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

# 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 $\beta_1$ and $\beta_2$, as well as the vector of the coefficients $\Gamma$, 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 $\xi_{p1}$ 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 $\theta$ and $\psi$ 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 $\beta^1$ represents the expenditure elasticity, while $\psi$ 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 $\psi$ would be equal to one (as the change of the unit value would correspond to change of the price) and $\beta^1$ would be approximately equal to zero. On the other hand, in the presence of quality shading, $\psi$ will be less than one (unit value change will be slower than the change of the price) and $\beta^1$ 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 $\theta$, 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 $\beta^0$ 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 $\alpha_1$, $\alpha_2$ and the coefficients vector $\Theta$ 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 $\xi_{p2}$ 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 $\xi_{p1}$ represents the prevalence elasticity, $\xi_{p2}$ represents the conditional demand (intensity) elasticity and $\xi_p$ 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*, $\xi_p$ and $\xi_i$ 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.

# 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*

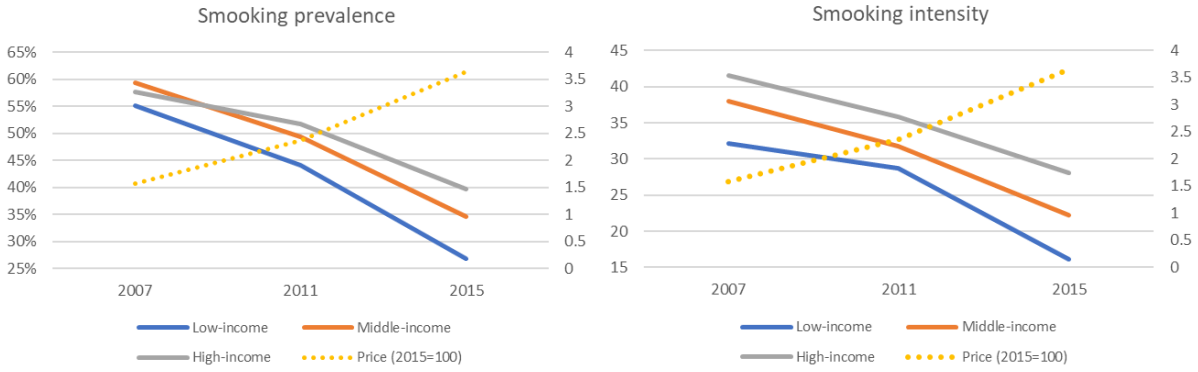
| Income group | Year | Average number of cigarette packs (per household) [1] | Average real household expenditure on cigarettes [1 2] | Average price (average real unit value) [1 2] | Average budget share on cigarettes [1] | Average income per household member [1] |
|---|---|---|---|---|---|---|
| **Low** | 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).

# 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.