



Article

Impact of Taxation Policy on Household Spirit Consumption and Public-Finance Sustainability

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Abstract: The objective of this study was to estimate the sensitivity of spirit quantity demanded for price and income changes in Montenegro and to show the effectiveness of taxation-policy changes in the reduction of spirit consumption. It is the first study on this topic in Montenegro, where adverse effects of alcohol are recognized as an important obstacle in achieving Sustainable Development Goals (SDGs). The price elasticity of spirits was estimated using Deaton's methodology on the Household Budget Survey (HBS) data in the period of 2006–2017. Cigarettes were included as a control variable as, along with spirits, they are one of the most harmful substances used in Montenegro. Using these results, we simulated the effects of spirit use on public revenue. The results show that the spirits' own price elasticity equaled -0.45 , while the cross-price elasticity equaled -0.17 , showing that spirits and cigarettes are complementary goods. These results, along with elasticities calculated by sex (male, -0.55 ; female, -0.5), income groups (low income, -1.16 ; middle-income, -0.46 ; high-income, -0.26), and for the working-age group (-0.74), demonstrate that an increase in excise taxes could be a very efficient tool in decreasing the adverse effect of spirits and cigarettes on household member's productivity, health, and budget, which is in line with SDGs. An efficient road map for sustainable development for Montenegro must include the reduction of health-harmful substance use through excise tax increase.

Keywords: price elasticity; income elasticity; taxation policy; HBS; SDGs; public revenue; Montenegro

1. Introduction

The excessive consumption of alcohol, separately or in combination with other psychoactive substances, is one of the leading causes of preventable death, noncommunicable diseases, and other negative socioeconomic outcomes (crime, road incidents, violence, workplace-productivity loss) [1–6]. The adverse effects of alcohol are more closely related to people who drink frequently, belong to disadvantaged groups, and heavily drink spirits rather than beer or wine [7–9]. Moreover, excessive alcohol consumption, especially in low- and middle-income countries (LMICs), could cause growing disparity in health, poverty, and nonproductivity [6,10,11]. In line with the above facts, regulating alcohol use has become a global and national priority, not only to address health concerns, but also to improve economic growth and reduce poverty.

The United Nations' 2030 Agenda for Sustainable Development has recognized the prevention and treatment of harmful alcohol use as a global priority and as one of the 13 health-related targets, with significant cross-cutting impact on all UN sustainability-development goals (SDGs)

and targets [12]. The UN initiative identifies increasing excise taxes on alcoholic beverages as the single most effective alcohol-pricing policy for reducing alcohol consumption and its harmful social and economic costs [13–16]. Moreover, the World Health Organization (WHO) recommends alcohol taxations as “win–win” policy instrument, safeguarding both public health and public revenue [1,12].

In Montenegro, which is in a group of LMICs, alcohol drinking is traditionally widespread and socially acceptable behavior. Being a signatory of the Central European Free Trade Agreement (CEFTA) and the European Free Trade Association (EFTA), as well as a member of the World Trade Organization (WTO) [17], the import of alcoholic beverages in Montenegro is exempt from the payment of customs tariffs [18]. As a consequence of these economic treaties, imports are increasing, and branded alcohol beverages are promoted more [19,20]. Considering that there is no burden of import tariffs on the price of alcoholic beverages, the importance of effective excise-taxation policy is even more pronounced for policymakers to preserve public-finance sustainability and protect public health. As a key tool to control alcohol price and consumption, the Government of Montenegro uses a specific alcohol excise-tax model on all alcoholic beverages (spirits, wine, and beer) [21]. As a result, up until now, Montenegro’s alcohol excise taxes have surpassed the EU minimum excise rate [21,22]. Two major changes related to the increase in excise-tax level from 2013 are correlated with the adoption of two main strategies: The National Strategy for the Prevention of Harmful Use of Alcohol and Alcohol-Caused Syndromes in Montenegro 2013–2020, and the National Strategy on Sustainable Development until 2030 [23,24]. These strategies ensured political commitment and programmable actions on regulating alcohol use through hard and soft norms [25], representing a framework for the continuous increase of excise taxes. Even though evident regulatory changes occurred in the past few years, the latest available estimations by the Montenegrin Institute of Public Health (2017) [26] confirmed that prevalence of alcohol intake is still the largest compared to other psychoactive substances. This problem is especially evident among the youth population, with approximately 74% of boys and girls having consumed some alcoholic beverage at least once in their life [27] while, among adults, this percentage is 63.5% [26]. Additionally, WHO estimations report that three-year per capita average adult alcohol consumption for 2015–2017 is eight liters of pure alcohol [2].

By breaking down WHO estimations by beverage type, we must note that, in Montenegro, the consumption of spirits is of particular concern, being higher than the consumption of wines and beers (spirits, 44%; wines, 43%; and beers, 11%). This result is on the average global level (spirits, 44.8%), but it presents the highest consumption of spirits compared to other countries of the Western Balkan region (Albania, 38%; Serbia, 25%; Bosnia and Hercegovina, 12%; North Macedonia, 17%). The additional issue of spirit consumption is the fact that domestic spirit production is deeply rooted in the national tradition, and many domestically made products do not meet EU quality standards [9]. To deal with this issue, the government of Montenegro has continued to increase spirit excise tax and recommended that alcoholic beverages that contain more pure alcohol, like spirits (alcoholic content more than 40%), should be more expensive [23,28].

The problem of high alcohol and spirit consumption in Montenegro is even more concerning if evaluated in the context of complementary alcohol and tobacco consumption [29–33]. Results of the last study of the Montenegrin Institute of Public Health [26] showed an increase in smoking prevalence of the adult population to 35.4% in 2017 compared with 31% in 2012, despite continuing increase of tobacco taxes [21,34]. The interaction of tobacco and alcohol use is recognized as an important research topic according to a confirmed multiplied health-harmful effect of the consumption of both substances [32,33,35]. In line with these findings, the importance of the possible impact of tobacco control policy to reduce alcohol consumption is indicated.

One of the most important inputs for designing effective excise-taxation policy is price estimation and the income elasticity of the demanded alcohol quantity. Available international evidence indicates that the demand for alcoholic beverages is mostly price-inelastic [13,36–41] and income-elastic [38–40]. Generally, it was concluded that, in LMICs, price elasticity is on a similar level or, in some cases, a little higher compared to that found in high-income countries, depending on the applied methodology

(−0.64 for total alcohol, −0.50 for beer, and −0.79 for other alcoholic beverages) [41]. All studies showed that demand for spirits is generally more responsive to price, compared to wine and beer in both high- and LMICs. However, one should take into account that these results vary in the case of different applied methodologies, as well as in cultural differences in drinking preferences [42–46].

Despite the evident presence of health research regarding the harmful effects of spirits [3,7,8], there is a lack of research dealing with the economic effects of alcohol demand and related tax policies. Lack of these studies is notably evident in LMICs. Recognizing the high importance of this issue, we set as the primary objective of our research as an estimation of price and income elasticity of spirit consumption in Montenegro, with the aim to provide a crucial scientific input in the process of creating effective evidence-based excise policy.

From a methodological point of view, the contribution of our paper is to verify the suitability of the application of Deaton's model [47,48] on Household Budget Survey (HBS) data for Montenegro, where direct market prices on spirits and tobacco are not available. Using the HBS database for the period of 2006–2017, we estimate the conditional price elasticity of demanded spirit quantity [49]. This means that our focus is on consumers reporting the positive purchase of spirits. To make an effective proposal for tax policy, we also analyze spirit interdependence with cigarette consumption because of the recognized economic and health impact. Moreover, generated estimations are used to simulate the impact of spirit-price increase on public revenue, as well as the impact of cigarette prices on spirit consumption. The former was conducted using spirits' own price elasticity, while the latter was analyzed using cross-price elasticities (spirits and cigarettes).

To the best of our knowledge, this is the first scientific study in Montenegro, as well as in other Western Balkan countries, related to alcohol and tobacco consumption and taxation where the adverse effects of alcohol are recognized as an important obstacle in achieving SDGs. This paper also aims at filling the scientific-evidence gap of this issue for LMICs. An important contribution of our study is that the estimated results could serve as a basis in the process of strategic government considerations and policy planning, being able to promote increased taxes as an effective tool in the reduction of alcohol consumption. Moreover, elasticity estimation can be used to simulate the effects of excise-tax increases on public-finance sustainability. In a broader context, the results of this research could serve as an important input for the comprehensive analysis of the causal effects of spirit- and tobacco-taxation policy on other areas of sustainability development.

2. Materials and Methods

To estimate the price and income elasticity of demanded spirit quantity, we used the Almost Ideal Demand System (AIDS), a system of demand equations introduced by Deaton and Muellbauer (1980) [47,48]. This methodology is commonly applied in this kind of research due to its various advantages. The model allows to estimate demand systems depending on consumer behavior in the process of choosing different commodities. The household decision process depends on product price, quality, and quantity within a specific cluster. Clusters are of crucial importance in the analysis, as the assumption of the model is that households in the same cluster pay the same price for the commodities, while price variations exist across clusters. Clusters are defined as a small territory or unit (in our case, municipalities) in which households live. Households within the same cluster are surveyed over the same period. The basic assumption of the model is to compare living standards across time and space.

Using this empirical approach, we conducted microresearch on the basis of HBS data. In the HBS, respondents reported the quantity of consumed products and the total expenditure incurred on different goods and services (total paid amount). Deaton's method is commonly used in cases where direct price information is not available. Although households do not self-report the market price in the HBS from Montenegro, it could be inferred from their purchasing decisions by calculating unit values. Deaton defines unit value as a proxy for price, dividing total expenditure on consumed commodity and quantity.

Even though unit value can be a proxy of price, it cannot be equal to price, as it contains information about product quality and measurement error. Still, Deaton's methodology proposes steps to estimate price elasticity by excluding quality effects and measurement errors. Therefore, the HBS database provided enough information to derive reliable estimates of price and income elasticity of demanded product quantity, even in cases when data on market prices were unavailable.

Accordingly, using Deaton's method in this research, we estimate own- and cross-price elasticities for spirits. Cigarettes were also included in the analysis as an important control factor and an additional measure of addiction. Therefore, along with spirits, the price and income elasticity of demanded cigarette quantity are estimated. Besides unit values, given in EUR per one liter of spirits and per pack of 20 cigarettes, the model defines a variable budget share, presented as monthly household expenditure on spirits and cigarettes as a percentage of total household expenditure. All values given in EUR were deflated using annual CPI for the period of 2006–2017, with 2006 as a base year [49,50].

Deaton's model, or demand system, is represented by two equations for spirits and cigarettes:

$$w_{ic} = \alpha^0 + \beta^0 \ln x_{ic} + \gamma^0 z_{ic} + \theta \ln p_c + u_{ic}^0 \quad (1)$$

$$\ln v_{ic} = \alpha^1 + \beta^1 \ln x_{ic} + \gamma^1 z_{ic} + \psi \ln p_c + u_{ic}^1 \quad (2)$$

These equations describe the relationship between variable budget share w_{ic} and unit value $\ln v_{ic}$ on the one side, and independent variables representing price $\ln p_c$, expenditure $\ln x_{ic}$, and sociodemographic characteristics z_{ic} . The relationship is defined for each household i in cluster c . Sociodemographic characteristics comprise:

- adult ratio—mean age of household members (older than 15 years);
- household size—number of household members;
- male ratio—proportion of males in household; and
- mean years of household-member education.

The model consists of three stages. Sociodemographic characteristics were included in the first stage so that their effects could be removed from both dependent variables. In that manner, these characteristics did not influence the estimation of income and price elasticity in the second stage. Consequently, unit values and budget-share averages per cluster were defined in the second stage. The final stage used the assumption of weak separability to distinguish between quality and price effects within the unit value. In the first-stage regression, beta coefficient β^1 from Equation (2) was determined and measured the expenditure elasticity of quality. Coefficient ψ of the same equation measured changes of unit value caused by a change in prices.

Data for this research were obtained from the Statistical Office of Montenegro (Monstat) for the period from 2006 to 2017 (excluding 2016, when the survey was not conducted) [49]. The HBS is conducted once a year in each municipality in Montenegro, or 21 statistical units in 3 regions, Central, North, and South (North, the least developed region comprising of 11 municipalities; Center, 4 largest municipalities, including the capital city; and South 6 coastal municipalities generating the highest income from tourism).

The survey provides data on household sociodemographic and economic features, as well as the average values related to their consumption structure and expenditure.

Deaton's (AIDS) model that we used in the analysis enabled the estimation of the conditional price and income elasticity of demanded spirit quantity [47,48]. So, in this research we focus on consumers with positive spirit consumption, of which the expenditure decisions were mostly influenced by changes in price. According to Deaton, conditional elasticity (applying the model on sample of only consumers) is estimated if factors that lead to the purchase of a good are different compared to ones causing the purchase when the decision is already made. Therefore, including the rest of the sample (nonconsumers) would mean the estimation of unconditional elasticity. This type of analysis would include the estimates of:

- existing consumer consumption changes due to price variations; and
- changes in consumption due to changes in cessation, initiation, and reinitiation.

Cessation, initiation, and reinitiation depend on different sociodemographic, psychological, and economic factors besides price. Analysis of all these factors is beyond the scope of this study. Moreover, most previous research in this area gave the estimates of conditional price and income elasticities [38,45,46,51,52]. Generally, according to the available evidence, it was concluded that systemwide estimations that include Deaton's model were set to conditional framework elasticity estimation. On the other hand, studies that deal with elasticity estimation in unconditional frameworks showed that those estimates are higher (mostly twice) in absolute values compared to conditional estimates [14,38,42,43,45,46].

3. Results

3.1. Descriptive Statistics

Even though the main focus of our research is the sensitivity of spirit consumption on price and income changes, to gain deeper insight of the total alcohol use in Montenegro, we briefly present descriptive statistics for all groups of alcoholic beverages. Table 1 presents average expenditure, consumed quantity, unit value, and budget share for all alcohol and all three groups of alcoholic beverages and cigarettes. Consumed quantity is the physical quantity of a consumed product. Expenditure was defined as real household expenditure (total amount spent) on a product by each household. These two variables were directly available from HBS, i.e., self-reported by households. Unit value and budget share, as already defined in previous section, were calculated from data provided in HBS.

Table 1. Alcohol and cigarettes: price, expenditures, budget share, and consumed quantity.

	Spirits		Wine		Beer		Total Alcohol		Cigarettes	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Unit value *	8.08	3.17	2.35	0.88	0.84	0.21	2.96	2.93	0.99	0.38
Budget share	2.41%	0.024	0.78%	0.008	0.86%	0.009	2.17%	0.024	4.59%	0.037
Expenditure **	14.93	15.31	6.29	6.77	6.08	6.39	14.47	17.01	30.63	24.76
Consumed quantity ***	1.96	2.29	2.7	2.81	7.66	8.32	7.32	8.88	32.19	23.55

Source: authors' calculations. * Results given in EUR per 1 L for beverages and EUR per cigarette pack. ** Results given in EUR per month. *** Beverages results given per 1 L, and cigarette results given per pack.

A total number of observations covered 12,503 households, comprising 57% of households having positive total alcohol consumption in at least one group of beverages. Considering a specific group, percentages were 30%, 21%, 39% for spirits, wine, and beer, respectively. The percentages indicated a high level of alcoholic-beverage consumption, which could be a sign of a higher percentage of people with addiction and related health problems [3,7,8].

The results from the unit values showed that, on average, prices are in the range from €0.84 for beer to €8.08 for spirits. The average price for total alcohol amounted to €2.96. Budget share spent on different alcoholic beverages ranged from 0.78% for wine to 2.41% for spirits. The overall budget spent on alcoholic beverages amounted to 2.17% on average. The budget spent on cigarettes was relatively higher compared to alcohol (4.59%), with €1 price per pack on average.

The data definitely pointed out the importance of spirits in household consumption, taking the largest share in the home budget compared to other types of alcoholic beverages. Additionally, the highest price comparing all commodities was in the group of spirit beverages. A number of health studies indicated that spirits have the most intense impact on addiction and the consequently imposed health and social problems compared to other groups of alcoholic products [7,8].

Additionally, we conducted preliminary research to check wine- and beer-consumption sensitivity on price and income changes. Generated price elasticities were negative as expected, but insignificant

(−0.44, wine; −0.58, beer). Lack of significance was the additional reason not to include them in further analysis.

Therefore, we proceeded to estimate only the price and income elasticity of spirits on a sample of consumers. In Table 2, we present the descriptive statistics of households' sociodemographic variables related to spirit consumers.

Table 2. Descriptive statistics.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	Mean	sd	Min	Max
Male ratio	3760	0.511	0.250	0	1
Adult ratio	3760	0.901	0.179	0.250	1
Mean education	3722	8.040	2.226	0	12
Household size	3759	3.306	1.723	1	12
Total expenditure	3737	739.2	400.7	69.59	2807

Results showed approximately the same share of men and women in households with positive spirit expenditure, mainly with a secondary level of education. Average household size was three members, 10% of household members were those aged 15 or younger, and the average budget of households amounted to €740.

3.2. Estimation of Price Elasticity Using Microdata

Table 3 summarizes regional and time variations of unit values and budget shares for spirits.

Table 3. Regional and time variations of spirit unit values and budget shares.

	(1)	(2)
Variables	Unit Value	Budget Share
<i>Region</i>		
South	1.020 *** (0.149)	−0.00283 ** (0.00132)
North	−3.021 *** (0.0954)	0.00922 *** (0.000846)
<i>Year</i>		
2007	0.504 *** (0.181)	0.00224 (0.00160)
2008	0.953 *** (0.184)	0.000316 (0.00163)
2009	0.710 *** (0.188)	0.00417 ** (0.00167)
2010	1.214 *** (0.185)	0.00863 *** (0.00164)
2011	1.093 *** (0.194)	0.000320 (0.00172)
2012	0.621 *** (0.189)	−0.00191 (0.00168)
2013	−0.101 (0.202)	−0.00285 (0.00179)
2014	0.520 *** (0.199)	−0.00548 *** (0.00177)
2015	0.0773 (0.197)	−0.000702 (0.00174)
2017	0.153 (0.243)	−0.0135 *** (0.00215)
Constant	8.566 *** (0.131)	0.0209 *** (0.00116)
Observations	3760	3760
R-squared	0.271	0.069

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$.

From Table 3, we observe that regional variations exist and are significant for both variables. Time variations are mostly significant considering the unit value, but in the case of budget share, a significant effect existed only in few years. Unit value as a proxy of the price was higher in the South, while lower in the North when compared with the Center region. Households in the South spend less of their budget on spirits compared with the Center, while the opposite situation exists in the North.

Households were grouped in 201 clusters, defined on municipality-year level, which, on average, included 89 households. We checked the validity of the main Deaton's model assumption that unit values vary between clusters. To check the validity of this assumption, we used Analysis of Variance (ANOVA) to split total unit-value variation in two parts: within- and between-cluster variation. Test results showed a significant F-statistic ($F(190, 3569) = 14.61$, $\text{Prob} > F = 0.000$), which indicated that unit values could be informative of prices. R^2 equals 0.53, meaning that 53% of total unit-value variation is explained by the cluster dummies. These test results confirmed that we can use unit values to examine price variation and for the purpose of price-elasticity estimation. As we confirmed significant spatial and cluster variation, the main model assumption was satisfied.

3.3. First-Stage Regression—Quality Elasticity of Total Expenditure

In this stage, the presence of quality effects was estimated from Equation (2), which includes sociodemographic characteristics. Coefficient β^1 from Equation (2) represents the measure of quality shading, explaining the relation between unit value and total household expenditure. This step allowed us to estimate the corrected price elasticity with quality effects in the second stage. The results of quality elasticity, along with the coefficients estimated for other sociodemographic variables from Equations (1) and (2), are given in Table 4.

Table 4. Unit value and budget-share regression results.

VARIABLES	Unit Value Spirits	sd	Budget Share Spirits	sd
Total expenditure (ln)	0.114 ***	(0.013)	−0.015 ***	(0.001)
Household size (ln)	−0.047 ***	(0.012)	−0.002**	(0.001)
Male ratio	−0.003	(0.019)	0.006 ***	(0.001)
Adult ratio	−0.034	(0.031)	0.001	(0.002)
Mean education	0.005 **	(0.002)	−0.000 **	(0.000)
Cluster dummies	F (189,3505) 10.71 ***		F (189,3505) 5.36 ***	
Constant	1.329 ***	(0.080)	0.123 ***	(0.006)
Observations	3700		3700	
R-squared	0.454		0.348	
F	19.66		111.2	
r2_a	0.424		0.311	

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$.

In the unit-value equation, expenditure elasticity of quality amounted to 0.114. This means that 10% of the higher total expenditure leads to the consumption of 1.14% more expensive spirits. Considering the budget share, we could conclude that 10% of higher total expenditure causes a budget-share reduction of 0.15%.

From the above results, we could conclude that higher alcohol expenditure could potentially lead to a decrease in expenditure on other necessary goods and services. It is especially important to be aware of the crowding-out effect of spirit spending in the long term in LMICs due to its negative influence on households' already vulnerable situation [13,42,53].

Considering the number of men in households, we could conclude that the impact is significant but small. Households with more men spend a larger part of their budget on spirits. Studies for other Central and Eastern Europe countries also showed that men consume spirits more frequently, in larger quantities, and with a higher percentage of pure alcohol than women do [8,9].

In both equations, the adult ratio had no significant impact on spirit price and budget share. Finally, cluster effects confirmed the presence of spatial and time variation.

3.4. Second-Stage Regression—Price and Income Elasticity

In the second-stage regression, we used the bootstrap procedure (1000 replications) to estimate the sensitivity of demanded spirit quantity on price. Generated price elasticity equaled -0.45 ($SE_e = 0.122$, $t = -3.725$), which means that *ceteris paribus*, a 10% increase of spirit price decreases consumption by 4.5%.

Income elasticity of 0.26 means that a 10% increase in income increases consumption by 2.6%. We can conclude that income increase could partially neutralize the effect of price increase on spirit consumption [20].

3.5. Spirit and Cigarette Cross-Price Elasticity Estimation

The link between cigarette and alcohol consumption has been confirmed by a number of psychological and medical studies and significant evidence [32,33]. As we already emphasized, cigarettes represent an important harmful health factor in Montenegro along with spirits. The HBS data that we used in this research also provided us with information that a significant part of the budget share is spent on cigarettes (4.59%). The data indicating an increasing prevalence and high budget share spent on cigarettes are alarming, especially because of their potentially drastic impact on population health.

To understand the economic relation between spirit and cigarette consumption, in this part of the study we estimate cigarette own- and cigarette and spirit cross-price elasticities with respect to the price of cigarettes for households with positive spirit consumption. These estimated elasticities represent the base for policy simulations in the last part of the research. The results of own- and cross-price elasticities of spirits and cigarettes are given in Table 5.

Table 5. Own- and cross-price elasticities for spirits and cigarettes.

	Spirits—Own-Price Elasticity	sd	Cigarettes—Own-Price Elasticity	sd	Cross-Price Elasticity	sd
Total sample	−0.45 ***	−0.12	−1.10 ***	0.12	−0.17 *	0.10
Male	−0.55 ***	0.14	−1.06 ***	0.17	−0.22 *	0.13
Female	−0.5	−0.83	−1.15	−1.16	−0.26 ***	−0.07
Working age population	−0.74 ***	0.14	−1.21 ***	0.18	−0.37 ***	0.15
Low-income group *	−1.16 ***	0.10	−0.82 ***	0.23	−0.31	0.23
Middle-income group **	−0.46 ***	0.15	−1.15 ***	0.15	−0.12	0.16
High-income group ***	−0.26	273.71	−0.84	51.19	−0.81	78.74

* households below 30th percentile of expenditure distribution. ** households between 30th and 70th percentile of expenditure distribution. *** households above 70th percentile of expenditure distribution.

Considering the total sample, we can see that the own-price elasticity of demanded cigarette quantity is statistically significant and equaled -1.10 . Cross-price elasticity showed the effect of a change in the price of cigarettes on the consumption of spirits. According to the obtained results, an increase in cigarette price by 10% decreases spirit consumption by 1.7%, meaning that these are complementary goods [45–47].

To gain a clearer picture of spirit and cigarette addiction in Montenegro, analysis was divided by subgroups considering three criteria: sex, age group (15–65), and income. The reason for choosing adults aged 15–65 was to assess the impact of spirit and cigarette addiction on the working-age population. The coefficient of price elasticity for spirits and cigarettes was approximately equal for male and female, and significant only in the case of men. Spirit cross-price elasticities with respect to the price of cigarettes for both sex groups were also approximately equal and significant (-0.22 , -0.26).

The coefficient of spirit own- and cross-price elasticity in a subgroup of the working-age population was higher compared with the total sample (own elasticity of -0.74 compared to -0.45 ; cross-price elasticity of -0.37 compared to -0.17). Estimated elasticities in the working-age-population subgroup demonstrated that an increase in excise taxes could be a very efficient tool in decreasing the harmful effects of spirits and cigarettes on household-member productivity, increasing work quality and consequently contributing to the national income in Montenegro. This means that an excise-tax increase could contribute to the achievement of SDG Targets 3, 8, and 10. This information is significant for policymakers, also taking into account the results of other studies that indicate that harmful alcohol use could lead to poverty due to the loss of productivity and increase of health expenditure [5,6].

The income subgroup generated expected results, as the most price-elastic demand for spirits of -1.16 was in the most sensitive low-income group or the first 30 percentile of households ranked by their total budget expenditure. This means that an excise-tax increase could contribute to achieving SDG Target 1. The results for the middle (30–70 percentiles) and high-income (over 70 percentiles) group of spirit own-price elasticity were -0.46 and -0.26 , respectively. The least sensitive group to price changes was the high-income group, but the result is not significant. Cross-price elasticities obtained in these three groups were not significant.

3.6. Simulation of Spirit Price Changes on Excise-Tax Revenue Changes

The obtained results undoubtedly confirmed that price changes have a strong effect on the consumption of spirits and cigarettes, and therefore broader social-economic impact. The social-economic aspect is especially related to health outcomes, but also to government benefits through increased excises taxes on these goods, which is in line with SDG 17.1. Positive outcomes strictly depend on policy-change dynamics, which consequently have the main influence on price, income, and consumption. To demonstrate the positive effects of excise-tax changes, in this research, we simulate the effect of these changes on consumption and fiscal revenues. The basic assumption of the simulation model was the perfect elasticity of supply function, which means that the whole tax burden is on customers.

The simulation was based on the following assumptions:

- Spirits: 1,000,000 L;
- retail price: €20 per 1 L (average retail price was not available, and average unit value was lower than the total excise tax per liter. Therefore, it was impossible to use it as a proxy of the retail price in simulation. The next step was to find the median unit value, which was still under the total excise tax. The next value that could be an approximation of market value was €20);
- specific excise: €12.5 per 1 L [21];
- value added tax or VAT: 21% [54];
- spirit price elasticity -0.45 , income elasticity 0.26 ;
- cross-price elasticity (spirits and cigarettes) -0.17 ; and
- real GDP growth, 3.5% [55].

Calculation of the consumption change as a consequence of price and income increase can be defined as follows:

$$C_{t+1} = C_t(e_p \cdot \Delta p_c) \cdot (e_i \cdot i_g) \quad (3)$$

where C_{t+1} is the new demand, C_t is demand in year t , e_p and e_i are price and income elasticities, Δp is the percentage change of retail-price increase, and i_g is the GDP growth rate.

Consumption change was calculated by multiplying the baseline consumption of 1,000,000 litres with the sum of price and income effect. In Equation (3), the price effect represents the product of retail-price percentage change and price elasticity (-0.45), while the income effect represents a product of GDP growth (3.5%) [55] and income elasticity (0.26). The next step comprises the estimation of total excise revenue, which was derived as a product of changed consumption C_{t+1} and total excise tax.

Finally, by summing up total excise revenue and revenue from VAT, we estimated the total tax revenue from spirits. The scenario results are given in Table 6.

Table 6. Baseline scenario.

Baseline									
Alcohol Category	Consumption	Retail (€)	Tax Per Unit (€)			Net of Tax Price	Revenue Collection (€, 000)		
	Quantity (Liters, 000)	Price	Excise (Specific)	Total Excise	VAT		Total Excise	VAT	Total Tax
Spirits	1000	20	12.50	12.50	3.47	4.03	1466	404	1870

Under no changes of spirit taxes, which means that only the income effect was taken into consideration, the increase in consumption, total excise, VAT, and total tax revenues was 0.91%. Assuming that the specific spirit excise tax increased by 20%, from 12.5 to 15 per liter (according to the excise-tax calendar) [34], the price would increase by 15%, total consumption would decrease by 5.6%, and fiscal revenue would increase by 11.93%. Results are given in Table 7.

Table 7. Increase price via tax—effects on revenue and consumption.

Alcohol Category	Elasticities			Revenue Collection		
	Price	Income	Consumption (New)	Total Excise	VAT	Total Tax
Spirits	−0.45	0.26	941,041.9	€14,115,628.9	€3,759,277.5	€17,874,906.3

Additionally, if we take into consideration the effect of cross-price elasticity of −0.17 and the impact of changes in cigarette price on the consumption of spirits, estimates suggest that the specific excise on cigarette increase from €0.6 to €0.8 per pack of cigarettes [54] and ad valorem excise taxes by 2% would reduce spirit consumption by 1.2%.

4. Discussion

To test the possible positive impact of excise-tax increase on the consumption of spirits, we estimated the spirit price elasticity of demanded quantity, amounting to −0.45. In other words, an increase in price by 10% would decrease spirit consumption by 4.5%. Estimated results are in line with previously obtained results, ranging between −0.13 and −0.95 [38,44,45]. Results are similar in high-income countries and LMICs [41]. Not underestimating the use of cigarettes, which represents one more type of addiction and an obstacle for economic development in Montenegro, the cross-price elasticity of spirits and cigarettes was estimated. The results of −0.17 showed that the increase in cigarette price by 10% would lead to a spirit-consumption decrease of 1.7%, proving that these two commodities are complementary goods. These results compare favourably with estimates in other LMICs [44].

To gain in-depth insight, the study followed up with own- and cross-price elasticity estimation by subgroups considering three criteria: sex, age group (15–65), and income. The most price-elastic demand was related to the most sensitive low-income groups (−1.16). These results are consistent with many other studies [13,14] that indicate that alcohol-pricing policies could affect more disadvantaged groups than wealthier social groups. Spirit-price elasticity is significant only in the group of men, being approximately the same for both sexes (−0.5). The higher result of price elasticity was estimated in the working-age group (−0.74) compared to the total sample (−0.45). Therefore, the estimated elasticities demonstrate that the increase in excise taxes could be a very efficient tool in decreasing the harmful effect of spirits and cigarettes on household-member productivity, health, and budget [16]. Consequently, we would obtain positive effects on the national income and the country's sustainable-development progress (SDG 1, 3, 8, 10).

When it comes to about which data policymakers should be cautious, income elasticity of 0.26 implies that an income increase of 10% increases consumption by 2.6%. Estimated results are in

accordance with the results obtained in other similar studies in LMICs [42,43]. This result tells us that a living-standard increase could, to some extent, neutralize the impact of excise-tax increases, an important factor that should be taken into consideration in strategic planning of alcohol-tax policy. A strict focus on prices could be misleading, especially in the context of LMICs with rapidly expanding economies. In this group of countries, growth in income combined with aggressive marketing campaigns of branded alcoholic beverages and relatively stable or reduced alcohol price could be important drivers for an increase of alcohol affordability and consumption level.

Moreover, sustainable socioeconomic growth implies higher public revenue, which can definitely be obtained by dynamic changes in excise-tax policies (SDG 17.1). Assuming a specific spirit excise-tax increase by 20%, from €12.5 to €15 per liter, the price would increase by 15%, total consumption would decrease by 5.6%, and fiscal revenue would increase by 11.93%. Finally, a mutual positive effect could be found in cigarette-price increase whereas, due to the specific excise increase from €0.6 to €0.8 per pack of cigarettes and ad valorem excise taxes by 2%, spirit consumption would decrease by 1.2%. We conclude that taxation- and control-policy changes have great impact on the nation's health, poverty, productivity, and income, creating more sustainable socioeconomic growth. Revenue from taxes represents a valuable source of income for various government programs, especially health- and youth-targeted programs. The increasing prevalence of alcohol and cigarette use must be a sign for immediate comprehensive changes that could be put into practice in different areas such as health, education, social services, and environmental issues. Strengthening the prevention and treatment of alcohol use can decrease newborn mortality rates, injuries from road-traffic accidents (SDG 3 and 10), and domestic/public abuse (SDG 5 and 10) and other violent crimes (SDG 11 and 16).

A potential limitation of this study could be found in the fact that estimated elasticity was conditional under the assumption that prices did not impact the cessation, initiation, and reinitiation of alcohol use. This means that estimation was done on a sample of consumers with positive spirit consumption (excluding nonconsumers), whose expenditure decisions are mostly influenced by changes in price. Including the whole sample would imply the assessment of various sociodemographic and other factors besides price, on which cessation, initiation, and reinitiation depends. This estimation is beyond the scope of our study. Moreover, most previous research in this area gave estimates of price and income elasticities in a conditional setting. On the other hand, the unconditional price elasticity of spirit consumption in Montenegro is likely to be higher compared to our estimates of conditional elasticity, given the available evidence that total elasticities are often twice higher than conditional ones.

One more limitation could be found in the HBS data, which do not provide information on the consumption of domestic spirit production, as respondents did not have to pay for these goods. Hence, this consumption was not covered in our study.

5. Conclusions

The problem of increased alcohol consumption and its negative social and economic impact requires cautious global attention. This is why alcohol use is recognized as a development issue and included in the SDGs. Therefore, this study gives the first scientific results of the sensitivity of spirit consumption to price and income changes in Montenegro. This paper also fills the scientific-evidence gap of this issue for LMICs. Moreover, using elasticity estimates, we simulated the effectiveness of taxation-policy changes on consumption and public revenue. Finally, the suitability of the applied Deaton's model, in the case where market price was not available in HBS data, was verified. These facts significantly contribute to the complexity and originality of our research.

Estimated elasticities demonstrated that an increase in excise taxes could be a very efficient tool in decreasing the harmful effect of spirits and cigarettes on household-member productivity, health, and budget. Through this scientific research, we addressed some important aspects in the process of achieving SDG targets related to the adverse effects of alcohol and tobacco use. The estimated results could serve as a basis and crucial input in evidence-based policy-making in Montenegro, such as

legislative changes and compliance with EU directives. Moreover, elasticity estimation can be used to simulate the effects of excise-tax increases on public-finance sustainability.

In a broader context, the results of this research could serve as an important input for the comprehensive analysis of the causal effects of spirit- and tobacco-taxation policy on other areas of sustainability development. An extension of our research could be the estimation of unconditional elasticity comprising the issue of cessation, initiation, and reinitiation. Additionally, future research should focus on harmful-substance use in the youth subgroup.

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Abbreviations

The following abbreviations are used in the manuscript:

SDG	Sustainable Development Goals;
HBS	Household Budget Survey;
UN	United Nations;
WHO	World Health Organization;
EU	European Union;
AIDS	Almost Ideal Demand System;
CPI	Consumer Price Index;
VAT	Value Added Tax;
GDP	Gross Domestic Product;
CEFTA	Central European Free Trade Agreement;
EFTA	European Free Trade Association;
WTO	World Trade Organization.

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