases in specific excise tax

			Price	Consumption		Revenues	
			Euro	Million packs	% change	Million euro	% change
Baseline			1.28	214.5		209.8	
Scenario	Specific tax increase	Resulting price increase					
	10%	7%	1.37	212.4	-1.0%	226.5	8.0%
	25%	17%	1.50	202.5	-5.6%	242.8	15.7%
	50%	34%	1.72	186.1	-13.3%	264.0	25.8%

Source: Authors' calculations based on HBS data for North Macedonia

As explained above, a more precise idea of the impact on consumption and revenues can be gained by analyzing changes by income group. In Table 6.6 below, a 25 percent excise tax increase (resulting in around 17 percent price increase) is assumed with two options for real growth of private consumption.

Table 6.6: Projected consumption and revenues by income group from a 25 percent specific excise tax increase (option 1)

	Consumption			Revenues		
	Baseline[1]	Scenario[1]	% change	Baseline[2]	Scenario[2]	% change
Income group						
Low	62.1	59.3	-4.4%	60.7	70.9	16.8%
Middle	70.5	61.4	-12.9%	69.0	73.1	6.0%
High	81.9	79.3	-3.2%	80.2	94.9	18.4%
Total	214.5	200.1	-6.7%	209.8	238.9	13.8%

[1] Million packs; [2] EUR million

Source: Authors' calculations based on HBS data for North Macedonia

The first option, assuming 2.4 percent growth in consumption of all income groups is presented in Table 6.6. In that case, a 25 percent specific excise tax increase would result in an overall reduction in consumption of 6.7 percent, and a 13.8 percent increase in government revenue. The middle-income group would see the highest reduction in consumption, and the lowest increase in their tax burden. Consumption of the low-income group would reduce by 4.4 percent, primarily because around 7.7 percent of households would stop consuming cigarettes.

Finally, in the second option the impacts by income group are estimated assuming different changes in private consumption for each group based on the HBS trends. Table 6.7 shows that the overall impact is similar to that in option 1, there are significant differences by income group. The middle-income group would still see the most benefits from this policy change, with a reduction in consumption of 17.3 percent, and the lowest increase in tax burden of 1.3 percent. However, the consumption of the low-income group would decrease much more than in option 1 (11.6 percent), and the additional tax burden would be lower.

Finally, the high-income group would see a small increase in consumption and the highest increase in tax burden.

Table 6.7: Projected consumption and revenues by income group from a 25 percent specific excise tax increase (option 2)

	Consumption			Revenues		
	Baseline[1]	Scenario[1]	% change	Baseline[2]	Scenario[2]	% change
Income group						
Low	62.1	54.9	-11.6%	60.7	65.8	8.4%
Middle	70.5	58.3	-17.3%	69.0	69.9	1.3%
High	81.9	83.9	2.4%	80.2	100.5	25.5%
Total	214.5	197.1	-8.1%	209.8	236.3	12.6%

[1] Million packs; [2] EUR million
Source: Authors' calculations based on HBS data for North Macedonia

6.5 Policy implications and recommendations

Given high smoking prevalence in North Macedonia, urgent attention is needed to develop efficient tobacco control policies. Smokers in countries with higher cigarette prices are significantly more motivated to quit smoking.[36] Hence, to have a positive impact on public health, cigarette prices need to increase faster than income to ensure that cigarettes become less affordable over time.

Tobacco tax policy in North Macedonia is currently not based on the empirical evidence that points to the necessity of higher taxes as an effective way to reduce consumption and related health system savings. At the same time, the tax policy is only partly aligned with the EU and WHO recommendations, while other tobacco control measures have even deteriorated over the last year.[37]

Policy makers should pay particular attention to the finding of this study that an increase by 25 percent in excise tax (leading to 17 percent increase in price) would lead to an overall reduction in consumption by around 8.1 percent, and to 12.6 percent increase in additional government revenues. This would cause additional savings in the health system which should be a subject of further research.

Revision of the existing tax policy would therefore lead to an increase in tax revenues and have many other positive consequences related to lower consumption. In addition, it can be concluded that it does not seem that tax increase will have a socially regressive dimension, because the higher-income households bear the additional tax burden. Low-income household demand for cigarettes shows lower responsiveness to price increases, as compared to

[36] Chaloupka, F, Peck I, Peck R, Tauras J., Xu X. and Yurekli A. (2010). "Cigarette Excise Taxation: The Impact of Tax Structure on Prices, Revenues, and Cigarette Smoking," NBER Working Papers 16287, National Bureau of Economic Research, Inc.
[37] Mijovic Spasova T. and Mijovic Hristovska B.(2018), Economics of Tobacco and Tobacco Taxation, National Study – MACEDONIA, Research performed within the Project Accelerating Progress on Effective Tobacco Tax Policies in Low-and Middle- Income Countries. Analityca think tank, North Macedonia.

middle-income households, possibly due to lower awareness of the risks of smoking within those households. The tax system can be important instrument for achieving health policy goals by reducing cigarette consumption and by generating additional revenue for the state budget in North Macedonia.

7 Montenegro

The main goal of this study is to examine the responsiveness of smoking prevalence and cigarette consumption to price and income changes in Montenegro, as well as the effectiveness of tax policy changes for the reduction of cigarette consumption. The research was done using Household Budget Survey (HBS) data for Montenegro from 2006 to 2017. The research provides an analysis of differences by income group in the effects of cigarette price and income changes on smoking prevalence, that is, the percentage of people who smoke, and smoking intensity, that is, the amount of cigarettes consumed by people who smoke. Estimates are presented for three income groups (low-, middle-, and high) as well as for the whole sample. This more in-depth insight into response variation provides valuable information for framing effective tobacco tax and price policies. Using all estimated elasticities, the study concludes with a simulation of the impacts of cigarette tax and price increases on consumption and public revenues for the aggregate population and different income groups. Study results showed:

Smoking prevalence and consumption are very responsive to price and income changes. In the whole sample, as price increases by 10 percent, prevalence decreases by 6.36 percent. However, considerable differences in prevalence elasticity are noticeable between income groups. The estimates indicate that tobacco pricing policies have a much higher impact on smoking prevalence in the low-income group (price elasticity -0.891) relative to the high-income group (price elasticity of -0.341). The same conclusion can be drawn for the smoking intensity elasticity: the high-income group is the least affected by changes in price with a price elasticity of -0.277, while the most affected is the low-income group with the price elasticity of -0.413.

Poorer households spend a larger share of their budget on cigarettes. The fact that households in the low-income group spend a larger share of their budget on cigarettes is alarming, taking into consideration the level of their income. This is especially important in the context of poverty and growing disparities in health. However, taking into account the high prevalence of smoking and higher elasticity of this group, price-based measures, such as tax increases can be an effective policy to reduce cigarette consumption, which would free up household resources for other more necessary spending.

Increases in excise taxes on tobacco would reduce cigarette consumption, and at the same time, increase the collection of government revenue. The obtained results confirm that increases in price have a strong reduction effect on cigarette consumption and generate a broader socioeconomic impact. This aspect is related especially to health outcomes, but also to government revenues from increased excises taxes on these goods. The government calendar of excise tax increases includes a move toward greater reliance on specific taxes on tobacco rather than ad valorem. This schedule assumes an increase of the specific excise from EUR 0.6 per pack to EUR 0.95 per pack and an ad valorem decrease from 32 percent to 24.5 percent of the retail price, resulting in a retail sales price increase of 15.8 percent. Total consumption decreases by 7.5 percent and total government revenue increases by 11.3 percent. This is a significant decrease in smoking, which would have important positive results for public health.

The planned policy would increase the progressivity of the tobacco tax system, and would mostly benefit low- and middle-income households. Taxation policy has a positive impact in changing patterns of consumption and public revenues across each income group. Low- and middle-income households would benefit the most, with 8.7 and 8.3 percent reduced consumption, respectively. On the other hand, the highest revenue collection is generated from the high-income group.

7.1 Data and descriptive statistics

HBS data for Montenegro from 2006 to 2017 (excluding 2016 when the survey was not conducted) is used to estimate prevalence and conditional elasticity of demand for cigarettes. The data was obtained by the Statistical Office of Montenegro (Monstat). This survey is conducted annually, but only once in one month per year. Households are concentrated in 21 municipalities, in three regions: North, Central, and South. After removing outliers, the total sample is comprised of 12,503 households, while the average number of households per year is 1,136.

Trends in smoking prevalence, quantity of cigarettes smoked, household expenditure on cigarettes, and cigarette prices are reported in Table 7.1. Average price is approximated by an average unit value per cluster, which is defined at the municipality-year level. In case of only one household per municipality with reported cigarette consumption (89) and households with missing values (78), values of the price variable are replaced with average prices calculated per clusters defined at the region-year level. Even though the price effect may trigger substitution from cigarettes to other tobacco products, households that report spending on other tobacco products are excluded as they have a negligible share—only 3.59 percent.

Table 7.1: Cigarette use in Montenegro: prevalence, expenditures, number of cigarettes smoked

Year	Smoking prevalence (% of households)	The average number of cigarettes smoked (pack per household – monthly level)	Average real household expenditure on cigarettes in EUR *	Average real price[38] in EUR*
2006	52.4%	34.7	25.4	0.75
2007	52.6%	34.5	24.2	0.73
2008	56.2%	38.4	27.0	0.73
2009	50.4%	34.2	27.9	0.82
2010	44.1%	32.4	27.6	0.87
2011	44.2%	31.9	32.5	1.03
2012	42.5%	29.4	34.2	1.17
2013	42.1%	27.6	34.6	1.26
2014	44.1%	26.5	34.9	1.34
2015	40.2%	28.8	37.0	1.31
2017	36.5%	33.4	41.9	1.29

Source: Statistical office of Montenegro - Monstat

*Conditional on having positive expenditure on cigarettes. Values are calculated for cigarettes packs consumed per month per household.

[38] Average real price is proxied by an average ratio of reported household expenditure of cigarettes and purchased quantity, that is, average unit value.

[2] Variables deflated by CPI to 2006 values.

Smoking prevalence decreased during the observed period, while the number of cigarette packs consumed per month has a decreasing trend from 2008-2014, and then increasing afterwards. The possible reason of the consumption increase could be substitution to cheaper brands and cross-border transactions. When it comes to average real household expenditure on cigarettes and prices, an increasing trend is visible in the whole observed period.

7.2 Two-part model

A two-part model is applied to estimate prevalence and conditional price and income elasticity of cigarette consumption in Montenegro. Apart from above-defined price, income, and socio-demographic characteristics, the adoption and later amendments of law on limiting the use of tobacco products[39] affect cigarette consumption, and thus, were considered. Results show that these regulatory changes[40] had no statistically significant effect on the prevalence or quantity of cigarettes demanded, most likely due to poor implementation. Thus, they are excluded from further analysis. The final set of predictor variables of the model consists of two main variables: price per pack of cigarettes and total reported household expenditure, along with several control variables representing above-defined household socio-demographic characteristics.

7.2.1 Prevalence elasticity

To estimate prevalence elasticity, five models were tested using different specifications of logistic regression.[41] The model that passed all specification tests was formed with squared log income variable, log price in level, and socio-demographic variables.[42] Table 7.2. presents the result of price and income elasticities of smoking prevalence.

Table 7.2: Smoking prevalence model (different specifications)

Results	*Estimated values*	*Standard errors*
Elasticities		
Price	-0.636***	(0.102)
Income	0.308***	(0.041)
Percentage points change		
Price	-0.270***	(0.041)
Income	0.116***	(0.017)

Source: Authors' calculation

Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

[39] Official Journal of the Republic of Montenegro no. 52/04, no.32/11 of 01.07.2011, 47/11, 03/16.

[40] These regulatory indicators were formed as three dummy variables to capture changes of the law in the period observed. The period from the adoption of the law in 2004 until its first amendments, dummy variable captured the period from 2006-2011; the period when stricter bans were introduced in 2011, dummy variable captured the period 2011-2015; and the period from 2016-onwards, when amendments introduced changes of previous amendments, no amendments until, dummy variable captured the period year 2017.

[41] The models are comprised of variables in level, log-transformed price and income, squared income, squared price, square log of price and income. All these models, according to the Link test, were not correctly specified.

[42] The chosen model is preferred according to BIC, pseudo R square, and Log-likelihood criteria. Additionally, employed post-estimation diagnostic tests (Link test, Hosmer and Lemeshow (HL) goodness of fit test, multicollinearity test) confirmed the validity of the chosen model.

In the preferred model, the estimated price elasticity of prevalence is -0.636, while income elasticity is 0.308. Accordingly, if the price increases by 10 percent, prevalence would decrease by 6.36 percent, which would be equivalent to a 2.7 percentage point decrease. On the other hand, an increase in income by 10 percent would increase prevalence by 3.08 percent, or by 1.16 percentage points.

According to these results, smoking prevalence is likely to be higher in larger households, households with more men, adults, and unemployed members. On the other hand, smoking prevalence is likely to be lower in households with higher mean education level and more pensioners. Also, smoking prevalence is lower in the North and South, compared to the Central region.

7.2.2 Conditional/intensity elasticity

As explained in Chapter 2 of this report, two methods are used in estimating the elasticity of smoking intensity, the Deaton method as the main method, and the GLM method, as a robustness check.

Table 7.3: Price and income elasticity of smoking intensity

Results	*Estimated values*	*Standard errors*
Elasticities		
Price	-0.432***	(0.047)
Income	0.286***	(0.032)

Source: Authors' calculation
Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

As Table 7.3 shows, a 10 percent increase in price would reduce smoking intensity by 4.3 percent. At the same time, 10 percent increase in income would increase smoking intensity by 2.9 percent.

A sensitivity check using the GLM methodology was used to analyze the robustness of the estimates. GLM gives approximately the same estimates of conditional elasticity as the Deaton model, generating the conditional price elasticity of -0.393, and income elasticity of 0.352[43].

7.2.3 Total price and income demand elasticity

The price of cigarettes has a statistically significant and negative impact on smoking prevalence and conditional cigarette demand among households with members who smoke cigarettes. These results demonstrate that cigarette price increases would decrease the number of smokers and the quantity consumed among those who smoke.

[43] The specification of the chosen model from the first section was used in estimation of conditional elasticity, using GLM with family Gamma and link Log. The model passed all diagnostic specification tests (Box-cox test, Modified Park Test, Pregibon's modified Link Test, Multicollinearity, Modified Hosmer Lemeshow test).

Using the Deaton method, it is also possible to estimate unconditional price and income elasticity, which considers both consumers and non-consumers in the whole sample. Since this elasticity is not based on an assumption that one's decision to smoke or not does not depend on the price, this elasticity is also called the unconditional elasticity. If the Deaton method is applied on the whole sample, the unconditional price elasticity equals -0.75, while income elasticity is 0.63. An increase in price by 10 percent reduces cigarette consumption by 7.5 percent, both due to reduction in prevalence and smoking intensity, while an increase in income by 10 percent would increase consumption by 6.3 percent.

For a comparison, the obtained total price elasticity from the two-part model, as a sum of prevalence and conditional elasticity, equals -1.065. The increase in price by 10 percent reduces cigarette consumption by 10.65 percent. On the other hand, an increase in income could partially offset the effect of a price increase, as an income increase by 10 percent increases cigarette consumption by 5.95 percent.

Table 7.4: Total price and income elasticity from the two-part model

Prevalence Elasticity	price	-0.636***	(0.102)
	income	0.308***	(0.041)
Conditional intensity elasticity	price	-0.432***	(0.047)
	income	0.286***	(0.032)
Total demand elasticity	price	-1.065	
	income	0.595	

Source: Authors' calculation
Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

A significant difference in estimated elasticities by using these two methods may not be surprising, due to a use of unit value as a proxy for market price.

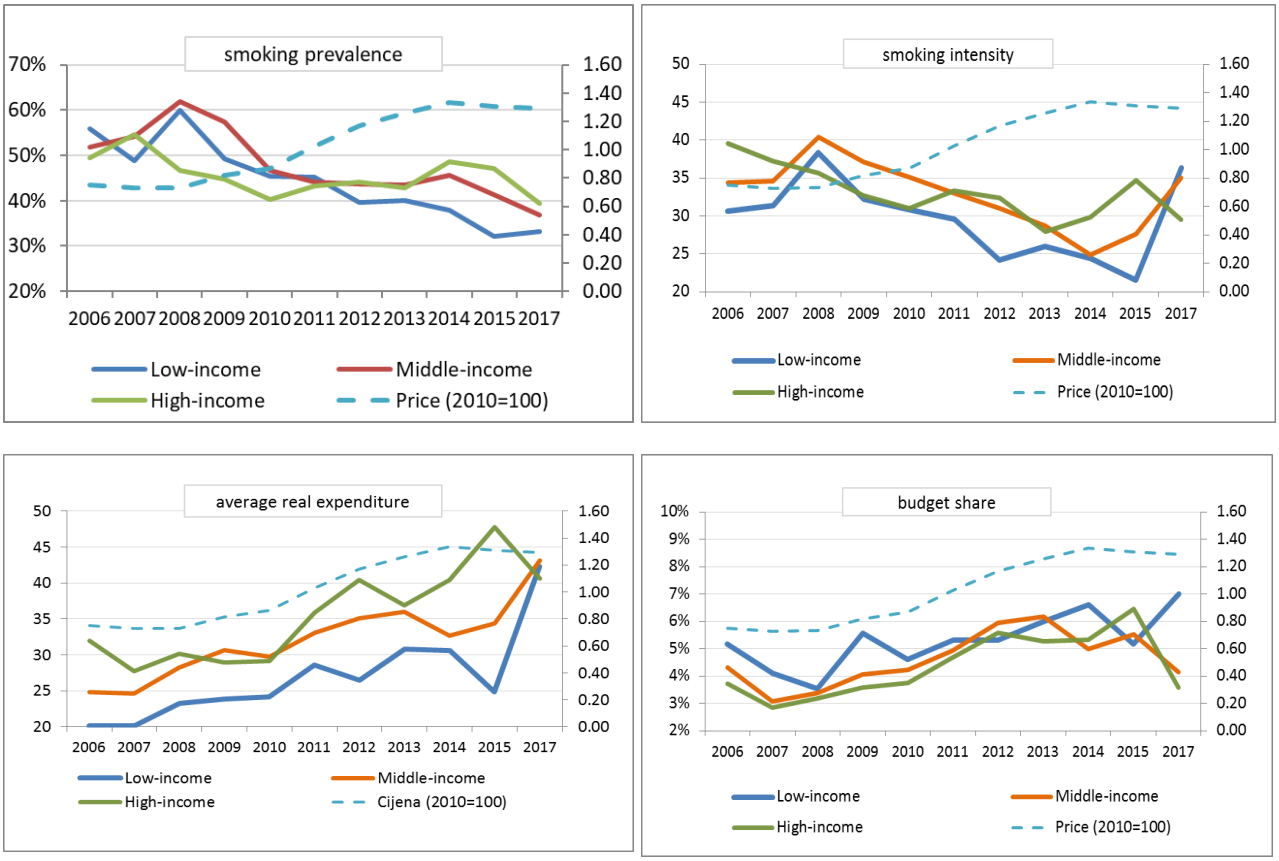
7.3 Price elasticity by income group

In order to gain a clearer picture of cigarette use in Montenegro, households are divided in three subgroups (low-, middle-, and high-income), according to total household expenditure per capita, used as an approximation for household income. In that manner it is possible to analyze the structure of each subgroup in the context of their average total expenditure and budget shares on cigarettes, demand trends, and smoking prevalence. Finally, the research provides the results of prevalence and conditional price and income elasticity by income group.

7.3.1 Demand trends by income group

To assess trends and possible differences in cigarette consumption by income groups, the relation between price, smoking prevalence, smoking intensity, average real expenditure, and budget share on cigarettes is analyzed. Figure 7.1 shows an increasing price trend during the period observed, which has likely impacted smoking prevalence and intensity. There is a decreasing trend across all income groups (Figure 7.1). Prevalence slightly increased in the high-income group in 2013, which decreased afterwards. This fact, as well as the change of consumption trend from 2014 could be potentially explained by the other factors besides price, such as substitution to cheaper brands and cross-border transactions.

Figure 7.1: Smoking prevalence, smoking intensity, average real expenditure and budget share trends by income groups



Source: Authors' calculation

Notes: Smoking prevalence is defined as the share of the households with positive tobacco consumption while smoking intensity represents the number of cigarette packs per household with positive expenditures on cigarettes smoked per month. Cigarette prices are defined as municipality/year average cigarette unit values (ratio between total expenditure and quantity) and expressed in real terms (2010=100).

In Figure 7.1 there is an increasing trend across all income groups considering average real expenditure on cigarettes. This effect is especially pronounced in the high-income group. On the other hand, households in the low-income group spend a larger share of their budget compared to those in the other two groups.

7.3.2 Prevalence and conditional elasticity

The estimates of prevalence elasticities by income group were determined using logistic regression and the same model specification as for the whole sample. The results from Table 7.5 show heterogeneity in prevalence price elasticity estimates by income category. The highest price elasticity estimate is found in the low-income group. As expected, estimated price elasticities are lower in high-income households compared to the other groups. This estimate indicates that tobacco pricing policies have a higher impact on smoking prevalence in poorer households.

Table 7.5: Prevalence and intensity elasticities by income group

	Low-income households		Middle-income households		High-income Households		All households	
Prevalence elasticity (logit model)								
Price	-0.891***	(0.122)	-0.671***	(0.117)	-0.341**	(0.139)	-0.636***	(0.102)
Income	0.343***	(0.063)	0.279***	(0.104)	0.315***	(0.074)	0.308***	(0.041)
Conditional demand (intensity) elasticity (Deaton model)								
Price	-0.413***	(0.050)	-0.341***	(0.066)	-0.277**	(0.138)	-0.432***	(0.047)
Income	0.171**	(0.084)	0.243**	(0.124)	0.292***	(0.058)	0.286***	(0.032)

Source: Authors' calculation
Notes: *** p<0.01, ** p<0.05, * p<0.1

Unlike the estimates of price elasticity, the estimates of income elasticity are approximately the same across groups, and the values are close to the estimated elasticity using the whole sample. The obtained elasticities results have expected signs, and all are statistically significant.[44]

The results from the application of the Deaton model (Table 7.5) show heterogeneity in conditional price elasticity estimates by income category. The same conclusions as in the case of prevalence elasticity apply: the high-income group is the least affected by changes in price, having a price elasticity of -0.277, while the low-income group is most affected with a price elasticity of -0.413. Income elasticity results show that cigarette consumption of the low-income group is somewhat less sensitive to an increase in income, compared to the two other groups. The check for robustness of the results using the GLM methodology generated similar results.[45]

7.3.3 Total price and income elasticity

As for all households, we also estimate the unconditional price and income elasticity by income group using Deaton method. As Table 7.6 shows, the low- and middle-income group respond similarly to change in price, while the middle-income group is the most responsive to changes in income.

Table 7.6. Unconditional elasticities by income group

	Low-income households	Middle-income households	High-income households
price	-0.705*** (0.148)	-0.693*** (0.136)	-0.518*** (0.177)
income	0.605*** (0.115)	0.678*** (0.177)	0.597*** (0.085)

Source: Authors' calculation
Notes: *** p<0.01, ** p<0.05, * p<0.1

[44] Also, the model passed all post-diagnostic and specification tests for each income group except for the model specification link test in the high-income group of households. Coefficient of predicted value squared for link test is statistically significant (prob>Z, = 0.042). Full specification checks available upon request.
[45] The GLM estimates give approximately the same estimates of conditional elasticity as in Deaton model. Considering elasticities by income group, there is only a small difference in middle-income group (Deaton model -0.341, GLM -0.475). On the other hand, there is a slightly higher income elasticity in the low-income group.

The total elasticities based on the estimates from the two-part model are again significantly higher than the above discussed unconditional estimates. As expected, the low-income group is the most affected by changes in price. On the other hand, an increase in income could potentially neutralize the effect of a price increase. As can be seen from the figure below, the estimated income elasticity is slightly lower in the low-income group than in the high-income group.

Figure 7.2: Prevalence and conditional elasticity by income group

7.4 Impact of price increase on consumption and government revenues

The obtained results confirm that changes in price have a strong effect on cigarette consumption and generate a broader socioeconomic impact. This aspect is related especially to health outcomes, but also to increased government revenues from increased excises taxes on these goods. Therefore, the main goal of this part of the research is to simulate effects of excise tax changes on cigarette consumption and fiscal revenues. The simulation based on the estimated unconditional elasticities by income group (Table 7.6) using the Deaton method, as these estimates are more conservative to those obtained with the two-part model.

The simulation was done under the following baseline scenario assumptions:

- Baseline cigarette consumption calculated based on used excise stamps, obtained from the Ministry of Finance: 26,549,828;
- Real consumption growth rate in 2018: 4.1 percent, calculated based on final consumption from national accounts;
- Weighted average retail price of cigarettes (WAPC) per pack EUR 2.1 (2018); and
- Specific excise EUR 0.6 per pack, ad valorem 32 percent, VAT 21 percent (2018).

Assumed changes in excise taxes are adopted from the excise tax calendar[46] in Montenegro, more precisely, the plan for excise tax changes which will be in effect starting 2024, which assumes an increase in specific excise to 0.95€ per pack of cigarettes (from 0.6€ in 2019). On the other hand, the ad valorem tax will be reduced from 32 percent to 24.5 percent of the retail sales price. The results of the simulation by income group, under an assumption that the planned changes take place in 2020, are presented in Table 7.7. The resulting price increase would be 15.8 percent.

Table 7.7. Impact of price on consumption and government budget

Share in total consumption		Consumption			Revenues		
		Baseline[1]	Scenario[1]	Change	Baseline[2]	Scenario[2]	% change
Income group							
Low	*30%*	8.0	7.3	-8.7%	€ 13.0	€ 14.3	9.9%
Middle	*36%*	9.6	8.8	-8.3%	€ 15.6	€ 17.3	10.5%
High	*34%*	9.0	8.5	-5.8%	€ 14.8	€ 16.7	13.5%
Total	**100%**	**26.6**	**24.6**	**-7.5%**	**€ 43.4**	**€ 48.3**	**11.3%**

[1] In million packs; [2] In million euros
Source: Authors' calculations

As Table 7.7 shows, the estimated impact of this policy would have positive impact on revenues, and at the same time, would make the tobacco tax system more progressive. While total consumption would decline by around 7.51 percent, with likely positive health effects, revenue collection would increase by 11.3 percent. Low- and middle-income households would benefit the most, with 8.75 and 8.26 percent reduced consumption, respectively. On the other hand, the most revenue is generated from the high-income group.

From these results, it is evident that increasing excise taxes on cigarettes has a positive impact in changing patterns of consumption and public revenues across each income group. Increases in excise taxes have the strongest reducing effect on consumption of cigarettes among poor households, while at the same time, these changes produce the smallest effect on public revenues. This result could be explained by significantly higher price sensitivity of poor households relative to the wealthier households. At same time, the high-income group contributes the most to public revenues. The response to change in income is similar across all groups.

[46] Law on Excise Taxes, Official Gazzete of Montenegro, 76/08, 50/09, 78/10, 40/11, 61/11, 28/12, 38/13, 45/14, 8/15, 1/17, 50/17, 55/18.

8 Serbia

Increasing excises and prices of cigarettes in Serbia would result in lower cigarette consumption. The price elasticity of demand for cigarettes is estimated at -0.659, indicating that if cigarette prices increase by 10 percent the demand for cigarettes would decrease by 6.6 percent on average. This decrease would stem from both a decrease in smoking prevalence (by 2.6 percent) and smoking intensity (by 4.5 percent). **A decrease in consumption of cigarettes would lower the harmful health effects of cigarettes, such as death and disease.**

An increase in cigarette excises would result in an increase of government revenue from tobacco taxation. Simulation results show that if prices were to increase by 10 percent, total government revenue would increase by 9.0 percent despite the decrease in consumption. This is due to the inelastic demand for cigarettes.[47] **Further positive fiscal effects could be expected since the decrease in cigarette consumption would likely lower health expenditures related to harmful effects of cigarettes.**

The decrease in consumption resulting from the price increase is not the same for all income groups. The decrease would be the highest for low-income households. A 10 percent price increase, as a result of 17.8 percent increase of specific excise, would lower the demand for cigarettes among low-income households by 5.4 percent, while the decrease for middle- and high-income households would be 2.4 percent and 0.7 percent, respectively.

If the prices of cigarettes increase, low-income households would decrease their expenditures on cigarettes. On the contrary, expenditures on cigarettes for middle- and high-income households would increase. Considering these divergent **consumer responses to cigarette price increases, increasing excises would be a pro-poor policy that has the potential to lower inequality in the country**. Lower expenditures on cigarettes for low-income households would likely be coupled with **lower health expenditures related to harmful effects of cigarettes.**

8.1 Data and descriptive statistics

In order to estimate the price elasticity of cigarette consumption in Serbia, Household Budget Survey (HBS) data from 2006 to 2017 is used. HBS is an annual survey, which provides detailed information on household consumption, as well as on individual characteristics of the household members. Additionally, survey data contain information on the municipality and region in which the respondents live. In total, there were 62,054 households in the sample.

Table 8.1 presents the data on cigarette use available from HBS. Smoking prevalence, defined as the share of the households that reported positive cigarette expenditures, has significantly decreased over the observed period: from 49.7 percent in 2006 to 34.2 percent in 2017, or by about 30 percent. Moreover, households have decreased their smoking intensi-

[47] Demand is inelastic when people's consumption of cigarettes does not change as much as the price changes.

ty: the average number of cigarettes smoked in the same period decreased from 39.1 to 27.2 packs per household per month, also by about 30 percent.[48]

At the same time, however, household expenditures on cigarettes increased: the average household expenditure (among the households with positive expenditures) increased from 1,988 RSD in 2006 to 3,241 RSD in 2017 (expressed in 2006 values), or by about 63 percent. As the increase of household expenditure coincided with the lowering of the smoking intensity, this means that real cigarettes prices were growing faster than smoking intensity was declining.

Table 8.1: Cigarette use in Serbia: prevalence, expenditures, number of consumed cigarettes

Year	Smoking prevalence (% of households)	Average number of cigarettes smoked (packs per household) [1]	Average real household expenditure on cigarettes (in RSD)[1 2]	Average real price (in RSD)[1 2 3]
2006	49.7 %	39.1	1,988	51.9
2007	47.9 %	39.2	2,279	58.7
2008	44.1 %	39.0	2,268	58.9
2009	42.0 %	37.9	2,353	62.7
2010	38.8 %	37.0	2,442	65.9
2011	38.4 %	36.2	2,487	68.7
2012	38.0 %	34.3	2,609	75.8
2013	35.1 %	29.6	2,758	93.0
2014	34.4 %	27.7	2,922	104.9
2015	36.3 %	28.9	2,985	103.2
2016	33.7 %	29.1	3,219	110.2
2017	34.2 %	27.2	3,241	117.8

Source: Authors' calculation based on HBS data for Serbia

[1] Based on reported expenditure and quantities of households with positive expenditure on cigarettes.

[2] Variables deflated by CPI to 2006 values.

[3] The average price is proxied by the average unit value, which is ratio of reported household expenditure on cigarettes and purchased quantity.

HBS does not collect data on prices, so this analysis uses a ratio of (real) household expenditure on cigarettes and the quantity of cigarettes smoked to calculate (real) unit values of cigarettes for each household. Average unit values of cigarettes reported by households within one municipality for each year and is used as a proxy for cigarette price.[49] Yearly trends of this variable are presented in the last column of Table 8.1. The average real price

[48] Since only 1.7percent of households in the sample report expenditures on cut tobacco this variable is not included in the analysis. Although there is a likely substitution effect between cigarettes and cut tobacco, the low number of households with positive cut tobacco consumption suggests that cut tobacco expenditures are not likely to impact the results.

[49] For 1,152 households the prices are replaced with regional (NUTS2) yearly averages, as in 733 cases there was only one household within municipality with positive expenditures and in 419 there were no households with no cigarette expenditures within the municipality.

(proxy) of cigarettes increased from about 52 RSD in 2006 to about 118 RSD in 2017 (expressed in 2006 values), indicating that the real price of cigarettes increased by 2.3 times.[50]

Therefore, while the prices of cigarettes more than doubled in real terms over the observed twelve years, during the same period both smoking prevalence and smoking intensity decreased by about 30 percent. The next section discusses the regression analysis described in chapter 2 to analyze the effect of prices on smoking prevalence and intensity while controlling for the impact of other variables.

8.2 Estimation of the price and income elasticity

The nature of tobacco consumption as a dependent variable requires that the prevalence and conditional demand elasticity are estimated separately. In what follows, the main results – price and income elasticities are presented, while the full results with specification tests can be found in an online appendix (Appendix F).

8.2.1 Prevalence elasticity

According to the estimates from the logit model (model 4, Table F1) the price elasticity of smoking prevalence in Serbia amounts to -0.265. This means that a 10 percent increase in the price of cigarettes decreases smoking prevalence by 2.65 percent. To better explain the meaning of estimated prevalence elasticity, a 10 percent increase in price would reduce current prevalence in absolute terms by 0.9 percentage points from 34.2 percent to 33.3 percent (see model 4, Table F1).

All other things equal, households with higher income (that is, higher total expenditure, which is used as a proxy for income) have higher levels of smoking prevalence. On average, total household expenditure elasticity is 0.609. In other words, a 10 percent higher income results in about 6 percent higher prevalence. In absolute terms, a 10 percent increase in income increases prevalence by about 1.8 percentage points from 34.2 percent to 36.0 percent (see section Table 8.2).

Additionally, the results from the model (Table F1) indicate that prevalence is higher in larger households and in households with higher shares of men and adults. Education, conditional on all other variables, has a non-linear impact: the lowest prevalence is associated with the lowest (incomplete primary) and highest (tertiary) levels of education. Compared to Belgrade, all other regions have higher prevalence. "Pensioner" and “self-employed” households have lower, while "unemployed" households have higher prevalence than "employed" households. Finally, the introduction of the advertisement ban in 2010 has reduced smoking prevalence.

[50] According to the official Statistics Office of the Republic of Serbia (SORS) data and our calculations, real tobacco Consumer Price Index (CPI) grew by 2.4 times, with similar trends by years, confirming the validity of the price measure that we use in our estimates.

8.2.2 Conditional demand (intensity) elasticity

Deaton model

The estimated value of conditional income elasticity is positive at 0.447. In other words, among the households which consume cigarettes, a 10 percent higher total expenditure is associated with a 4.47 percent higher quantity of cigarettes smoked. On the other hand, results indicate a negative price elasticity of -0.395. In other words, if cigarette prices in Serbia increased by 10 percent, the quantity of cigarettes consumed by those who smoke would decrease by about 4 percent.

GLM estimate

In order to test the robustness of the results obtained in the Deaton model the conditional income and price elasticity of demand is also estimated using the GLM model.

According to the results (model 4, Table F6), conditional (intensity) elasticity in Serbia is -0.450, which means that, among households that smoke, a 10 percent price increase decreases cigarette consumption by 4.5 percent.

All other things equal, households with higher income smoke more. Significance of the square term indicates that this relation is not linear, but that the effect diminishes with higher levels of income. On average, conditional income elasticity is 0.413 and does not vary significantly across the models. In other words, a 10 percent increase in income leads to an increase in cigarette consumption by about 4.1 percent. In all specifications control variables show expected signs: conditional smoking (intensity) demand is higher in larger households and households with higher shares of men and adults. Education, conditional on all other variables, lowers the smoking conditional intensity, while smokers in Belgrade smoke less than people from other regions. "Pensioner" and “self-employed” households have lower, while "unemployed" households have higher smoking intensity than the "employed" households. Finally, the introduction of the advertisement ban in 2010 has no effect on smoking intensity.

8.2.3 Total price and income demand elasticity

Based on the estimates above, total demand elasticity is calculated.[51] Table 8.2 presents two estimates of the total demand elasticity, which differ in the method applied to estimate the conditional demand elasticity. Total price elasticity amounts to -0.659, when the conditional demand is estimated using Deaton method. The same indicator is slightly higher, -0.714, when conditional demand is estimated via GLM. Total income elasticities are also similar for the two approaches: 1.056, when conditional demand is estimated via Deaton model, and 1.024 when conditional demand is estimated via GLM. The fact that the elasticities are similar confirms the robustness of the results.

[51] As explained in the methodology section, total elasticity is a corrected, rather than a simple sum of the two elasticities. More precisely, the size of the conditional demand elasticity needs to be corrected for the change in the number of smokers which occurs due to the increase/decrease in the prevalence.

Table 8.2: Total demand elasticity (comparison of Deaton and GLM model)

		Conditional demand estimate from Deaton model		Conditional demand estimate from GLM	
Total demand elasticity	price	-0.659		-0.714	
	income	1.058		1.024	
Prevalence elasticity	price	-0.265***	(0.051)	-0.265***	(0.051)
	income	0.609***	(0.020)	0.609***	(0.020)
Conditional intensity elasticity	price	-0.395***	(0.020)	-0.450***	(0.030)
	income	0.447***	(0.011)	0.413***	(0.012)

Source: Authors' calculation based on HBS data
Cluster robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Since the Deaton model accounts for the so-called "quality shading" (see Chapter 2), the remaining part of the study uses the Deaton model estimates as the primary result. The results from this model suggest that a 10 percent higher price is associated with the 6.6 percent reduction in demand for cigarettes. Similarly, a household with a 10 percent higher income has a 10.56 percent higher demand for cigarettes.

8.3 Price elasticity by income group

This part of the chapter examines trends in cigarette demand over the period 2006-2017 and estimates cigarette price and income elasticities by income group. Three groups of equal size are formed based on the total household expenditure per capita in each year, which is a proxy for household income: low-, middle-, and high-income.

8.3.1 Demand trends by income group

As mentioned previously, smoking prevalence in Serbia decreased significantly between 2006 and 2017, by 15.5 percentage points. Figure 8.1 (left panel) presents prevalence trends for the three income groups and compares them with the average prices[52] for the period. The decrease in prevalence was the sharpest among low-income households, where the decrease was 18.6 percentage points (from 47 to 28.4 percent) (Figure 8.1) The decrease was slightly lower for middle-income households – by 17.5 percentage points (from 53.4 to 35.9 percent), while prevalence decrease of high-income households was below the average, at 10.7 percentage points (from 48.8 to 38.1 percent). Furthermore, in the period of the highest rise of prices (2011-2014), low-income households decreased their prevalence more than the two other income groups, indicating that low-income group prevalence trends might be more related to the price changes.

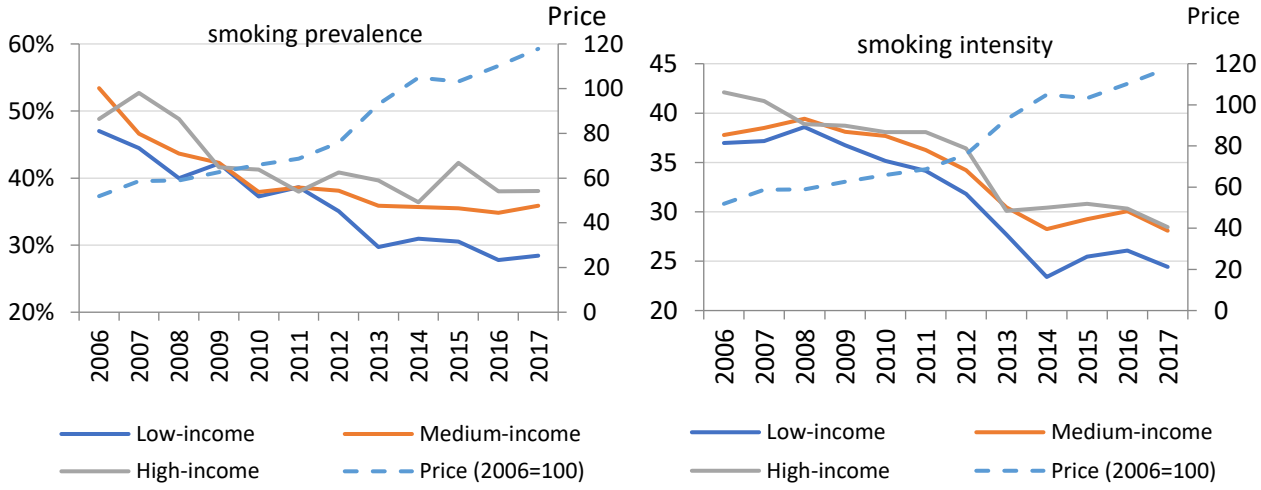
On the other hand, among the households with positive cigarette consumption, between 2006 and 2017, smoking intensity decreased on average by 11.9 packs per month. The decrease was above average in high-income households, by 13.7 packs (from 42.1 to 28.4 packs, or by about 32 percent), and in low-income households, by 12.6 packs (from 37 to 24.4 packs, or by about 34 percent). On the other hand, in middle-income households the decrease was the lowest – 9.7 packs (from 37.8 to 28.1 packs, or by about 26 percent). Simi-

[52] Unit value averages by municipality and year are used as a proxy for prices. See section 2 for more details.

lar to the prevalence trends, Figure 8.1 (right panel) indicates that the in the period of the highest rise of the prices (2011-2014), smoking intensity among low-income households decreased more than the two other income groups.

Therefore, in low-income households, the decrease in both smoking prevalence and intensity was higher than the national average. This resulted in unchanged real expenditures on cigarettes for low-income households (including both consuming and non-consuming households) in the period in which real prices of cigarettes more than doubled, while the budget share spent on cigarettes decreased by 0.4 percentage points (decrease from 3.3 to 2.9 percent). On the other hand, in the two other income groups real expenditures increased by about 20 percent, which led to a slight increase in the total budget shares spent on cigarettes by 0.4 percentage points for middle-income households (from 3.0 to 3.4 percent) and by 0.8 percentage points for high-income households (from 2.4 to 3.2 percent).

Figure 8.1: Smoking prevalence and conditional (demand) intensity trends by income group



Source: Authors' calculation based on HBS data

Notes: Smoking prevalence is defined as the share of the households with positive tobacco consumption, while smoking intensity represents the number of cigarette packs a household with positive expenditures on cigarettes smoked per month. Cigarette prices are defined as municipality/year average cigarettes' unit values (ratio between total expenditure and quantity) and expressed in real terms (2006=100).

8.3.2 Prevalence elasticity by income group

Table 8.3 shows that the price elasticity of smoking prevalence is the highest for low-income households, estimated at -0.565, as expected.[53] The price elasticity of high-income households is not statistically significant suggesting that their decision to smoke is not impacted by price, but by other factors. A 10 percent price increase decreases smoking prevalence by 5.6 and 2.6 percent in low-, and middle-income households respectively, while for high-income households price does not affect smoking prevalence.

[53] Table F10 in the Appendix presents the full model.

Table 8.3: Prevalence and conditional demand elasticities by income group

	Low-income households		Middle-income households		High-income households		All households	
Prevalence elasticities (logit model)								
Price	-0.565***	(0.075)	-0.261***	(0.070)	-0.040	(0.066)	-0.265***	(0.050)
Income	0.809***	(0.044)	0.665***	(0.062)	0.401***	(0.031)	0.609***	(0.020)
Conditional demand (intensity) elasticity (Deaton's model)								
Price	-0.514***	(0.067)	-0.371***	(0.065)	-0.220***	(0.041)	-0.395***	(0.053)
Income	0.550***	(0.037)	0.598***	(0.065)	0.338***	(0.025)	0.447***	(0.011)

Source: Authors' calculation based on HBS data
Notes: *** p<0.01, ** p<0.05, * p<0.1

The analysis further indicates that in all income groups, higher income increases smoking prevalence, in other words, all three income groups have positive income elasticities. Similar to price elasticity, income elasticity is the highest for low-income households, at 0.809, slightly lower in the middle-income group 0.665, and the lowest in the high-income group, at 0.401. This means that having a 10 percent higher income is associated with 8.1, 6.6, and 4.0 percent higher smoking prevalence by for low-, middle-, and high-income households, respectively

8.3.3 Conditional demand (intensity) elasticity by income group

The conditional demand elasticity in each income group is estimated using the Deaton model. For the overall sample, price elasticity is estimated at -0.395, with an income elasticity of 0.447. Estimates by income group are as follows:

Price elasticity is negative and estimated at -0.514, -0.371, and -0.220 for low-, middle- and high-income households, respectively.[54] In other words, if cigarette prices in Serbia increased by 10 percent, the quantity demanded for cigarettes among smoking households will decrease by about 5.1, 3.7, and 2.2 percent for low-, middle-, and high-income groups, respectively.

Income elasticity is positive and estimated at 0.550, 0.598, and 0.338, for low-, middle- and high-income households, respectively. In other words, a 10 percent higher income is associated with 5.5, 6.0, and 3.4 percent higher quantity of cigarettes smoked in low-, middle-, and high-income households, respectively.

[54] Price elasticities from the GLM suggest slightly higher values at -0.605, -0.441, and -0.348 for low-, middle-, and high-income households, respectively. Higher values from GLM model are expected as, unlike the Deaton model it does not correct for the quality shading, which results in an upward bias of the coefficients.

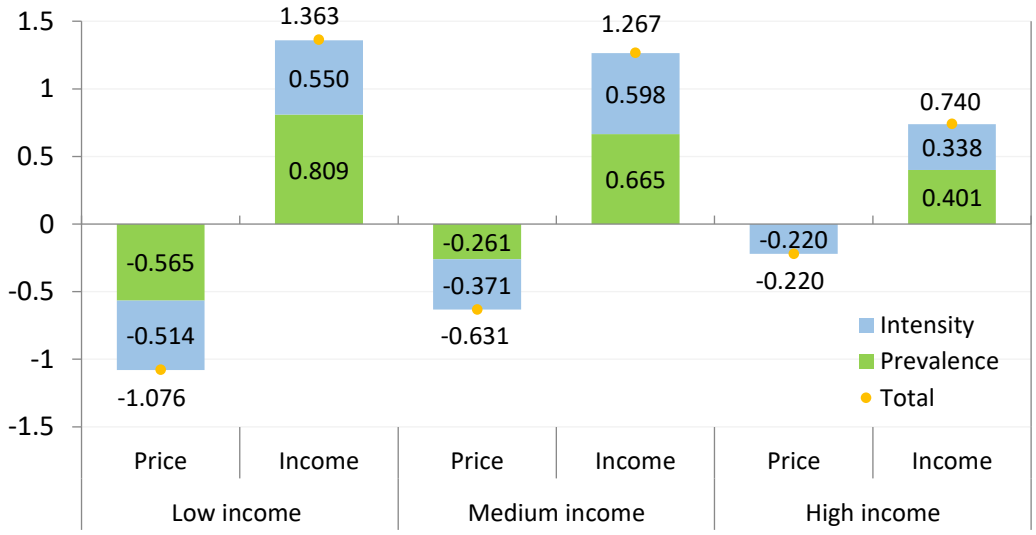
8.3.4 Total price and income elasticity by income group

Based on the estimates of prevalence and conditional demand elasticity from the previous sections, total demand elasticity is calculated and presented below by income group in Figure 8.2.[55]

Total price elasticity is the highest for low-income households at -1.076, which means that a 10 percent price increase leads to a decrease in consumption by 10.8 percent. In the middle-income households, total elasticity is almost two times lower at -0.631, with more of the effect attributable to a decrease in smoking intensity than the lowering of prevalence. Finally, elasticity is the lowest in the high-income group at -0.220 and the effect is entirely attributable to a decrease of smoking intensity, as prices have no significant effect on prevalence.

Total income elasticities in all the groups are higher than the total price elasticities and estimated at 1.363; 1.267 and 0.740 for low-, middle-, and high-income households, respectively.

Figure 8.2: Total elasticity by income group



Source: Authors' calculation based on the estimated elasticities (Table 8.3)

8.4 Impact of price increases on consumption and government revenue

This section discusses the economic implications of the estimated price and income elasticities of cigarette consumption in Serbia. The obtained elasticities are used to simulate the

[55] As explained in the methodology section, total elasticity is a corrected, rather than a simple sum of the two elasticities. More precisely, the size of the conditional demand elasticity needs to be corrected for the change in the number of smokers which occurs due to the increase/decrease in the prevalence.

effect that a price increase would have on cigarette consumption and total government revenue from taxes on cigarettes, including both excises and value-added tax (VAT). According to the Ministry of Finance, Tobacco Administration Department, total cigarette consumption in Serbia in 2017 was 671.4 million packs while the weighted average price of cigarettes was €1.87 (that is, 226.96 RSD). According to the taxation rules, which include specific excise of €0.53 per pack (64.75 RSD), ad valorem excise of €0.62 per pack (in other words, 33 percent of the retail price), and VAT of €0.31 per pack (20 percent of the pre-VAT price) per pack, total tax paid on a pack of cigarettes in Serbia amounts to €1.46, and it represents about 78.8 percent of the total retail price. Estimated total government revenue from cigarette consumption in 2017 was about 982 million euros (or 6.9 percent of the total government tax revenues).

Total price and income elasticities are estimated at -0.659 and 1.058 (Table 8.2), respectively. Assumed real growth in household consumption in 2018 is 3.0 percent.[56] Detailed below are simulations of a price increase of 10 percent, 25 percent, and 50 percent on cigarette consumption and government revenues from cigarette taxation in 2018. Such growth in retail prices could be achieved by an increase of excise taxes by 17.7 percent, 44.4 percent, and 88.8 percent, respectively, while holding ad valorem tax and VAT rates at the same levels as they are. In the government revenue simulations, it is assumed that producers are not going to change their net-of-tax prices.

The effects on tobacco consumption are calculated as follows:

$$D_{t+1} = D_t * (1+E_p*\%p \text{ change} + E_i * \%i \text{ change})$$

where D_{t+1} is the new demand, D_t is the demand in year t, E_p and E_i are price and income elasticities, while *%p* and *%i* change are the percentage increases in price and income, respectively.

The change in consumption and government revenues where prices increase by 10, 25, and 50 percent are shown in Table 8.4.

Table 8.4: Impact of price increases on consumption and government revenues

		Price	Consumption		Revenue	
		(Euros)	(Million packs)	(% change)	(Million euros)	(% change)
Baseline		1.87	671.4	0	982.0	0
Scenario	Price increase	New price				
	10%	2.06	648.4	-3.4%	1,070	8.9%
	25%	2.34	582.1	-13.3%	1,124	14.4%
	50%	2.81	471.5	-29.8%	1,130	15.1%

Source: Authors' calculation based on Ministry of finance data and estimated elasticities

[56] According to SORS, total household consumption grew in 2018 by 3.0percent (https://publikacije.stat.gov.rs/G2019/PdfE/G20191267.pdf)

In addition to its potential to generate additional revenues, a cigarette price increase could potentially lead to significant health and economic benefits through reduced consumption. Numerous evidence shows that higher prices of cigarettes have a beneficial impact on health and development.[57]

8.5 Impact of price increases on consumption and expenditures by income group

A more nuanced estimate of the impact of price increases on consumption and revenues is obtained by estimating changes by income group, as they respond differently. First, total consumption of cigarettes is split by income group by applying the shares of total consumption calculated from HBS 2017 data. As data on real growth in household consumption by income group is not available, the estimated 2018 growth rate of 3.0 percent is adjusted for each income group based on the real growth in private consumption by income group between 2016 and 2017 obtained from HBS data. For the low-, middle-, and high-income group, estimated growth rates are 3.9, 3.1, and 2.0 percent, respectively. Assuming a 25 percent price increase, achieved by an 44.4 percent increase of excise tax, estimated price and income elasticities by income group (Figure 2) are used to estimate the change in cigarette consumption and tax revenues in 2018.

Table 8.5 presents the results of the simulation. As expected, the low-income group would experiences the largest reduction in consumption (21.6 percent) and a reduction in spending on cigarettes (2.0 percent), while the government revenue collected from this groupwould increase by (3.5 percent). The reduction in consumption in the middle- and high-income groups would be significantly lower, and their spending on cigarettes would increase. This result supports the argument that an increase in tobacco taxes and prices would increase the progressivity of the tobacco excise tax system in Serbia, and that the poor would benefit the most. The overall impact of a 25 percent price increase would be a reduction in consumption of 11 percent and additional government revenue from tobacco taxation of 17.4 percent.

Table 8.5: Impact of price increase on consumption and expenditures by income group

Income group	Consumption			Government revenue			Spending on tobacco		
	Base-line[1]	Scenar-io[1]	Change	Base-line[2]	Scenar-io[2]	Change	Base-line[2]	Scenar-io[2]	Change
Low	162.0	127.0	-21.6%	236.3	244.7	3.5%	302.9	296.9	-2.0%
Middle	238.4	210.1	-11.8%	347.7	404.8	16.4%	445.8	491.2	10.2%
High	271.0	260.1	-4.0%	395.3	501.0	26.7%	506.8	608.0	20.0%
Total	671.4	597.3	-11.0%	979.3	1,150.5	17.5%	1,255.4	1,396.1	11.2%

[1] In million packs;
[2] In million euros
Source: Authors' calculation based on Ministry of finance data and estimated elasticities

[57] https://tobacconomics.org/wp-content/uploads/2018/08/Tobacco-and-SDG-Brief-FINAL.pdf

9 Summary and Conclusions

The results of the research provide a unique comparative analysis for all the countries. This chapter summarizes the results presented in country chapters 3 to 8 and offers conclusions and recommendations based on the collected evidence.

In all the analyses, microdata from HBS was used to estimate the price and income elasticities of cigarettes use. Descriptive data from HBS is presented in tables 9.1-9.3.

9.1 Average cigarette prices in six SEE countries (€, in 2015 values)

	ALB	B&H	KSV	MNE	NMK	SRB
2006				0.98		0.78
2007		0.81	1.28	0.95		0.89
2008			1.22	0.95		0.89
2009			1.52	1.07		0.95
2010			1.40	1.13		1.00
2011		1.21	1.40	1.34		1.04
2012			1.56	1.52		1.15
2013			1.51	1.64		1.41
2014	1.63		1.52	1.74	1.50	1.59
2015	1.65	1.87	1.66	1.70	1.65	1.56
2016	1.68		1.77		1.86	1.66
2017	1.71		1.89	1.68		1.78

The price of cigarettes, as a proxy of unit values, calculated from HBS is similar in all countries. The cost is deflated to 2015 values since that is the only year for which data is available from all countries. Even though the prices were significantly different in the past, recent data show that they have converged to a large extent. This leads to the conclusion that the market of six countries could be observed as one single market.

9.2 Smoking prevalence in six SEE countries (in %)

	ALB	B&H	KSV	MNE	NMK	SRB
2006				52.4		49.7
2007		57.4	48.2	52.6		47.9
2008			47.8	56.2		44.1
2009			41.1	50.4		42.0
2010			52.1	44.1		38.8
2011		48.4	50.9	44.2		38.4
2012			53.4	42.5		38.0
2013			49.0	42.1		35.1
2014	38.7		49.7	44.1		34.4
2015	31.6	33.8	46.9	40.2	40.5	36.3
2016	31.3		45.2		39.7	33.7
2017	31.7		46.3	36.5	39.5	34.2

While the average cigarette price is similar across countries, smoking prevalence[58] varies between 31 and over 56 percent over the 12 year period. However, it is important to note that, as reported in previous studies[59] in Albania, B&H, and Kosovo, there is a large disproportion in prevalence among the male and female population, while in other countries the rates are similar for both genders. It is also noticeable that prevalence rates do not follow the same trend in the region. The largest decrease is registered in B&H, Serbia, and Montenegro, while in Kosovo and North Macedonia there is practically no change observed. The decrease in prevalence rates is stagnating in the latest reported years.

9.3 Average monthly household consumption of cigarettes in six SEE countries (number of packs)

	ALB	B&H	KSV	MNE	NMK	SRB
2006				34.7		39.1
2007		37.4	41.3	34.5		39.2
2008			40.2	38.4		39.0
2009			43.1	34.2		37.9
2010			40.0	32.4		37.0
2011		32.3	40.6	31.9		36.2
2012			43.2	29.4		34.3
2013			41.6	27.6		29.6
2014	17.4		42.4	26.5		27.7
2015	19.0	22.9	42.0	28.8	30.5	28.9
2016	18.4		40.8		29.1	29.1
2017	19.5		41.9	33.4	28.2	27.2

The change in smoking intensity also varies by country. While in Albania, Kosovo, and Montenegro there has been no change in average consumption, in B&H, Serbia, and North Macedonia there is a stable decreasing trend.

The differences observed in descriptive statistics have a significant impact on the research outcomes, namely estimation of prevalence and intensity price elasticity of demand for cigarettes; estimation of price elasticity of demand by income group; and simulation of the impact of an increase in tobacco excise and price on consumption and government budget.

Table 9.4: Price elasticities of cigarette consumption in six SEE countries

	ALB	B&H	KSV	MNE	NMK	SRB
Prevalence	-0.165	-0.563	0.000	-0.636	-0.214	-0.265
Intensity	-0.267	-0.458	-0.387	-0.432	-0.232	-0.395
Total	-0.432	-1.018	-0.387	-1.065	-0.446	-0.659

[58] Smoking prevalence in this study is expressed as a share of households that report positive consumption of cigarettes in total number of households.
[59] http://www.tobaccotaxation.org/research.php?cID=26&lng=srb

Increasing excises and prices of cigarettes will result in lower cigarette consumption in all countries. Total price elasticity varies from -0.387 in Kosovo to -1.065 in Montenegro, indicating that if the cigarette prices increase by 10 percent the demand for cigarettes would decrease by 3.8-10.6 percent. This decrease would stem from both a decrease in the smoking prevalence and smoking intensity. More details about price elasticities are presented in Table 9.4.

Distribution of total price elasticity between prevalence and intensity is not even among the countries. Consumers in Albania, Kosovo and Serbia react more intensively to change in price by reducing the number of cigarettes smoked. In B&H and in Montenegro there is a stronger reaction in terms of quitting smoking. At the same time in North Macedonia, there is even distribution of the two elasticities. It is important to note that value of prevalence intensity for Kosovo equals zero due to not statistically significant causality between the price and prevalence rates.

Table 9.5: Income elasticities of cigarette consumption in six SEE countries

	ALB	B&H	KSV	MNE	NMK	SRB
Prevalence	0.781	0.374	0.212	0.308	0.411	0.609
Intensity	0.329	0.426	0.568	0.286	0.465	0.447
Total	1.113	0.802	0.779	0.595	0.874	1.058

Increasing income would result in higher cigarette consumption in all countries. Total income elasticity varies from 0.595 in Montenegro to 1.113 in Albania, indicating that if the income increases by 10 percent the demand for cigarettes would increase between 5.9 and 11.1 percent. This growth would stem from both the growth of smoking prevalence and smoking intensity. More details about income elasticities are presented in Table 9.5.

Distribution of total income elasticity between prevalence and intensity is not even among the countries. Consumers in Kosovo and North Macedonia react more intensively to changes in income by increasing the number of cigarettes smoked. In Albania and in Serbia there is a stronger reaction in smoking initiation. At the same time in B&H and Montenegro, there is even distribution of the two elasticities.

Comparison of the total price and income elasticities shows that in Albania, Kosovo, North Macedonia, and Serbia the values of income elasticities are higher than price elasticities, indicating that in those countries the growth in income could easily erase the impact of increasing prices, especially in Albania. This result indicates that when countries revise excise policies, they should account for the expected growth of income in the country. ***Therefore, increasing excises would have an inequality-reducing effect.***

Total income and prices elasticities are significantly different if compared by income groups. Prices elasticities are the highest in low-income households, and the lowest in high-income households (Table 9.6).

Table 9.6: Elasticities in six SEE countries by income group

		ALB	B&H	KSV	MNE	NMK	SRB
Price	Low	-1.198	-1.411	-0.532	-1.300	-0.446	-1.076
	Middle	0.00	-0.929	-0.630	-1.009	-0.888	-0.631
	High	-0.709	-0.708	0.00	-0.617	-0.278	-0.220
Income	Low	1.728	0.901	0.668	0.514	1.245	1.363
	Middle	1.141	0.782	0.894	0.522	1.124	1.267
	High	0.517	0.735	0.619	0.607	0.583	0.740

Such results mean that the population of smokers with the lowest income are the most sensitive to changes in income, while in the majority of countries, they are also the most sensitive group to changes in prices. Therefore, rapid growth in prices would result in the most intensive response in the low-income group in reducing their consumption. On the other hand, high-income households do not react as intensively to changes in prices and income.

Table 9.7: Impact of tax and price increase on consumption (by income group and total)

	ALB[1]	B&H[2]	KSV[1]	MNE[3]	NMK[2]	SRB[1]
Low	-27.1%	-22.1%	-16.3%	-8.7%	-11.6%	-21.6%
Middle	-4.8%	-14.0%	-18.4%	-8.3%	-17.3%	-11.8%
High	-16.4%	-10.3%	1.7%	-5.8%	2.4%	-4.0%
Total	**-15.0%**	**-14.6%**	**-11.1%**	**-7.5%**	**-8.1%**	**-11.0%**

[1] Albania, Kosovo, and Serbia simulate the impact of an excise tax increase which would result in a 25 percent price increase;
[2] B&H and North Macedonia simulate impact of a 25 percent excise tax increase;
[3] Simulation for Montenegro includes both changes in specific and ad valorem excise, resulting in 15.8 percent increase in price

An increase in cigarette prices would result in a decrease in consumption. The results indicate that a price increase would result in consumption decrease in all countries (Table 9.7). The highest impact would be on consumption in the low-income households, while the high-income households would see the lowest change.

Table 9.8: Impact of tax and price increase on government revenues (by income group and total)

	ALB[1]	B&H[2]	KSV[1]	MNE[3]	NMK[2]	SRB[1]
Low	1.1%	-6.4%	18.9%	9.9%	8.4%	3.5%
Middle	32.1%	3.3%	15.9%	10.5%	1.3%	16.3%
High	15.9%	7.7%	44.4%	13.5%	25.5%	26.7%
Total	**17.9%**	**2.5%**	**26.2%**	**11.3%**	**12.6%**	**17.4%**

[1] Albania, Kosovo, and Serbia simulate the impact of an excise tax increase which would result in a 25 percent price increase; [2] B&H and North Macedonia simulate impact of a 25 excise tax increase; [3] Simulation for Montenegro includes both changes in specific and ad valorem excise, resulting in 15.8 percent increase in price

An increase in cigarette prices would result in an increase in government revenue from tobacco taxation. The results indicate a price increase would result in government revenues in all countries (Table 9.8). The lowest tax burden would be borne by low-income house-

holds, while high-income households would contribute the most to government revenue, confirming the progressivity of increase of excise levels in all the countries.