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TIME TO QUIT: THE TOBACCO TAX INCREASE AND HOUSEHOLD WELFARE IN BOSNIA AND HERZEGOVINA

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ABSTRACT

Tobacco, a leading cause of death, is linked with high medical expenditures, lower life expectancy at birth, reductions in the quality of life, and other adverse effects. Tobacco taxes are considered an effective policy tool to reduce tobacco consumption and produce long-run benefits that may outweigh the costs associated with a tobacco price increase. However, policy makers avoid using tobacco taxes because of the possible regressive effects. In particular, poorer deciles across the income distribution are proportionally more negatively affected than richer ones by the extra tax burden. This paper uses an extended cost-benefit analysis to estimate the distributional effect of tobacco tax increases in Bosnia and Herzegovina. The analysis considers the effect on household income of an increase in tobacco prices, changes in medical expenses, and the prolongation of working years under various scenarios, based on data in three waves of the national Household Budget Survey. One critical contribution is a quantification of the impacts by allowing price elasticities to vary across consumption deciles. The results indicate that a rise in tobacco prices generates positive income variations across the lowest income groups in the population (the bottom 20 percent). At the same time, tobacco price increases have negative income effects among middle-income and upper-income groups. These effects are larger, the higher the income level. If benefits through lower medical expenses and an expansion in working years are considered, the positive effect is acerbated among the lowest income groups. The middle of the distribution sees the income effect turn from negative to positive, and the top 40 percent, although continuing to experience a negative effect, see the magnitude of this effect diminish. Altogether, these effects mean that increases in tobacco prices have a pro-poor, progressive effect in Bosnia and Herzegovina. These results also hold within entities and across urban and rural areas.

JEL Codes: H23, H31, I18, O15

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1 INTRODUCTION

The World Health Organization (WHO 2017a) estimates that tobacco kills more than 7 million people worldwide each year. It is the second leading cause of death and disability worldwide (Ng et al. 2014) and is among the major preventable causes of disease and premature death globally (Doll and Hill 1956; Wynder and Graham 1950). Diseases associated with tobacco use include lung cancer, stroke, ischemic heart disease, and respiratory diseases (DHHS 2004). Nearly 80 percent of the world's smokers live in low- and middle-income countries and are less likely to be informed about the adverse health effects of tobacco use relative to individuals in high-income countries. Bosnia and Herzegovina is a major consumer of tobacco, where 47.2 percent more men and 30.0 percent more women smoke than in the high–human development index (HDI) country-average (Tobacco Atlas 2018). As a consequence of high prevalence of tobacco consumption, 29.8 percent more men and 13.7 percent more women die than on average in HDI countries (Tobacco Atlas 2018).

The World Health Organization (WHO) has set the reduction of tobacco consumption as one of its primary goals. It has thus promoted the implementation of MPOWER control policies which include tobacco monitoring, smoke-free policies, smoking-cessation support programs, relevant health advice, advisory deterrents, and taxation policies (WHO 2015a). According to Levy et al. (2013), if 41 countries across the world had implemented at least one MPOWER policy advocated by WHO between 2007 and 2010, the number of smokers would have been cut by 14.8 million, and 7.4 million would have avoided death caused by smoking. Among the strategies, tobacco taxation is deemed to be one of the most efficient ways to reduce tobacco consumption. The inelastic demand of some tobacco consumers is useful for increasing tax revenues (Goodchild et al. 2016); and the higher price elasticity of younger smokers makes the tax an effective consumption deterrent (Chaloupka et al. 2002; Debrott Sánchez 2006).

The reduction of tobacco consumption in Bosnia and Herzegovina has thus become a priority not only because of the health care costs, but also as a necessity in the country's accession to the European Union (EU). Each prospective EU member is required to adjust current excise tax policies to the EU acquis communitaire. To reduce the burden on the public health system and to tackle other issues, such as productivity losses because of premature deaths and absenteeism, the government adopted an aggressive tobacco tax policy. The country now has the highest share of total and excise taxes in the average price of a pack of cigarettes globally, currently standing at 86.0 percent (WHO 2015b). The latest decision of the Office of Indirect Taxation effective from January 1, 2018, on special

and minimum excise duties and the amount of excise duties on cigarettes represents the continuation of the harmonization of excise policy with EU standards. The specific excise on the most sold brand of cigarettes is 26.7 percent of the average price, which represents an increase of 100 percent over the corresponding tax in 2010 (WHO 2017b). The ad valorem tax of 42 percent and the fixed tax of KM 1.50 per 20-cigarette pack has increased the overall tax burden (expressed as a share of average retail price) by 17 percent relative to 2010. Overall, government revenue from tobacco excise taxes (specific and ad valorem) rose from KM 449 million in 2009 to KM 808 million in 2016 (WHO 2017b) and is expected to increase further in coming years because the country is only half way to reaching the minimum EU excise duty on tobacco, which is currently KM 3.60 per 20-cigarette pack[1]. Furthermore, the government introduced health warnings on cigarette packs; advertising material was banned; and smoking is prohibited in educational, health care, and social institutions.

Even though increasing taxes on tobacco seem to be one of the most efficient measures for reducing tobacco consumption and increasing government revenue, its effectiveness largely depends on how the tax increase impacts the final price paid by consumers (World Bank, 1999). In 2009 when the Law on excise tax on tobacco and tobacco products was enacted the specific excise duty applied to the most sold brand was 13 percent while by the end of 2016 it increased to 27 percent (WHO 2017b). During the same period, the price of cigarettes increased from an average KM 2 to more than KM 4 in 2018 for the most popular cigarettes. The consolidation of tobacco market and constant and regular increase of excise duties has resulted in strong price increase of tobacco products which may have led to increased illicit trade as argued by major tobacco companies. In one of the rare studies on the illicit tobacco trade in Bosnia and Herzegovina, Joossens et al. (2009) estimate that the share of the illicit cigarette market in the country is between 35 percent and 45 percent, while more recent data of Euromonitor International (2018) suggest a share of the illicit trade in legal cigarette consumption at around 17 percent. However, Gallagher et al. (2018) have conducted a systematic review of 35 existing assessments of industry-funded data on ITT. They find that tobacco industry estimates are higher than independent estimates. Problems were identified with data collection (29 cases), analytical methods (22), and the presentation of results (21), which resulted in inflated ITT estimates or data on ITT that were presented in a misleading manner.

According to the most recent Report on the Global Tobacco Epidemic (WHO 2017b), the age-standardized prevalence of current cigarette smoking declined from 41.5 percent in 2009 to 31.6 percent in 2015.[2] A significant decrease was recorded among both genders.

[1] In U.S. dollars, government revenue from tobacco excise taxes (specific and ad valorem) rose from US$329 million in 2009 to US$435 million in 2016.

[2] Similarly, the age-standardized prevalence of daily cigarette smoking declined from 37.5 percent in 2009 to 28.1 percent in 2015.

In addition, recent estimates of the Global Youth Tobacco Survey suggest that the prevalence of cigarette use among youth (ages 13–15) declined as well, from 11.7 percent in 2008 to 11.2 percent in 2013. The decrease in prevalence can partially be attributed to the increase in the tax burden over the years. For example, in 2008, the share of GDP per capita required to purchase 2,000 cigarettes of the most popular brand was standing at 3.1 percent, while, in 2016, the share rose to 5.9 percent, indicating that cigarettes have become less affordable (WHO 2017b).

Because low-income families usually allocate a larger proportion of their budgets to purchase tobacco products, the tax increase would seem to be a regressive policy at first glance. However, the expected overall reduction in tobacco consumption associated with the tax increase would -in the long run- reduce the adverse effects of tobacco consumption, including higher medical expenditures and added years of disability among smokers, the negative effect on life expectancy at birth, reductions in the quality of life, and numerous negative externalities among first- and secondhand smokers, thus benefiting former smokers and their families. Therefore, if these indirect effects are considered, the concerns about the distributional impacts of tobacco tax policies diminish and could even no longer hold. As has been shown by Denisova and Kuznetsova (2014) and Verguet et al. (2015) for Ukraine and China, respectively, the future benefits of nonsmoking outweighs the costs attributed to tobacco taxes, especially for low income families. The increase in the tobacco tax and the subsequent reduction of tobacco consumption could therefore result in potential measurable benefits for different income groups.

The aim of this paper is to quantify the effects of tobacco taxation on incomes through three factors: (1) the tobacco price increase driven by taxes increases, (2) the reduction in medical expenses associated with averted treatment costs of tobacco related diseases, and (3) the rise in revenues because of the gain in years of employment due to extension in life expectancy. To assess the impact of these effects, this paper estimates the price elasticity of tobacco for different income groups, simulates upper- and lower-bound scenarios, and calculates the welfare gains among these various income groups.

The study is structured as follows. Section 2 reviews the literature on the health effects of tobacco, the economic costs associated with tobacco-related diseases, tobacco tax policies, and price elasticities. Section 3 presents methodology and model used to estimate the impact of the tobacco tax. Section 4 present the data and provides descriptive statistics. Section 5 examines the results. The final section concludes with a discussion on policy implications.

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2 LITERATURE REVIEW

2.1. Tobacco and health

Calculations show that close to 100 million deaths could be attributed to tobacco consumption in the 20th century (Peto and Lopez, 2004), and that if current consumption trends continue, up to 1 billion people could die from tobacco-related diseases during the present century (Jha and Peto 2014). In Bosnia and Herzegovina, more than 2,000 children (10-14 years old) and 1,053,000 adults (15+ years old) continue to use tobacco each day (Tobacco Atlas, 2018).

According to the U.S. Department of Health and Human Services, tobacco consumption is responsible or contributes to many types of cancers, respiratory problems and cardiovascular diseases. The exposure to secondhand smoke has a causal relationship with many respiratory diseases in children and adults. There are more than 4,000 chemicals in tobacco smoke (of which at least 250 are harmful and more than 50 can cause cancer). Moreover, according to the WHO (2017a), secondhand smoke is responsible for over 890,000 premature deaths worldwide. Tobacco consumption has negative consequences on human capital development and imposes an increasing economic burden because smoking decreases earnings potential and labor productivity (WHO 2015a).

Goodschild et al. (2018) find that tobacco-related diseases accounted for 5.7 percent of global health expenditure in 2012 with the highest proportion in Eastern Europe where smoking is responsible for around 10 percent of total health expenditure. The total economic costs of smoking, including health expenditure and productivity losses, were equivalent to 1.8 percent of the world's gross domestic product (GDP) (US$1.85 trillion in purchasing power parity U.S. dollars). The highest share, according to these authors, was in high-income countries (US$1.12 trillion in purchasing power parity dollars), where the tobacco epidemic is the most advanced. The economic burden of smoking is highest in Eastern Europe where the costs related to smoking amount to 3.6 percent of GDP. Estimates on Bosnia and Herzegovina suggest that total economic costs attributable to smoking constitute 3.4 percent of GDP (US$1.2 billion in purchasing power parity dollars). In addition, the authors estimate that smoking-attributable health expenditure that includes the direct costs incurred in a given year (for instance, hospitalization and medications) and indirect costs, representing the value of lost productivity in current and future years because of disability and mortality, is equal to 7.5 percent of total health expenditure in Bosnia and Herzegovina.

Tobacco price increases are also associated with expansion in productive life years. Verguet et al. (2015) analyze the health effects of a price increase in China. Their research concludes that a 50 percent rise in prices would result in 231 million years of life gained over 50 years, with a significant impact in the lowest income quintile. For Russia, Maslennikova et al. (2013) estimate that if taxes were increased to 70 percent of retail price along with other policies like banning smoking in public places, 3.7 million tobacco-related deaths would be averted, even without considering the effects of second hand smoking. Goodschild et al. (2018) estimated that in 2012 number of labour years lost due to smoking-attributable diseases came to 26.8 million years, with 18.0 million years lost due to mortality and 8.8 million years lost due to disability.

2.2. Tobacco control policies

Globally, antitobacco policies include prohibiting smoking in particular locations to establish completely smoke-free environments, advertising to deter tobacco use, restrictions on tobacco sales by age, smoking cessation programs, prohibitions on tobacco sales close to schools, and taxation. These various policies have produced diverse effects in tobacco use and exposure among populations. For instance, the most common policy is related to mass media campaigns. In 2016, such campaigns addressed 56 percent of the world's population. However, people in low-income countries are less likely to be exposed to these campaigns and there is limited information about the cost effectiveness of this approach (WHO, 2015a). Durkin, Brennan, and Wakefield (2012) conclude that mass media awareness programs could promote quitting; however, their impact depends on the duration of the campaigns, especially among low-income smokers. It also depends on the message; information about the adverse health risks of smoking represents the most efficient means to reach users. Another common way to discourage tobacco consumption is through health warning labels on tobacco packages. In 2016, almost 45 percent of the world's population was being exposed to such labelling. They are on the most cost-efficient means to discourage tobacco consumption and are widely supported by public (WHO 2015a).

In Bosnia and Herzegovina, there are currently no laws prohibiting smoking in public places. Designated smoking rooms with strict technical requirements are allowed in all indoor public places under the current legislation of both the Federation of Bosnia and Herzegovina (Law on amendments to the Law on the limited use of tobacco products, 2011) and the Republika Srpska (Law on amendments to the Law on the prohibition of smoking tobacco products in public places, 2009). Cessation services are available in both entities and health insurance fully cover the costs. Nicotine replacement therapy is also available and can be purchased over the counter, but it is not on the essential drug

list and therefore is not covered by health insurance. Tobacco laws also mandate that health warning appear on every package and any outside packaging and labelling used in the retail sale and describe the harmful effects of tobacco use on health. The laws have enforced bans on five of seven forms of direct advertising, and it also bans appearances of tobacco brands on television or films.

2.3. Tobacco taxes

Tobacco taxation is considered one of the most efficient measures to reduce tobacco consumption (World Bank, 1999). Therefore, by imposing an excise tax the government aims to correct a negative externality such as health risk associated with tobacco consumption and reduce exposure to second hand smoke. Apart from putting a price to tobacco consumption the aim of so called Pigouvain tax is to raise revenues which may then be used to lower taxes elsewhere or to finance the necessary prevention and control of cigarette-related diseases.

Levy et al. (2014) have associated price increases with significant declines in tobacco consumption. They estimate that higher taxes are responsible for almost 50 percent of the decline in smoking. The effects of these policies mainly depend on the type of taxes (ad valorem and specific excise taxes). Ad valorem taxes are based on a percentage of the retail price. This type of tax tends to widen price differences between cigarette brands, making expensive brands relatively more expensive. However, tobacco companies can lower the tax burden by keeping prices low. For this reason, the levels of consumption and the amount of government tax revenue depend on the industry pricing strategy. Alternatively, specific excise taxes can be used by adding a fixed, monetary tax to every cigarette, regardless of its baseline price. It reduces price differences between brands, benefitting manufacturers of more expensive cigarettes. Specific tobacco excise represents a more efficient for tobacco control purpose as it increases cigarettes prices relatively more than ad valorem taxes (IARC, 2011). However, they must be adjusted periodically for inflation to accomplish their mission as otherwise specific taxes may decline over time in real terms. The taxation system in Bosnia and Herzegovina uses both type of taxes.

The Law on Excise Duties in Bosnia and Herzegovina came into force in 2009. Initially, the tax base for specific and ad valorem taxes was the most popular brand of cigarettes sold in the country. However, an amendment to the law that came into effect in 2014 (*Official Gazette* 49/14) changed the tax base to the weighted average price of cigarettes. The latter is calculated as the total value of all cigarettes released for consumption, based on the retail selling price including all taxes, divided by the total quantity of cigarettes released for consumption. Under the Law on Excise Duties, duty on tobacco products is

to be paid at the rate of 42 percent on the tax base, plus a special duty depending on the number of cigarettes—per 1,000 or per pack of 20 cigarettes—determined by Governing Board of the Indirect Taxation Authority. The latter is introduced to ensure the dynamics of harmonization of the excise rate with the relevant European directives. Under the amended law which came into effect in 2014, the Governing Board of the Indirect Taxation Authority will increase the specific tax until total excise tax burden reaches KM 176 per 1,000 cigarettes. In addition, minimum yearly increase cannot be lower than KM 7.50 per 1,000 cigarettes. According to latest decisions adopted in October 2018 ("Official Gazette", No. 75/18) defines that the following excise tax will be paid effective from 1st January 2019:

- Proportional excise duty at the rate of 42 percent of the retail weighted average price of cigarettes (KM 4.76)
- The specific excise duty of KM 82.50 per 1,000 cigarettes (KM 1.65 per pack of 20). In addition, minimal excise duty is determined in the amount of KM 143 per 1,000 cigarettes.

2.4. Price elasticities of tobacco consumption

The effectiveness of tax increases on cigarette consumption is mainly determined by cigarette price elasticity. The magnitude of price elasticity is central in calibrating the effect of tobacco taxation systems because it determines the sensitivity of demand to a change in tobacco prices. There is extensive research on the price elasticity of tobacco.

In low- and middle-income countries, a 10 percent increase in prices of cigarettes is associated with an average 6 percent reduction in cigarette consumption (IARC 2011). The higher price elasticity of young people makes taxes a good way to fight tobacco. Institutions such as IDB (2011), WHO (2008), The International Agency for Cancer Research (IARC 2011), the World Bank (1999) and authors such as Yeh et al. (2017) showed that a rise of 10 percent in the price of cigarettes would significantly reduce cigarette consumption as well the total death toll caused by smoking in the EU, but would be most effective in countries where GNI per capita is below US$5,500, such as Bulgaria and Romania, where the price elasticity of demand is the highest.

Chaloupka et al. (2010) reported the price elasticity of cigarettes demand was in the range from -0.25 to -0.5 after revising more than 100 studies from industrialized countries. Consumption reduction was larger in low- and middle-income countries. Chaloupka and Grossman (1996) and Lewit and Coate (1982) estimate the elasticity among the under-18 population in the United States at between –1.44 and –1.31 and, among adults ages 18 years or older, at between –0.27 and –0.42. Gallus et al. (2006) estimate a price elasticity of

−0.46 for 52 countries in Europe. Denisova and Kuznetsova (2014) estimate price elasticities in Ukraine by income deciles, ranging from −0.44 for the lowest income group to −0.11 for the highest. Fuchs and Meneses (2017) also estimate decile-level price elasticities in Ukraine and find a higher average price elasticity (−0.45), ranging from −0.33 for the richest income group and −0.59 for the poorest. For India, cigarette price elasticities have been estimated for different income groups, including −0.83 and −0.26 for the lowest and highest income groups, respectively (Selveraj et al., 2015).

Among several factors, there are two important ones involved in determining tobacco price elasticities, namely, income and age. People in lower-income groups tend to change consumption behavior more given a change in price, that is, they have more elastic demands, relative to higher-income groups (Jha and Chaloupka 2000). At the same time, younger groups in populations are more responsive to tobacco price increases because on average they tend to be less nicotine dependent, more affected by peer effects, and possess less disposable income. Hence the importance of the increase in tobacco prices (through taxes) to reduce tobacco consumption among the younger groups of the population. Studies have also shown that there are geographical variations in smoking behavior (Idris et al. 2007). In Eastern European countries, such as Slovenia, Romania, and Slovakia, tobacco prevalence in rural and remote areas is higher than in urban areas whereas in Western European countries, such as Germany, Sweden, Finland and Denmark, the opposite has been reported (Idris et al. 2007).

This paper will take advantage of the extensive literature analyzing the health effects of tobacco, public policies, and price elasticities on the international level discussed above to analyze the potential changes in household welfare induced by an increase in tobacco taxes, as there is little empirical evidence on Bosnia and Herzegovina.

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3 MODEL

The impact of increasing tobacco taxes in Bosnia and Herzegovina is estimated using an extended cost-benefit analysis as in other recent studies conducted in Eastern Europe and other regions of the world (Fuchs and Meneses 2017; Pichón-Riviere et al. 2014; Verguet et al. 2015). The paper analyzes three factors to estimate how tobacco taxes could affect household income. First, assuming tobacco consumption does not change, tobacco taxes directly affect household income as the share of household budgets allocated to tobacco purchases increases with the tax rise. Second, household medical expenses could decrease as a result of reduced tobacco consumption. Households might also experience a positive income change because of additional years of labor recovered through the extension of life expectancy. The aggregate effect of a tax policy is estimated as follows:

$$\text{Income effect} = \underbrace{\text{change in tobacco expenditure}}_{\text{(A)}} + \underbrace{\text{lower medical expenses}}_{\text{(B)}} + \underbrace{\text{rise in income}}_{\text{(C)}} \qquad (1)$$

For the first effect, a partial equilibrium approach is used, so that the impact on consumption because of an increase in the price of cigarettes is simulated. This approach is used to evaluate the first-order effects of a change in prices. It relies mainly on household expenditure patterns. The simulation allows for differences in the responses across consumption deciles to reflect the fact that poor households likely have different price elasticities relative to households with more resources. The different elasticities, combined with the initial consumption patterns across deciles, explain whether a price reform will be more regressive, more neutral, or more progressive.

The loss of real consumption arising from the price increases in a product i is obtained as follows:

$$\left(\omega_{ij} + \Delta\omega_{ij}\right) * \frac{\Delta p_i}{p_{i,o}}, \qquad (2)$$

Where ω_{ij} is the share of product i in total household expenditure for a household in a decile j; Δp_i is the price increase; and $\Delta\omega_{ij}$ is the change in the consumption of the good that depends on the price elasticity of the product.[3]

3.1. Change in tobacco expenditure

To estimate the variation in cigarette consumption after the price increase, the model considers the change in prices (Δp_i), the tobacco price elasticity (ε_j) for decile j, and the share of cigarette expenditure in period 0 (ω_{ij}). The change in expenditure for each

[3] For a detailed discussion of the methodology, see Coady et al. (2006); Kpodar (2006).

household in each decile is presented as a share of total expenditure and averaged by decile to quantify the overall impact, as follows:

$$\Delta\ \text{Expenditure}_{i,j}=((1+\Delta P)(1+\varepsilon_j * \Delta P)\text{-}1)*\frac{\omega_{ij0}}{\text{Total expenditure}_{j0}} \quad (3)$$

3.2. Medical expenses

The change in medical expenses from tobacco-related diseases is estimated using equation (4), where the cost of treatment of tobacco-related diseases for income decile i is obtained from administrative data. The cost of tobacco-related medical expenses is distributed across income decile i according to the share of households that consume tobacco in decile i. Equation (4) shows the income gains associated with the reduction of medical expenses because of reduced tobacco consumption in the long term.

$$\Delta\ \text{Medical expenditure}_{i,j}=((1+\varepsilon_j * \Delta P)\text{-}1)*\frac{\text{Cost Treat.Tobacco Related Diseases}_i}{\text{Total expenditure}_{j0}} \quad (4)$$

A reduction in tobacco consumption in the long run would be strongly related to a reduction in tobacco-related diseases. The model assumes that the health effects of tobacco-related diseases will immediately diminish with the reduction in tobacco consumption. Even though this assumption is implausible in the short term because changes in the effects if tobacco-related diseases take some time to materialize, it provides an upper-bound estimate of the effects of tax increases.

3.3. Increase in years of working life

Finally, the model estimates the impact on income arising from the increase in working years (equation 6). To estimate the increase in working years, the years of life lost (YLL) from tobacco-related diseases are distributed across deciles (i) proportionally to the number of households that consume tobacco (equation 5). Subsequently, the income lost is estimated as the average income per household in decile i. Overall, the model anticipates that income will increase as the number of years lost because of premature deaths from tobacco consumption decline.

$$Working\ Years_i = \frac{YLL_i * Share\ of\ Smokers_i}{Population_i} \quad (5)$$

$$\Delta\ \text{Income}_i=((1+\varepsilon_j * \Delta P)\text{-}1)*\frac{\text{Working Years}_i * \text{Total Expenditure}_i}{\text{Total expenditure}_i} \quad (6)$$

Lastly, the total income gains in each income group are estimated by adding the results of the increase in tobacco expenditures, the reduction in medical treatments, and the gain in working years (equation 1).

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4 DATA AND DESCRIPTIVE STATISTICS

Data on household consumption and expenditure on tobacco products in Bosnia and Herzegovina come from three waves of the Household Budget Survey (2007, 2011 and 2015). The survey covers consumption expenditure information on a range of commodities including tobacco products, using a 14-day reference period. It also collects household characteristics such as age, gender and educational qualifications. The advantage of surveys is that one may detect the price paid by consumers and account for promotions and sales. However, the price paid is not independent of the characteristics of the buyers, for instance, as heavy smokers may consume cheaper brands, buy greater quantities, shop at lower-priced retailers, or engage in tax-avoiding behaviors (WHO 2011). In addition, the accuracy of the responses depends on the ability of household head to accurately respond on questions about expenditure by other household members. Despite these shortcomings, the use of household surveys to calculate price elasticities is a common practice in both developed and developing countries (Fuchs and Meneses 2018).

In Bosnia and Herzegovina, the Household Budget Survey does not contain data on prices of tobacco products. Therefore, an indirect method using unit values is used. The Household Budget Survey in Bosnia and Herzegovina asks households "how much [was] spent in the last 14 days on cigarettes and tobacco" and, "how many packages of cigarettes [were] purchased during the 14-day period." These questions allow an estimate of the average price paid by household at three different points in time and to estimate individual price elasticities.[4] Outliers are eliminated for each year that are three standard deviations from the mean under the assumption that these purchases tend to reflect data problems. Once a measure of the price of cigarettes in Bosnia and Herzegovina is obtained, the tobacco price elasticities for the total population is estimated using the following equation:

$$\ln Q_{id} = \beta_0 + \beta_1 lnP * D_i + \beta_3 X_{id} + \mu_{id} \qquad (7)$$

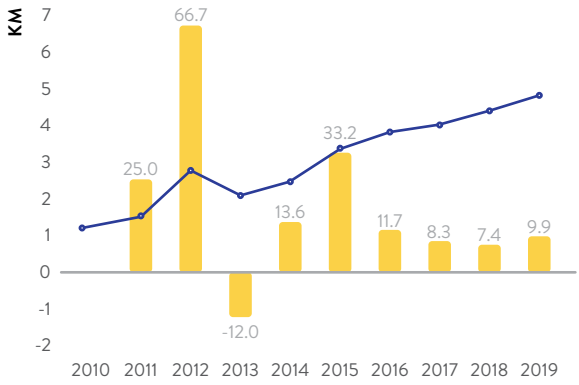
where Q_{id} is the quantity of cigarette packs smoked per month by household head i in income decile d; P the average monthly price of cigarette pack (both imported and domestic); D_i the consumption decile of individual i; X_{id} the individual characteristics (age, education, location, gender).

[4] The purchased quantity of cigarettes and total expenditure on cigarettes during 14-day period are converted to monthly terms. Cigarette prices are obtained by converting nominal monthly expenditure on cigarettes to real monthly expenditure using national monthly CPI index. Each pack of cigarettes is expressed in 2010 prices.

4.1. Descriptive statistics

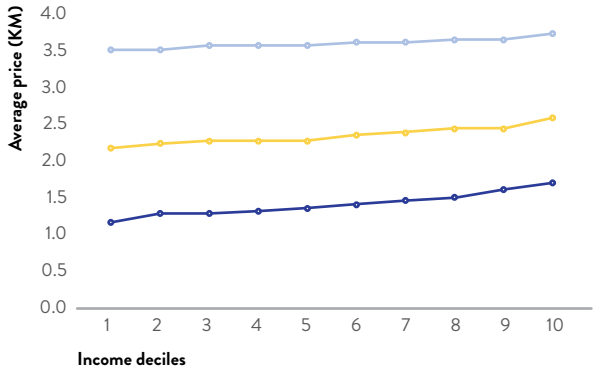
Figure 1 presents trends in cigarette prices in Bosnia and Herzegovina in 2009, when the Law on Excise Duties on cigarettes was introduced. Over the years, one can see a clear upward trend in the prices which is mainly caused by constant increase in the excise burden that on average accounts around 76 percent of the retail price.

Figure 1. Trends in cigarette prices, Bosnia and Herzegovina



Source: Calculations based on official data of the Indirect Taxation Authority.

Figure 2. Average price paid by households for a 20-cigarette pack



Source: Calculation based on the Household Budget Survey.

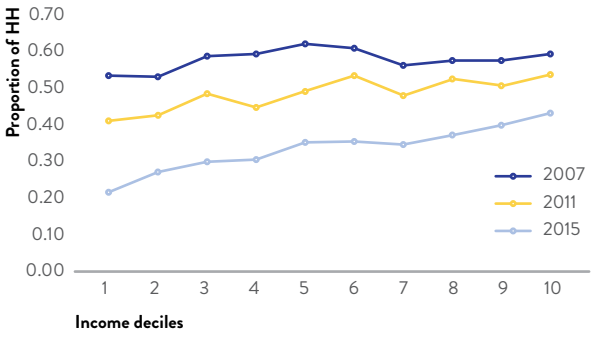
Note: Deciles were created using per capita household expenditure.

Figure 2 shows variation in average cigarette (domestic and imported) prices over time and income deciles. While there is no significant variation of cigarette prices across deciles, the prices obtained from the Household Budget Survey follow the same trend as those reported by official statistics in Figure 1, albeit lower on average. These differences are likely caused by household recall error and the way how prices are calculated in the Household Budget Survey. Because prices in the Household Budget Survey are calculated by using household expenditure on cigarettes it may also account for illicit trade, therefore underestimating the proportion of income aimed at cigarette consumption and resulting in lower prices. In addition, the Household Budget Survey does not report cigarette prices by brand, and therefore the differences across income deciles may be underestimated as well.

Table 1 summarizes the most important indicators, including total monthly household expenditures and the share of expenditures on smoked tobacco products for year 2015. The share of households using tobacco products is more prevalent among higher income families (47 percent in the highest decile vs 33 percent in the lowest income decile). On average, households spend 6 percent of their income on tobacco. For instance, the lower income households spend slightly more on tobacco (7 percent) relative to 5 percent in higher income households. When looking at monthly mean per person consumption, it is clear that higher income households spend three times more on tobacco and cigarettes consumption. This indicates that higher incomes households choose more expensive products although their consumption of cigarettes is very similar to lower income deciles. In addition, higher income deciles prefer cigarettes consumption over other types of tobacco products such as cigars or leaf tobacco.

Figure 3 reports the proportion of households smoking cigarettes over the analyzed period. The reported numbers suggest that tobacco control policies, especially taxation policies have had an impact on consumption of cigarettes across all income deciles, especially for lower income households. Similarly, Figure 4 suggests that the overall share of cigarette consumption in total household consumption has decreased over time as well.

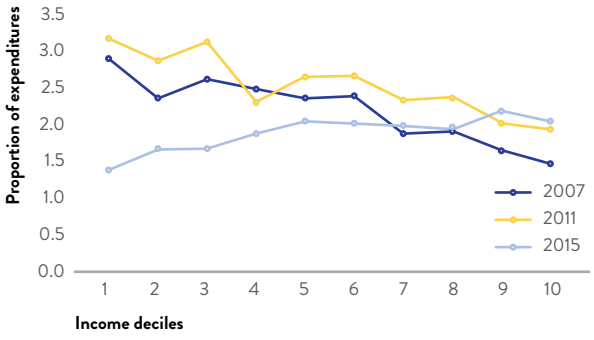
Figure 3. Households with Cigarette Consumption



Source: Calculations based on the Household Budget Survey.

Note: Deciles were created using per capita household expenditure.

Figure 4. Share of Cigarette Expenditures in Total Household Consumption



Source: Calculations based on the Household Budget Survey.

Note: Deciles were created using per capita household expenditure. The proportions of cigarette consumption are calculated for all households, regardless of cigarette consumption.

Table 1. Baseline Descriptive Results, by Decile

INDICATOR	DECILE 1	DECILE 2	DECILE 3	DECILE 4	DECILE 5	DECILE 6	DECILE 7	DECILE 8	DECILE 9	DECILE 10	AVERAGE
Household per capita monthly expenditure (US$)	81	122	150	175	202	235	274	325	405	687	298
Household total monthly expenditure (US$)	309	456	526	561	613	694	740	834	977	1343	760
Proportion of households smoking cigarettes	0.21	0.26	0.29	0.30	0.35	0.35	0.34	0.37	0.40	0.43	0.34
Proportion of households smoking all tobacco products	0.33	0.38	0.38	0.38	0.44	0.43	0.40	0.44	0.45	0.47	0.42
Proportion of expenditure on cigarettes	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06	0.05	0.06
Proportion of expenditure on all tobacco products	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.05	0.06	0.05	0.06
Amount spent on cigarettes (US$/month)	22	34	34	36	40	43	48	50	56	62	46.64
Amount spent on all tobacco products (US$ /month)	23	34	33	36	39	43	47	48	56	61	45.19
Cigarettes smoked in the last seven days (only smokers)	76	90	91	84	92	91	92	94	97	106	93
Age when started to smoke	19	19	19	19	20	20	20	19	20	20	20
Household size	3.93	3.80	3.51	3.23	3.01	2.97	2.72	2.57	2.41	2.05	3.09
Proportion of households with woman head	0.22	0.18	0.18	0.20	0.22	0.25	0.27	0.32	0.31	0.36	0.26
Proportion of households with higher educational attainment	0.04	0.04	0.06	0.06	0.08	0.10	0.12	0.15	0.18	0.29	0.13
Prop. Urban area	0.29	0.34	0.33	0.37	0.38	0.42	0.46	0.47	0.51	0.59	0.43

Source: Estimates based on 2015 version of the Household Budget Survey.

Note: Deciles created using per capita household expenditure. The proportions of cigarette/tobacco consumption and expenditure levels/shares are calculated only for households reporting positive cigarette/tobacco consumption.

4.2. Tobacco price elasticity, by decile

Table 2 shows the tobacco price elasticity across income deciles across countries. It is evident that in all countries reported, the elasticity estimates are larger for lower income deciles suggesting higher price elasticity for those income groups.

Table 2. Cross-Country Elasticity Estimates, by Decile

	1	2	3	4	5	6	7	8	9	10
Bangladesh	−0.81	−0.66	−0.63	−0.57	−0.47	−0.42	−0.42	−0.32	−0.30	−0.25
Chile	−0.64	−0.58	−0.52	−0.47	−0.41	−0.35	−0.29	−0.24	−0.18	−0.12
Indonesia	−0.64	−0.59	−0.55	−0.53	−0.52	−0.50	−0.49	−0.48	−0.47	−0.46
Moldova	−0.51	−0.39	−0.40	−0.34	−0.32	−0.32	−0.32	−0.25	−0.24	−0.26
Russian Federation	−0.48	−0.41	−0.38	−0.34	−0.32	−0.31	−0.29	−0.26	−0.25	−0.21
South Africa	−0.36	−0.26	−0.24	−0.31	−0.34	−0.17	−0.24	−0.21	−0.13	−0.22
Ukraine	−0.59	−0.51	−0.52	−0.46	−0.44	−0.43	−0.42	−0.41	−0.36	−0.33

Source: World Bank.

In the case of Bosnia and Herzegovina, the average price elasticity reported in Table 3 is -0.56 which is higher than other estimates obtained for Ukraine and Moldova (Fuchs and Meneses, 2017; 2018) and those reported in Table 2. However, there are not far from those estimated by Chaloupka et. al. (2010) for low and middle-income countries. As expected, lower income deciles exhibit higher elasticities relative to richer deciles. For instance, the poorest decile has a medium-bound elasticity of –1.08, whereas the richest has an elasticity of –0.34.

Table 3. Cigarette Price Elasticities, by Decile

PRICE ELASTICITY	1	2	3	4	5	6	7	8	9	10	NATIONAL
Lower bound	−1.182	−0.970	−0.773	−0.784	−0.681	−0.656	−0.606	−0.530	−0.530	−0.402	−0.603
Medium bound	−1.081	−0.871	−0.687	−0.700	−0.604	−0.580	−0.532	−0.461	−0.461	−0.336	−0.557
Upper bound	−0.980	−0.773	−0.602	−0.615	−0.527	−0.504	−0.458	−0.392	−0.392	−0.271	−0.511

Source: Estimates based on the Household Budget Survey 2007, 2011, 2015.

Note: Deciles were created using per capita household expenditure. Lower- and upper-bound elasticities show average differences of –0.2 and +0.2, respectively, with the medium-bound elasticity.

To show the effect of different scenarios, a lower-bound elasticity and an upper-bound elasticity are simulated. Lower-bound elasticity tends to reflect income groups that would not change consumption patterns, such as rural residents or older individuals, while the upper-bound elasticity tends to show a longer-term scenario, reflecting the effect the tobacco tax would have on younger individuals. After a few decades, only these would still

be alive; the total average effect of the price increase would therefore be approximated more accurately by the upper-bound price elasticity.

Table 4. Deaths, by Gender, Illnesses Related to Tobacco Consumption, Bosnia and Herzegovina, 2015

	WOMEN	MEN	TOTAL
Cerebrovascular diseases	2,670	1,999	4,668
Ischaemic heart disease(s)	2,092	2,533	4,626
Lung cancer	406	1,212	1,618
Chronic lower respiratory diseases	312	466	778
Stomach cancer	200	329	530
Pulmonary heart disease and diseases of pulmonary circulation	215	216	431
Influenza and Pneumonia	175	197	372
Pancreatic cancer	143	213	356
Leukemia	99	105	204
Bladder cancer	48	146	194
Kidney cancer	48	89	137
Esophagus cancer	22	43	65
Uterus cancer	27	0	27
Tongue cancer	3	19	22
Other forms of heart disease	3,410	2,611	6,021
Other respiratory diseases	94	116	210
Other acute lower respiratory infections	3	3	6
Total	**9,967**	**10,300**	**20,267**

Source: Institute of Public Health, Federation of Bosnia and Herzegovina.

Note: Data for Bosnia and Herzegovina are obtained by dividing estimates for the Federation of Bosnia and Herzegovina by the share of the country's population in the Federation of Bosnia and Herzegovina.

4.3. Mortality and morbidity

Data on mortality used in the estimations are obtained from Tobacco Atlas (2018) based on the methodology developed by the Global Burden of Disease (GBD).[5] Estimates for 2015 indicate that 8,725 deaths were caused by tobacco-caused diseases. For illustrative and comparative purposes, detailed data obtained from the Institute of Public Health of the

[5] GBD estimates are based on over 80,000 different data sources and therefore may differ from national statistics due to differences in data sources and methodology.

Federation of Bosnia and Herzegovina are presented on a number of illnesses associated with tobacco consumption, but which also include deaths resulting from other causes (for example, cerebrovascular diseases could also be caused too by high blood pressure, diabetes, or high blood cholesterol). For this reason, the estimates reported in the Tables 4 and 5 are higher than the ones coming from the Tobacco Atlas. The illness-level mortality and morbidity rates estimates for Bosnia and Herzegovina are obtained assuming that the Republika Srpska incidence is proportional to the population. The data are disaggregated according to the gender of the deceased. According to these calculations, in 2015, approximately 20,267 deaths were attributed to the illnesses associated to tobacco consumption (Table 4) of which 10,300 were men. Ischemic heart disease, other forms of heart disease and cerebrovascular diseases are among the most prevalent forms. Similarly, more than 287 thousand cases for the illnesses associated to tobacco consumption were reported in Bosnia and Herzegovina the same year (Table 5).

Table 5. Events, by Age-Group, Illnesses Related to Tobacco Consumption, Bosnia and Herzegovina, 2015

	15–18	19–64	65+	TOTAL
Chronic lower respiratory diseases	3,278	28,431	22,822	54,531
Other forms of heart disease	216	23,882	28,383	52,482
Ischaemic heart disease(s)	57	24,098	23,377	47,533
Influenza and Pneumonia	4,280	27,755	10,814	42,849
Other acute lower respiratory infections	5,779	22,539	8,855	37,173
Cerebrovascular diseases	24	7,020	9,765	16,809
Other diseases of upper respiratory tract	2,449	9,122	4,037	15,608
Other respiratory diseases	1,157	5,817	3,523	10,497
Pancreatic cancer	14	1,997	1,940	3,951
Lung cancer	2	1,050	850	1,901
Bladder cancer	2	741	839	1,582
Leukemia	24	776	579	1,380
Stomach cancer	0	406	364	770
Uterus cancer	0	434	277	711
Total	**17,282**	**154,070**	**116,424**	**287,776**

Source: Institute of Public Health, Federation of Bosnia and Herzegovina.

Note: Incidence is defined as the number of new cases of a given disease during a given period in a specified population. It is also used for the rate at which new events occur in a defined population. It is differentiated from prevalence, which refers to all cases, new or old, in the population at a given time. Data for Bosnia and Herzegovina are obtained by dividing estimates for the Federation of Bosnia and Herzegovina by the share of the country's population in the Federation of Bosnia and Herzegovina.

4.4. Tobacco-related medical costs

After producing estimates of the deaths and other events related to tobacco, the study examines the medical costs of treatments of tobacco-related diseases. Data on these costs are obtained from official Republika Srpska sources. To estimate medical costs for the entire country, the following steps outlined in box 1 have been undertaken to approximate the costs reported in Table 6.

Box 1. Estimating Tobacco-Related Medical Costs, Bosnia and Herzegovina

1. The cost of treating the diagnoses associated with the use of tobacco in Republika Srpska was divided by the total costs of curative treatment in Republika Srpska as reported in national health accounts.
2. The ratio obtained in the first step was then used to obtain the equivalent costs for the Federation of Bosnia and Herzegovina by multiplying the former by the total costs of curative treatment for the Federation of Bosnia and Herzegovina obtained from national health accounts.
3. Once the costs were obtained for the Federation of Bosnia and Herzegovina and Republika Srpska, these were added together to obtain the total cost of the treatment of diseases related with tobacco consumption.

Because data for Republika Srpska show the distribution of costs according to diseases, these costs could also be approximated for the Federation of Bosnia and Herzegovina by carrying out additional steps, as follows:

4. The associated costs for each disease in Republika Srpska are divided by the total costs related to tobacco treatment for men and women separately.
5. After obtaining corresponding ratios for each disease, these were added up to obtain total shares for each gender separately.
6. The total ratios by gender (74 percent for men and 26 percent for women) are then multiplied by the costs related to tobacco treatment for the Federation of Bosnia and Herzegovina obtained in step 2 (KM 57,296,290) to obtain the total costs for each gender.
7. In the final step, the corresponding ratios for each disease in Republika Srpska are multiplied by the total costs for men and women in the Federation of Bosnia and Herzegovina.

Annual direct health care costs attributable to the treatment of health problems related to tobacco use in Bosnia and Herzegovina in 2015 amount to US$51 million, of which more than two-thirds are related to medical treatments among men. Most medical costs can

be attributed to the treatment of Ischaemic heart disease(s), other forms of heart diseases and cerebrovascular diseases which are also the major cause of death reported in Table 3. It is worth noting that the medical costs reported in Table 3 are related to treatment of diagnosis related to tobacco use and do not take into account additional cost estimates of cytostatic, specific drugs, and biological therapies associated with the use of tobacco and tobacco products. If these extra costs are included, the total medical costs of tobacco use amount to US$60.5 million.[6]

Table 6. Medical Cost of Treatment of Tobacco-Related Diseases (KM), 2015

	MEN	WOMEN	TOTAL
Ischaemic heart disease(s)	14,155,628	4,354,722	18,510,350
Cerebrovascular diseases	9,395,247	5,393,228	14,788,475
Influenza and Pneumonia	6,008,061	2,129,306	8,137,367
Lung cancer	5,360,088	951,297	6,311,385
Chronic lower respiratory diseases	3,279,764	1,134,855	4,414,618
Leukemia	2,824,143	1,085,343	3,909,485
Stomach cancer	1,708,732	388,360	2,097,093
Bladder cancer	1,405,250	271,243	1,676,493
Pancreatic cancer	1,051,805	498,696	1,550,501
Pulmonary heart disease and diseases of pulmonary circulation	973,576	550,168	1,523,745
Kidney cancer	663,524	159,503	823,027
Esophagus cancer	229,175	20,213	249,388
Tongue cancer	170,153	33,697	203,849
Uterus cancer	-	11,312	11,312
Other forms of heart disease	12,948,611	5,169,431	18,118,042
Other respiratory diseases	4,234,399	1,374,626	5,609,025
Other diseases of upper respiratory tract	2,208,568	487,384	2,695,952
Other acute lower respiratory infections	1,225,030	184,802	1,409,833
Total (KM)	**67,841,754**	**24,198,186**	**92,039,940**
Total (US$)	**37,664,754**	**13,434,480**	**51,099,234**

Note: Calculations based on official statistics of Republika Srpska and the Federation of Bosnia and Herzegovina.

[6] Because these extra costs are only available for Republika Srpska, the procedure outlined in box 1 is followed to obtain costs for the Federation of Bosnia and Herzegovina. The extra medical costs associated with the use of drugs to treat tobacco-related diseases amount to US$9.4 million.

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5 RESULTS

To investigate the distributional effects of an increase on tobacco taxes, the effects on prices, medical expenditures, and years of working life were estimated, aggregating these three into a single measure. The price elasticities estimated in Table 3, including the lower- and upper-bound elasticities, facilitate an understanding of how the results could change under different assumptions.

5.1. Tobacco price increase

Income changes that arise from an increase in tobacco prices are estimated for each decile based on low, medium-, and upper-bound elasticities. Using the price elasticities and the share of household expenditure on tobacco by decile, one may simulate the effects of an increase in tobacco prices. To show the effect of the elasticities on prices, Table 7 also includes estimates of a complete pass-through scenario, whereby the increase in prices is completely transferred to consumers without a reduction in consumption. For instance, if one assumes that the prices for tobacco products rose by 25 percent (in line with price growth between 2015 and 2018), given the medium-bound elasticity for cigarettes in the bottom decile (–1.08) in Table 3 and the proportion of cigarettes expenditures in the bottom decile (7 percent) in Table 1, the expected increase in household expenditures would be 0.13 percent (Table 7). This represents a rise in welfare because consumers would react strongly to price increases and therefore devote a smaller share of their incomes to purchasing the same amount of tobacco, thereby augmenting the consumption of other goods. The results for all income deciles and elasticity scenarios are shown in Table 7. Across all scenarios, the direct effects after the second income deciles is a welfare loss, but, in none of the cases, does the shock seem to be regressive. In contrast, the effect of

Table 7. The Direct Effect of Price Increases through Taxes, by Decile (%)

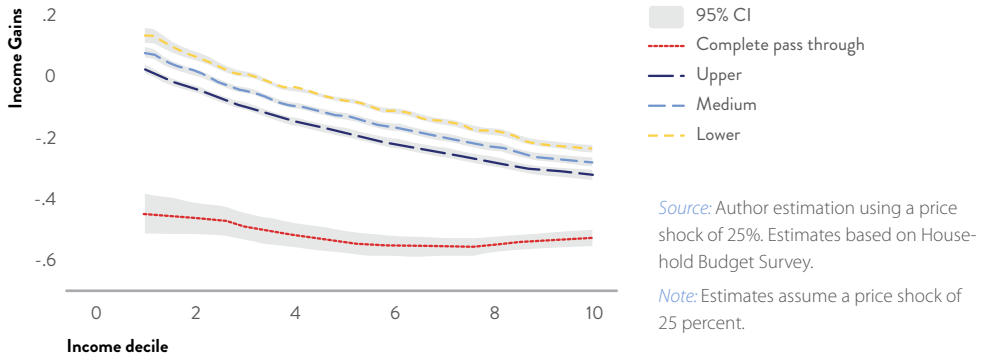
	DECILES									
PRICE SHOCK SCENARIO +25%	1	2	3	4	5	6	7	8	9	10
Complete pass-through	−0.37	−0.47	−0.45	−0.47	−0.56	−0.53	−0.54	−0.53	−0.55	−0.48
Low-bound elasticity	0.17	0.10	−0.02	−0.01	−0.08	−0.09	−0.13	−0.18	−0.19	−0.24
Medium elasticity	0.13	0.04	−0.06	−0.06	−0.14	−0.14	−0.18	−0.22	−0.23	−0.28
Upper-bound elasticity	0.08	−0.02	−0.11	−0.11	−0.19	−0.19	−0.23	−0.27	−0.28	−0.32

Source: Estimates based on the Household Budget Survey.

Note: The table shows the share of total consumption for each decile. Complete pass-through refers to elasticity equal to zero; consumers pay all the increased prices, and this does not affect the quantity purchased.

a price rise is relatively progressive, that is, it affects upper-income groups (the last two deciles) in a larger proportion. In the complete pass-through scenario, the price shock is also progressive, that is, the negative effects are still smaller among lower-income groups than among high-income groups.

Figure 5. Income Gains: Direct Effect of Tobacco Taxes (Change in expenditure because of tobacco taxes)



Source: Author estimation using a price shock of 25%. Estimates based on Household Budget Survey.

Note: Estimates assume a price shock of 25 percent.

5.2. Medical expenses

Tables 8 and Figure 6 report the income effect of a reduction in medical expenses. The total medical costs are obtained from Table 6 and augmented with additional costs' estimates of cytostatic, specific drugs and biological therapies involved in the diagnosis associated with the use of tobacco and tobacco products. Because these costs are only available for Republika Srpska, the same procedure outlined in box 1 is followed to obtain the costs in the Federation of Bosnia and Herzegovina. The model assumes that the health effects of tobacco-related diseases will immediately diminish with the reduction in tobacco consumption. Although this assumption is implausible in the short term because changes in the effects of tobacco-related diseases take some time to materialize, it provides an upper-bound estimate of the effects of tax increases.

The overall results indicate that the reduction in medical expenditures is progressive, benefiting lower-income groups. This derives from two factors: (1) the higher price elasticity and (2) a lower income base that benefits from the reduction in medical costs. The income gains would vary between 0.51 and 0.05 percentage points in the case of the lower-bound elasticity assumption, between 0.47 and 0.04 percentage points in the case of the medium-bound elasticity, and between 0.42 and 0.03 percentage points in the case of the upper-bound elasticity (Figure 3). These results show the importance of the elasticity assumptions; they also stress the relevance to the possible elasticity variations across income groups.

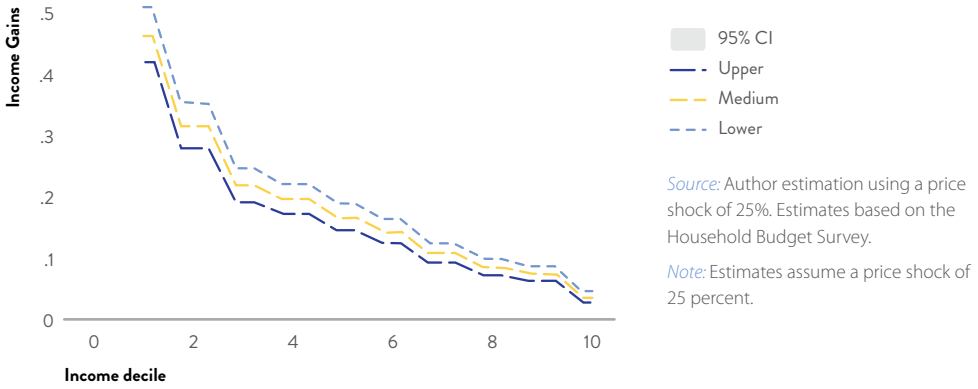
Table 8. Reduction in Medical Costs, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO +25%	1	2	3	4	5	6	7	8	9	10
Lower-bound elasticity	0.51	0.36	0.25	0.22	0.19	0.17	0.13	0.10	0.09	0.05
Medium elasticity	0.47	0.32	0.22	0.20	0.17	0.15	0.11	0.09	0.08	0.04
Upper-bound elasticity	0.42	0.28	0.20	0.18	0.15	0.13	0.10	0.08	0.07	0.03

Source: Estimates based on the Household Budget Survey.

Note: The table reports the share of total consumption for each decile.

Figure 6. Income Gains: Medical Costs of Tobacco Taxes (Reduction in Medical Expenditures)



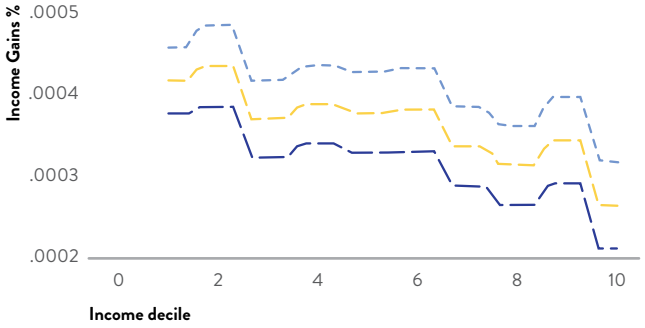
Source: Author estimation using a price shock of 25%. Estimates based on the Household Budget Survey.

Note: Estimates assume a price shock of 25 percent.

5.3. Income gains deriving from an increase in years of working life

The cost of working life lost because of tobacco consumption is estimated based on the assumption that the impact of lower tobacco use on health and work-generated income is direct. The 8,725 deaths obtained from the Tobacco Atlas attributed to tobacco consumption in 2015 are distributed using the mortality profile. For each death, working years lost are divided across deciles proportionately to the number of households that consume tobacco in each income group. The results show that the reduction in tobacco consumption and the expected reduction in work years lost have a positive, albeit negligible impact on welfare in all income groups (Figure 7; Table 9). However, given that elasticities differ across deciles, the gains are more pronounced among lower-income groups across all three scenarios.

Figure 7. Income Gains: Production during Years Lost, by Decile



Source: Author estimation using a price shock of 25%. Estimates based on the Household Budget Survey.

Note: Estimates assume a price shock of 25 percent.

Table 9. Years of Working Life Lost, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
Medium elasticity	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003	0.0003	0.0003	0.0003
Upper-bound elasticity	0.0004	0.0004	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002

Source: Estimates based on the Household Budget Survey.

Note: The table reports the share of total consumption for each decile. Years of life lost have been estimated using all deaths from tobacco-related diseases.

5.4. Net effects: total distributional impact

Once the effects of tobacco tax policy on prices, medical expenditures, and increased years of employment are calculated separately, one may examine the total distributional impact. Based on all three scenarios, the aggregate effect of an increase on tobacco taxes is positive and progressive; in the long run, poorer deciles benefit more than richer ones in the sense that their income is positively affected. The positive effect of reduced medical expenses and years of life gained offset the negative price effect which was evident in third and higher income deciles in Table 7.

It seems that population that smokes will reduce tobacco consumption sufficiently to allow health and work benefits to offset the price increases. The positive income effects are evident among low and middle income population under all scenarios. It seems that young persons (upper-bound elasticity estimates) from low income households benefit less from reduction in consumption and the positive effects tend to decline and become negative again in the middle of income distribution. On average, the results suggest that positive effects are more pronounced in medium and especially lower-bound elasticity scenarios.

The assumptions in this model do not include other possible policies, such as smoking cessation programs, antismoking advertising, youth outreach, or policies financed through the new tax revenue. Therefore, these results are in line with the literature, showing important the important role that taxation plays in lowering tobacco usage.

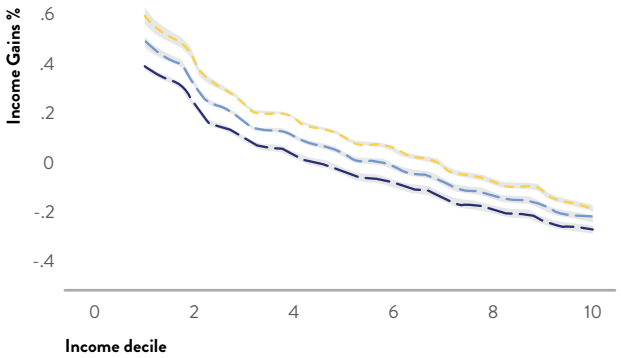
Table 10. Net Effect on Household Expenditures, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.685	0.456	0.236	0.216	0.111	0.074	−0.002	−0.074	−0.094	−0.192
Medium elasticity	0.595	0.361	0.159	0.143	0.036	0.004	−0.067	−0.133	−0.154	−0.239
Upper-bound elasticity	0.506	0.268	0.083	0.069	−0.040	−0.065	−0.133	−0.192	−0.213	−0.286

Source: Estimates based on the Household Budget Survey.

Note: The table reports the share of total consumption for each decile.

Figure 8. Total Income Effect: Direct and Indirect Effects of Tobacco Taxes (Tobacco price increase, medical expenditure, and working years gained)



Source: Author estimation using a price shock of 25%. Estimates based on the Household Budget Survey.

Note: Estimates assume a price shock of 25 percent.

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6 RESULTS BY ENTITY AND HOUSEHOLD TYPE

6.1. Federation of Bosnia and Herzegovina vs. Republika Srpska

To shed more light on the results in the previous section, a separate analysis is run by entity and household type to explore possible differences. Across all scenarios, the elasticity estimates shown in Table 3 are maintained. However, the parameters related to medical costs and years of life lost have changed. Because the Tobacco Atlas only reports total years of life lost, latter is approximated by calculating the proportion of population living in the corresponding entity and multiplying this by the total years of life lost. Tables 11 and 12 report the net income effects in the Federation of Bosnia and Herzegovina and Republika Srpska, respectively. In both entities the effects of tobacco taxation are positive among lower- and middle-income groups across all elasticity scenarios. However, the positive effects are more pronounced in Republika Srpska, with the exception of poorest income decile. Results presented in annex A (Tables A.1 and A.4) suggest that positive net income effects are driven by the positive direct effects of the tobacco price increase in the two lowest income deciles.

If one considers indirect effects that take into account the medical expenses associated with the averted treatment costs of tobacco-related diseases, the welfare gains are even greater. The overall results indicate that the reduction in medical expenditures is progressive, benefiting lower-income deciles to a greater extent (Tables A.2 and A.5). For instance, because of the price increase, households in the first income decile would experience an increase in incomes of 0.51 percentage points in the Federation of Bosnia and Herzegovina and 0.49 percentage points in Republika Srpska, while households in the highest income bracket would increase their incomes by only 0.04 and 0.05 percentage points in the Federation of Bosnia and Herzegovina and Republika Srpska, respectively, under the medium elasticity scenario. Similar results hold also across the other two scenarios.

As was the case in the baseline model, the expected reduction in work years lost have a positive impact on welfare among all income groups across all three scenarios. The gains are more pronounced in the lower-income groups, especially in the Federation of Bosnia and Herzegovina (Table A.3).

Table 11. Net Effect on Household Expenditures, Federation of Bosnia and Herzegovina, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.738	0.449	0.241	0.226	0.101	0.075	0.003	−0.081	−0.078	−0.180
Medium elasticity	0.643	0.362	0.169	0.153	0.035	0.005	−0.057	−0.137	−0.133	−0.225
Upper-bound elasticity	0.550	0.275	0.097	0.079	−0.032	−0.065	−0.116	−0.194	−0.186	−0.269

Table 12. Net Effect on Household Expenditures, Republika Srpska (%)

	DECILES									
PRICE SHOCK SCENARIO	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.739	0.515	0.275	0.279	0.164	0.097	0.022	−0.061	−0.090	−0.227
Medium elasticity	0.639	0.406	0.191	0.189	0.078	0.017	−0.048	−0.136	−0.157	−0.284
Upper-bound elasticity	0.541	0.299	0.107	0.098	−0.009	−0.063	−0.118	−0.210	−0.224	−0.340

6.2. Urban vs. rural

The estimated net effects on household expenditure for household type show that urban population benefits disproportionally more. This is especially pronounced for lower income households across all three elasticity scenarios. The aggregate effect of an increase on tobacco taxes is positive and progressive for low and middle income households and is mostly driven by positive contribution in the reduction of medical costs (Tables A.8 and A.11). By looking at medium price elasticity scenario, one can see that the reduction of medical costs for urban population as a result of an increase in tobacco prices by 25 percent will lead to almost two times larger effect for lowest income decile in comparison to rural population. As is the case in other models, the effects of reduction in the years of life lost has positive effects across all income deciles, but it is very low in magnitude to be able to offset any negative price effects.

When it comes to direct effects, the results suggest that an increase in prices by 25 percent benefits lower income deciles in both groups of households. This increases household welfare because consumers in two lowest income deciles are more price sensitive and react strongly to price increase by reducing the purchase of cigarettes. However, this positive direct effects turn negative for middle and higher income deciles,

but in none of the cases does the shock seem to be regressive. On the contrast, the effect of price increase is relatively progressive, that is, it affects upper-income groups (the last two deciles) in a larger proportion.

Table 13. Net Effect on Household Expenditures, Urban Population, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.87	0.49	0.27	0.28	0.13	0.07	0.03	−0.05	−0.08	−0.17
Medium elasticity	0.76	0.40	0.18	0.19	0.06	0.00	−0.04	−0.11	−0.14	−0.22
Upper-bound elasticity	0.66	0.31	0.08	0.09	0.00	−0.07	−0.11	−0.16	−0.20	−0.26

Table 14. Net Effect on Household Expenditures, Rural Population, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.546	0.455	0.199	0.195	0.112	0.052	−0.009	−0.079	−0.118	−0.214
Medium elasticity	0.473	0.357	0.131	0.126	0.042	−0.012	−0.077	−0.136	−0.179	−0.264
Upper-bound elasticity	0.401	0.259	0.063	0.056	−0.028	−0.075	−0.146	−0.194	−0.240	−0.313

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7 DISCUSSION

There has been extensive research on the negative effects of tobacco consumption and on the benefits of various public policy mechanisms aimed at reducing tobacco use. The implementation of tobacco taxes, both specific and ad valorem is considered one of the most effective ways to discourage tobacco use. Nonetheless, this policy has a direct impact on household incomes, especially among low-income households that are more likely to smoke, have limited access to health insurance and adequate health care. The question whether tobacco taxes are regressive is particularly important because the welfare effects derived from increased taxes depend on price elasticity of this product across different sectors of the population. The price elasticity determines the magnitude of the income shock and the benefits gained from decline in tobacco consumption.

Using three waves of household budget surveys, the study calculated the price elasticity of tobacco for the population in Bosnia and Herzegovina, obtaining an average price elasticity of −0.56 and estimates for the 10 income deciles. The elasticity for the lowest income group is −1.08 and −0.34 for the highest income group. This appears to be the first tobacco price elasticity estimate across income groups ever produced on Bosnia and Herzegovina. To extend the analysis, elasticities have also been simulated for the younger population (upper-bound) and the older (lower-bound) population and the long-term scenario to assess the net welfare gains from this policy.

Therefore, apart from the direct impact on household income, other benefits of lower tobacco consumption are considered, including a reduction in medical costs and an increase in the potential working years associated with good health. Thus, it is critical to justify the maintenance or intensification of the use of tobacco taxes by means of a demonstration of the aggregate monetary gains or losses generated. Moreover, the policy should focus on low-income households that are more likely to smoke and, hence, tend to be the most highly affected by consumption taxes. One of the main motivations of this study is to weigh the main costs and benefits of tobacco taxation to determine if, in the end, the policy is regressive.

Results show that, considered by itself, a price increase for tobacco through higher taxes generate negative income variation for middle and high-income groups in the population, but positive ones for lower income groups because of the overall prices increase. These negative effects are particularly accentuated under the upper-bound elasticity scenario. Based on assumptions of a more comprehensive approach, including benefits through lower medical expenses and an increase in working years the positive monetary effect for lower income groups are further accentuated and bring about positive income effects to

middle income households as well. The reduction in medical expenses is the main driver of the increase in net incomes because of the reduction in tobacco-related problems that require expensive treatments. In all three elasticity scenarios, the benefits of medical expenses are greater than the benefit of the increase in working years.

Net income effects indicate that although increased prices may lead to reduction in tobacco consumption for some groups they do not necessarily lead to tobacco cessation which would bring substantial benefits evident in substantial reduction in medical costs and increased working life. Overall monetary effects are positive, and results suggest that older population and those with lowest income experience more positive and greater income effects. The limited data on medical costs and mortality, which are available only for Republika Srpska and the Federation of Bosnia and Herzegovina, respectively, obliged a certain adjustment to the data and may therefore represent a lower bound on the potential benefits of reduced medical expenditure and aggregate wealth effects. More investigation is therefore needed to produce more accurate estimates of the distributional effects of tobacco policy.

Under an alternative scenario, if one simulates the effects of a price increase in different entities and for different household types, the main effects are corroborated. The results suggest that overall monetary effects are positive among lower- and middle-income households, regardless of the location or household type. All households benefit disproportionately more from decreased medical expenses and an increase in working life in the future, but lower income households also benefit from a direct increase in tobacco prices because they substitute tobacco consumption for other types of goods. The net effects are positive and progressive. Thus, overall, the benefits of increased prices go to lower-income households.

The three price elasticity scenarios do not exactly mimic the short- versus the long-term effects of a tobacco tax. There is evidence that adult smokers will introduce changes in their behavior if price increases, the lower-bound elasticity would tend to represent this behavior more closely. In contrast, younger groups of the population show less elastic demand, similar to the upper-bound elasticity. After a few decades, one expects the impact of the tax policy to resemble the upper-bound elasticity scenario.

In summary, the results provide evidence that supports possible reduction in tobacco taxes. In addition, given the limited use of tobacco cessation strategies, taxation policy should be accompanied by prohibiting smoking in public places, mass media campaigns on the negative effects of tobacco use and increase the bans on all forms of direct and indirect advertising. An integrative approach to anti-tobacco policies that favors coordination between taxation and behavioral change policies is thus needed to generate positive social returns.

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ANNEX A. DETAILED SCENARIO OUTCOME ACROSS ENTITY AND HOUSEHOLD TYPE

A.1. Federation of Bosnia and Herzegovina

Table A.1. Direct Effect of Price Increase through Taxes, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO +25%	1	2	3	4	5	6	7	8	9	10
Complete pass-through	−0.36	−0.41	−0.41	−0.46	−0.49	−0.53	−0.48	−0.51	−0.49	−0.45
Low-bound elasticity	0.17	0.09	−0.01	−0.01	−0.07	−0.10	−0.12	−0.17	−0.17	−0.23
Medium elasticity	0.13	0.04	−0.06	−0.06	−0.12	−0.15	−0.16	−0.22	−0.21	−0.26
Upper-bound elasticity	0.08	−0.01	−0.10	−0.11	−0.17	−0.20	−0.21	−0.26	−0.25	−0.30

Source: Estimates based on the Household Budget Survey.

Note: The table shows the share of total consumption for each decile. Complete pass-through refers to elasticity equal to zero; consumers pay all the increased prices, and this does not affect the quantity purchased.

Table A.2. Reduction in Medical Costs, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO +25%	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.565	0.362	0.254	0.235	0.173	0.170	0.119	0.093	0.088	0.046
Medium elasticity	0.516	0.325	0.226	0.210	0.154	0.150	0.105	0.081	0.077	0.039
Upper-bound elasticity	0.468	0.288	0.198	0.184	0.134	0.131	0.090	0.069	0.065	0.031

Source: Estimates based on the Household Budget Survey.

Table A.3. Years of Working Life Lost, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.0003	0.0003	0.0003	0.0003	0.0002	0.0003	0.0002	0.0002	0.0002	0.0002
Medium elasticity	0.0003	0.0003	0.0002	0.0003	0.0002	0.0003	0.0002	0.0002	0.0002	0.0002
Upper-bound elasticity	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001

Source: Estimates based on Household Budget survey

A.2. Republika Srpska

Table A.4. Direct Effect of Price Increase through Taxes, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO +25%	1	2	3	4	5	6	7	8	9	10
Complete pass-through	−0.42	−0.55	−0.48	−0.56	−0.60	−0.59	−0.55	−0.63	−0.60	−0.57
Low-bound elasticity	0.20	0.12	−0.02	−0.01	−0.09	−0.11	−0.13	−0.21	−0.20	−0.29
Medium elasticity	0.15	0.05	−0.07	−0.07	−0.15	−0.16	−0.19	−0.27	−0.26	−0.33
Upper-bound elasticity	0.10	−0.02	−0.12	−0.13	−0.21	−0.22	−0.24	−0.32	−0.31	−0.38

Source: Estimates based on the Household Budget Survey.

Note: The table shows the share of total consumption for each decile. Complete pass-through refers to elasticity equal to zero; consumers pay all the increased prices, and this does not affect the quantity purchased.

Table A.5. Reduction in Medical Costs, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO +25%	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.54	0.40	0.29	0.29	0.25	0.20	0.16	0.15	0.11	0.06
Medium elasticity	0.49	0.36	0.26	0.26	0.23	0.18	0.14	0.13	0.10	0.05
Upper-bound elasticity	0.45	0.32	0.23	0.23	0.20	0.16	0.12	0.11	0.08	0.04

Source: Estimates based on the Household Budget Survey.

Table A.6. Years of Working Life Lost, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.0002	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001
Medium elasticity	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Upper-bound elasticity	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Source: Estimates based on the Household Budget Survey.

A.3. Urban population

Table A.7. Direct Effect of Price Increase through Taxes, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO +25%	1	2	3	4	5	6	7	8	9	10
Complete pass-through	−0.37	−0.39	−0.59	−0.60	−0.48	−0.55	−0.53	−0.48	−0.54	−0.45
Low-bound elasticity	0.18	0.08	−0.02	−0.01	−0.07	−0.10	−0.13	−0.16	−0.18	−0.22
Medium elasticity	0.13	0.03	−0.08	−0.08	−0.12	−0.15	−0.18	−0.20	−0.23	−0.26
Upper-bound elasticity	0.08	−0.01	−0.15	−0.14	−0.16	−0.20	−0.23	−0.24	−0.28	−0.30

Source: Estimates based on the Household Budget Survey.

Note: The table shows the share of total consumption for each decile. Complete pass-through refers to elasticity equal to zero; consumers pay all the increased prices, and this does not affect the quantity purchased.

Table A.8. Reduction in Medical Costs, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO +25%	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.691	0.411	0.292	0.295	0.205	0.172	0.157	0.108	0.105	0.051
Medium elasticity	0.631	0.369	0.260	0.264	0.181	0.152	0.138	0.094	0.091	0.043
Upper-bound elasticity	0.573	0.328	0.228	0.232	0.158	0.132	0.119	0.080	0.077	0.034

Source: Estimates based on the Household Budget Survey.

Table A.9. Years of Working Life Lost, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001
Medium elasticity	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0002	0.0001
Upper-bound elasticity	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Source: Estimates based on the Household Budget Survey.

A.4. Rural population

Table A.10. Direct Effect of Price Increase through Taxes, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO +25%	1	2	3	4	5	6	7	8	9	10
Complete pass-through	−0.31	−0.51	−0.41	−0.45	−0.50	−0.50	−0.57	−0.52	−0.59	−0.52
Low-bound elasticity	0.15	0.11	−0.01	−0.01	−0.07	−0.09	−0.14	−0.18	−0.20	−0.26
Medium elasticity	0.11	0.05	−0.06	−0.06	−0.12	−0.14	−0.19	−0.22	−0.25	−0.30
Upper-bound elasticity	0.07	−0.02	−0.10	−0.10	−0.17	−0.18	−0.24	−0.27	−0.30	−0.34

Source: Estimates based on the Household Budget Survey.

Note: The table shows the share of total consumption for each decile. Complete pass-through refers to elasticity equal to zero; consumers pay all the increased prices, and this does not affect the quantity purchased.

Table A.11. Reduction in Medical Costs, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO +25%	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.400	0.346	0.212	0.204	0.186	0.141	0.129	0.096	0.079	0.043
Medium elasticity	0.366	0.311	0.189	0.182	0.165	0.124	0.113	0.084	0.069	0.036
Upper-bound elasticity	0.332	0.276	0.165	0.160	0.144	0.108	0.097	0.071	0.059	0.029

Source: Estimates based on the Household Budget Survey.

Table A.12. Years of Working Life Lost, by Decile (%)

	DECILES									
PRICE SHOCK SCENARIO	1	2	3	4	5	6	7	8	9	10
Low-bound elasticity	0.0002	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Medium elasticity	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001
Upper-bound elasticity	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001

Source: Estimates based on the Household Budget Survey.