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

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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

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.

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.

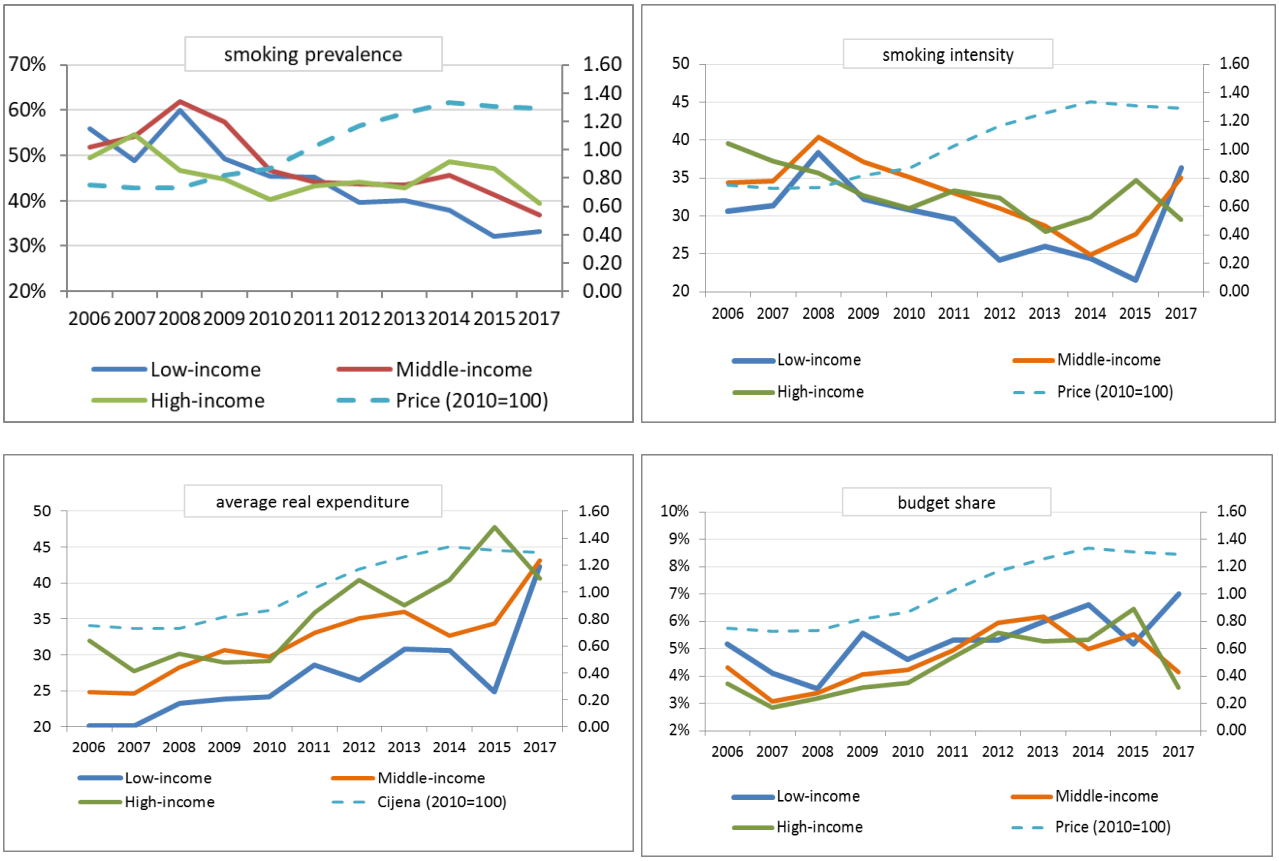
7.3 Price elasticity by income group

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.

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.