Crowding-Out Effect of Tobacco Consumption in North Macedonia

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Abstract

Background

The focus of this study is estimating the crowding-out effect of tobacco expenditures on other household expenditures in North Macedonia.

Methodology

This analysis uses Household Budget Survey (HBS) data for the period 2018–2022. To estimate the crowding-out effect of tobacco use in North Macedonia, we employ a 3SLS empirical approach.

Results

A crowding-out effect is detected in the overall sample, confirming that spending on tobacco is associated with decreased spending on more beneficial goods and services like clothing, health, furniture; while at the same time it is associated with increased expenditures on less productive goods and services like alcohol and bars and restaurants. The analysis of the spending habits of households in different income groups points to similar patterns as those seen in the overall sample; however, the magnitude and statistical significance differ by income group.

The estimated crowding-out effect further emphasizes the detrimental impact of tobacco consumption on household welfare. Across all income groups, tobacco expenditures are found to crowd out spending on necessities and essential items. Notably, while low-income households experience more pronounced crowding-out effects on certain expenditure categories such as clothes and health, middle- and high-income households also exhibit significant reductions in spending on items like furniture and recreation.

Conclusions

These findings underscore the urgent need for targeted policy interventions to address the pervasive issue of tobacco consumption in North Macedonia. Efforts aimed at reducing tobacco use and promoting public health should be prioritized, with a particular focus on populations that are disproportionately affected by the negative consequences of smoking. Additionally, policies that incentivize healthier lifestyle choices and discourage excessive spending on tobacco products can help mitigate the adverse economic and social impacts associated with tobacco consumption.

Introduction

Tobacco is not only harmful for health but also for family budgets and healthy lifestyles. In the existing literature (Liu et al., 2006; Goodchild et al., 2018), the economic costs of tobacco are usually evaluated from a macroeconomic perspective, based on data for medical costs and productivity loss due to tobacco-related illnesses. However, a significant stream of studies have started demonstrating the importance of microeconomic-level data for understanding the burden of tobacco use at the level of the family and its budget. This effect estimation—to understand how tobacco consumption affects overall household consumption, keeping in mind that households operate on constrained budgets—is known as the "crowding-out" effect. The main idea assumes that households operate on fixed budgets, which results in opportunity costs once a significant part of that limited budget is spent on tobacco. When a specific household spends significant amounts on tobacco, it must cut down consumption on other goods and services such as food, clothing, education, health care, and housing. Due to limited household budgets, spending on tobacco often puts households in so-called "secondary poverty." As explained by John et al. (2019), secondary poverty occurs when a household's budget would be satisfactory for a quality lifestyle; however, after deducting expenditures on tobacco, the available budget in the household resembles that of a household classified as poor.

North Macedonia, a middle-income country, is one of the countries in Europe with the highest prevalence of regular tobacco consumption, reaching 48.4 percent in 2019 (Mijovic Hristovska et al., 2020). In comparison, in 2019, the EU average of regular smokers was 18.4 percent of the population above 15 years of age, while the global average was 22.3 percent. Hence, the national average of regular smokers in North Macedonia is significantly higher than both the EU and global averages. However, there is difference among the EU states, so the most smoking nations are Bulgaria and Greece (28.7% and 23.6%, respectively) and EU countries with least smokers are Finland and Sweden (6.4 % and 9.9 %, respectively)[1]. Almost 81.4 percent of current daily smokers in North Macedonia initiated smoking before 25 years of age (Mijovic Hristovska et al., 2020). Another study shows that, out of all regular smokers, 70 percent of them started smoking before the age of 21 (Word Health Organization, BCI study, 2022). Smoking intensity is also very high: 44.4 percent of current smokers consume more than 20 cigarettes a day (Mijovic Hristovska et al., 2020). That statistics for EU

[1; 2] Tobacco consumption statistics
https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Tobacco_consumption_statistics

members is significantly lower[2], where only 5.9% of the EU smoking populations aged 15 and above consume over 20 cigarettes daily. Looking through country specific statistics, again there is notable difference for the smoking habits between the countries in the north and in the south of Europe. For example, there is only 1% heavy smokers in Sweden, 3% in Finland, the Netherlands, Luxembourg and Denmark, relative to 10.8 % in Greece, 11.6 % in Croatia and 12.9 % in Bulgaria. In terms of gender, men smoke more than women (Word Health Organization, BCI study, 2022). According to the Survey on Income and Living Conditions, North Macedonia has a high at-risk-of-poverty rate, reaching 21.8 percent in 2020 (State Statistical Office (SSO), 2022), leading to more concerns regarding secondary poverty in households that spend income on tobacco. For instance, households that have at least one smoker spent 11.1 percent of their budget on tobacco products in 2020. Furthermore, the same survey of the SSO analyzes poverty by household type, suggesting that the at-risk-of-poverty rate in households with two adults and two dependent children in 2020 was 20.7 percent. These numbers are very concerning first for poorer households, but also for families with young children, where some of the needs important for development can be neglected due to the expense of spending on tobacco.

Despite the facts that North Macedonia ratified the World Health Organization Framework Convention on Tobacco Control (WHO FCTC) in 2006 and previously introduced a general ban on smoking in public places, recently the government has become less restrictive about this ban, and smoking is again allowed in many public places, especially in restaurants and bars. Most adults in North Macedonia are exposed to tobacco smoke mainly in bars or nightclubs (73.6 percent) and restaurants (44.2 percent) (Hristovska Mijovic et al., 2020).

This study is the first attempt to estimate the crowding-out effect of tobacco use on the rest of household consumption in North Macedonia. For that purpose, a first attempt was made to estimate Engel curves using the 3SLS estimation technique on the Household Budget Data from the State Statistical Office for the period 2018–2022. Despite knowing that GMM 3SLS is most effective, in our case it did not converge, so the results presented in the study were obtained with the traditional 3SLS model. Studies like this one are important for academic audiences but more so for policy makers, who can use the findings to more effectively tailor and implement tobacco control measures.

This report is organized as follows: Section 1 outlines a literature review; Section 2 gives an overview on the methodology used, with special reference to the theoretical and empirical frameworks, data analysis, and estimation strategy;

Section 3 elaborates the results, both descriptive and empirical; and, finally, Section 4 presents conclusions.

Literature Review

Over the past 25 years, there have been a number of empirical studies that attempt to analyze and understand the crowding-out effect of tobacco consumption on household budgets. They began with simple OLS approaches determining the linkages, and latter estimation methods evolved into analyzing the effect of expenditures on tobacco by estimating demand curves, by including main expenditure categories, or analysis on the household spending structure.

One of the first attempts to detect the crowding-out effect of tobacco use was conducted in the early 2000s, using descriptive analysis on data from Bangladesh and China (Efroymson et al., 2001). In their study, researchers in Bangladesh got results in line with the theoretical expectations suggesting that tobacco use is a large burden on household budgets, and that the burden is especially significant for low-income households. Further, the study showed that poor households consume twice as much tobacco compared to wealthy households. In terms of gender, men were found to use more tobacco and spent significant amounts—dedicating more than twice as much on cigarettes than on clothing, housing, and health—compared to women. The first formal empirical studies that implemented conventional econometric methods for estimating the crowding-out effect of tobacco in households are from 2004, and interest in the topic is still high and relevant. Busch et al. (2004), conducted a study on the United States of America, applying separate OLS regressions on consumer expenditure surveys, and found that tobacco consumption crowds out clothing and housing.

In the latter stage of empirical studies development, it is common to find the application of SUR models, with different estimation approaches. The most commonly accepted approach is the three stages least squares (3SLS), yet in the beginning of 2000 some authors used different approaches. For example, Wang et al. (2006) conducted a study on China applying a fractional logit model to a primary survey, and their findings suggested that tobacco consumption crowds out education, health, agriculture, equipment maintenance, and savings.

In the development of different estimation streams, John (2008) and San & Chaloupka (2016) included tobacco expenditure and total non-tobacco expenditure as covariates. This new approach raised another estimation issue:

endogeneity. To address the endogeneity issue, John (2008) pioneered the first study using the instrumental variables (IV) method, using the ratio of adult men to adult women and total expenditure or income as instruments. The study was conducted for the case of India on the National Sample Survey, where tobacco was found to crowd out food, education, entertainment, and other consumption, particularly impacting woman and children, highlighting an equity issue. Almost a decade later, San and Chaloupka (2016) conducted a study for Turkey in which they applied instrumental variables using data from the Household Budget Survey and found the crowding-out effect of tobacco on several items like food, housing, education, and durable/non-durable goods. Then more IV studies followed. Block and Webb (2009) conducted a study on Indonesia by applying reduced-form equations on Nutrition Surveillance System data, and their study found a crowding-out effect of tobacco on food, especially among low-income households.

Some of the studies that implemented the 3SLS approach faced heteroskedasticity issues, so to correct the errors they used Feasible Generalized Least Squares (Husain et al., 2018; John et al., 2011). Husain et al. (2018) applied instrumental variables using data from Bangladesh's Household Income and Expenditure Survey and detected a crowding-out effect of tobacco on clothing, housing, education, energy, transportation, and communication. Several other studies estimating Engel curves on Household Surveys in other countries found similar results: the crowding-out effect of tobacco affects household spending on food, clothing, health, education, housing, household durables, and other commodities (Saleem & Iqbal, 2021; Vladisavljević et al., 2021; Mugoša et al., 2022; Sánchez et al., 2023; Swarnata et al., 2024).

Many of the studies, along with estimating the overall crowding-out effect of tobacco on the rest of the expenditure of the households, also estimate the effect for different income levels. For example, John (2008) suggests that tobacco had a crowding-out effect on per capita food intake, education, and entertainment, with similar estimated effects for low-income and high-income households. In other studies, the most crowded-out expenditures were food, health, and education (Wang et al., 2006; San & Chaloupka, 2015; Vladisavljević et al., 2021; Mugoša et al., 2022). But in other studies, crowding out also occurred in categories such as housing, recreation, clothing, transport, and communication (Wang et al., 2006; Husain et al., 2018).

Along with the crowding-out effect, there was a "crowding-in"[2] effect detected. Notably, the majority of the studies (Wang et al., 2006; Mugosa et al., 2022;

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[2] Only Husain et al. (2018) found crowding-in effect in food and health.

Vladisavlevic et al., 2022; Masaud et al., 2020; Benavides, 2024) found that in households that spend on tobacco, the crowding-in spending is on so-called complementary goods. So those households also have increased spending on alcohol, restaurants and bars, and entertainment. The distribution is different among the different income groups, with the wealthiest households spending more on restaurants and bars, but all groups spend more on alcohol, considering similar addictive patterns.

Methodology

1.1.   Theoretical framework and empirical approach

Consumption theory—according to which each household maximizes utility as a function of a set of commodities—has an important theoretical role in estimating Engel curves. Therefore, there is much interest in estimation and analysis of Engel curves based on cross-sectional data at the household level that includes expenditures and incomes by type. In the context of the crowding-out effect of tobacco on a household's budget allocation, it is critical to establish statistical links among the expenditure categories of interest and some explanatory variables. In this process, it is necessary to bear in mind that household behaviors are not homogenous, and that some categories might be necessities for some household types and luxuries for other types. Regardless, all categories fall under the same assumption that each household attempts to define their consumption such that they maximize the single utility function. Following the theoretical framework for household consumption modeled by the demand function, it is assumed that a household's demand for tobacco (q_n) is predetermined at level ($q_{n=}$ $\overline{q_n}$), so that the household maximizes the following utility function (Pollak, 1968):

$Max\ U = (q_1\ ,\dots\ ,\ q_{n-1}\ ,\ \overline{q_n},;a)$ (1)

subject to budget constraint $M = \sum_{i=1}^{n-1} p_i q_i$, where *M* represents the remaining budget after deducting expenditure on tobacco ($M = Y - p_n \overline{q_n}$).

Since the demand for tobacco is predetermined, the demand for other commodities is conditional on the consumption of tobacco ($\overline{q_n}$), the prices of all commodities except tobacco ($p_1\ ,\dots\ ,\ p_{n-1}$), the remaining budget (*M*), and a set of household characteristics. Hence, we estimate the following model:

$$w_{ij} = \alpha_i + \beta_{1i}\, d_j + \beta_{2i}\, \text{tobexp}_j + \left(\gamma_{1i} + \gamma_{2i}\, d_j\right)\ln M_j + \left(\theta_{1i} + \theta_{2i}\, d_j\right)(\ln M_j)^2 + \delta_i\, h_j + u_{ij}$$
(2)

where, for each household j:

- w_{ij} represents a share of spending on a commodity i in the remaining budget M after deducting spending on tobacco ($w_{ij} = p_{ij}q_{ij}/M_j$),
- d_j is a binary variable that is equal to one if a household has a smoker,
- tobexp_j is the expenditure on tobacco ($p_{nj}\overline{q_{nj}}$), and
- h_j is a vector of household characteristics.

To account for difference in preferences among smoking and non-smoking households, the binary variable d_j is included in the model. This variable serves the function of explaining whether a household has zero expenses for tobacco because its members do not consume tobacco (abstention) or because they cannot afford it (corner solution). The Wald test is used to test the null hypothesis that "coefficients associated with the binary variable in Equation (2) are jointly significant" ($H_0 : \beta_{1i} = \gamma_{2i} = \theta_{2i} = 0$).

The idea behind the null hypothesis is that joint significance of the coefficients should suggest different preferences of the smoking and non-smoking households. This means that the utility function of non-smoking households should differ significantly from the utility function of smoking households.

There are some possible issues in estimating Equation (2) detected by the literature. First, there is a high likelihood that tobexp_j and M_j are endogenous. Second, consumption shares of different commodities can affect each other; therefore, contemporaneous correlation is expected. Third, the errors may be heteroskedastic. To address these three issues, it is recommended to apply one of these three methods:

1. Equation-by-equation instrumental variables estimation (2SLS),
2. Instrumental variable system estimation (3SLS), or
3. GMM 3SLS estimation.

Due to possible endogeneity among estimators, OLS is not possible, so IV estimator is the first choice. However, IV is less efficient than OLS, and it is recommended to be used only if there are endogenous variables presented in the model. Also, IV estimator follows a very strong assumption that a valid instrument Z exists under two conditions:

1. Instrument z is partially correlated with the endogenous regressor; and
2. Instrument z affects the dependent variable only through the regressor.

The 3SLS estimation method is more efficient than the previous one (2SLS). The 3SLS method is used to estimate Engel curves, one for each commodity group, aiming to detect how and where crowding out happens. In each of the estimations, tobacco consumption is included as a conditioning commodity. According to the literature, the traditional 3SLS estimator is less efficient due to heteroscedasticity in the variances. So, Wooldridge (2010) suggests allowing for heteroscedasticity and different instruments for different equations, and he calls it GMM 3SLS. From the consulted literature and the most recent studies, we assume that the GMM distance test will be used to test the endogeneity of the regressors.

1.2. Data and descriptive statistics

For the purpose of the analysis, we use Household Budget (Consumption) Survey (HBS) data for North Macedonia for the period 2018–2022.[3] HBS is a nationally representative survey conducted by the State Statistical Office, following specific statistical protocols and principles to ensure quality and accuracy of the data. HBS serves to calculate household consumption and the quantity of purchased and goods from own production, along with demographic characteristics, to be used for calculating weights for the monthly CPI index and quarterly consumption in GDP. The data collected are of great importance and use in the country for policy makers and academia.

HBS is a nationally representative survey that collected data annually as a repeated cross section (that is, without a panel structure) from 2,646 households in 2018, 2,564 households in 2019, 2,871 households in 2020, 3,061 households in 2021, and 2,783 households in 2022. In structure, HBS data on household consumption are separated into 12 broad commodity groups, in accordance with the Classification of Individual Consumption According to Purpose (COICOP). Consumption expenditure at the household level is recorded for around 360 commodities at a disaggregated level. For the purpose of this analysis, we assume that tobacco expenditure has the greatest impact on food consumption; therefore, we chose 12 different food categories (cereals, meat, fish, milk, other dairy products, oils and fats, fruits, vegetables, desserts, ready-made food, coffee and tea, and other non-alcoholic beverages) to be included in the crowding-out estimation, along with the other main COICOP groups (alcohol, clothes, housing and utilities, furniture, health, transportation, communication, recreation and culture, education and bars, restaurants, and hotels). In

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[3] These are the years that the State Statistical Office made available for use. The years 2015–2017 were not provided.

Appendix 1, we present the specific expenditure groups we will use in the analysis together with the rest of the variable definitions.

Since HBS does not include a specific question about whether a household is smoking or non-smoking, we will use our definition: a household is considered a tobacco user if any expense for tobacco products is reported in its consumption. Since the data are at the household level, we cannot tell if only one household member or all household members are tobacco users. A tobacco-using household will take the value of 1, while a non-tobacco household will take the value of 0. On average, for the period of analysis (2018–2022), around 39.12 percent of households are tobacco users.

Table 1 outlines trends in tobacco prevalence and expenditures for the five-year period of analysis (2018–2022). For the observed period we see discouraging results—that is, smoking prevalence increased from 37.1 percent in the first period of the analysis to 42.01 percent at the end period of the analysis, an increase of five percentage points. This could indicate that the number of households with smoking members increased over the years and that funds now allocated for tobacco products reduce funds for other consumption within the same household.

Additionally, real prices of tobacco, measured through the CPI index, also show an increase in the real price of tobacco products. The overall change in tobacco expenditure for smoking households is positive and significantly higher over the five-year period. Real expenditure for tobacco products in smoking households increased by 12.4 percent. This resulted in the budget share for tobacco consumption increasing from 10.3 percent in 2018 to 13.2 percent in 2022 in households with smokers.

Table 1. Trends in tobacco consumption and expenditures of smoking households, 2018–2022

Year	Smoking prevalence	Tobacco CPI 2022=100	Real expenditure on tobacco products (MKD)	Budget share on tobacco products
2018	37.07	88.9	7128	10.30%
2019	36.66	88.3	7878	11.20%
2020	37.55	88.6	7966	11.10%
2021	41.85	90.4	8318	12.40%
2022	42.01	100	8012	13.20%

Source: Authors' calculations based on HBS data (CPI 2022=100)

Following the literature and using total expenditure as a proxy for total income, we calculate further the budget shares by household income groups. To calculate income groups (low-, middle-, and high-income), we calculate the total household expenditures divided by the number of household members to obtain income per household member. From these data, we then calculate the three income groups.

Figure 1. Prevalence of tobacco consumption (left) and budget shares spent on tobacco by smoking household (right), by income groups
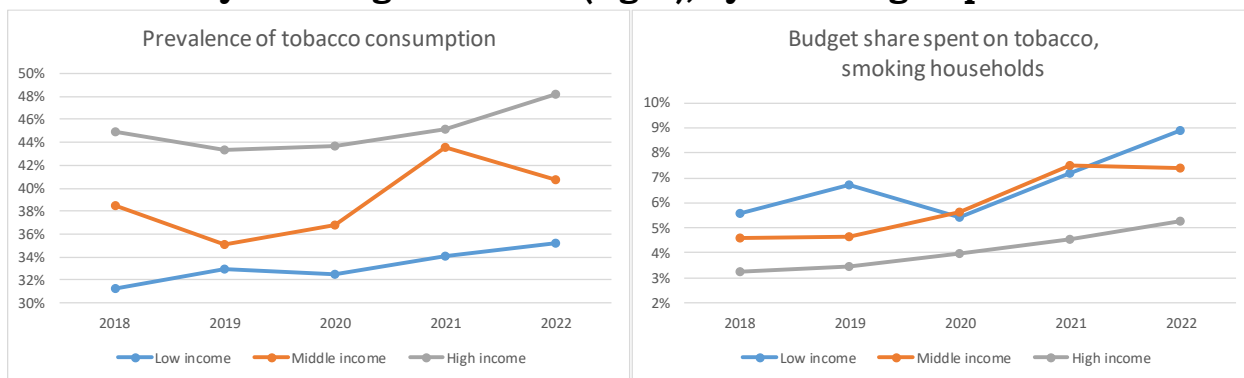
Source: Authors' calculations based on HBS data

In Figure 1, we analyze the main trends in tobacco prevalence and budget shares spent by income group. For that purpose, the authors first created dummy variables for the three income groups by using total household expenditures as a proxy for income, as described earlier. We then created three groups: 1) low income, including households that fall in the lowest 30 percent of expenditures; 2) high income, including households that fall in the highest 30 percent of expenditures; and 3) middle income, including households that fall in between the lowest 30 percent and the highest 30 percent of expenditures.

The prevalence of tobacco consumption in the five-year period of analysis increased in all three income groups, however there is a difference in the magnitude. If we look at the left panel, low-income households' tobacco prevalence increased over time from 31.2 percent in 2018 to 35.2 percent in 2022 (an increase of four percentage points). This group is closely followed by the prevalence for high-income households, which increased their consumption from 44.9 percent in 2018 to 48.2 percent in 2022 (an increase of 3.3 percentage points). Finally, the increase in tobacco prevalence was the smallest for middle-

income households,[4] from 38.5 percent in 2018 to 40.7 percent in 2022 (an increase of 2.3 percentage points).

The burden of tobacco expenditure on the households' budgets, however, was not the same as the smoking prevalence increase. In particular, the budget shares spent on tobacco increased the most for the low-income households, followed by the middle-income households, whereas the increment in the household budget share spent on tobacco was smallest for high-income households. Between 2018 and 2022, the budget share spent on tobacco in low-, middle-, and high-income households increased from 5.6 percent to 8.9 percent; from 4.6 percent to 7.4 percent, and 3.2 percent to 5.3 percent, respectively. It is a common social phenomenon that people in lower-income groups allocate a bigger share of their household income to spend on addictive products and habits (Velandia-Morales, 2022).

Those trends, along with steady increases in the prices of tobacco and cigarettes, result in higher shares of household budgets being allocated to tobacco. However, this increase in price is still not enough to decrease the prevalence and consumption. It is interesting to observe that the high-income group also has an increase in its budget share spent on tobacco, which—in terms of lifestyle and social context—contradicts finding in the literature wherein people in higher-income groups typically feel peer pressure to adopt healthy habits, which results in reduction of tobacco and alcohol consumption.

Figure 2. Budget shares spent on products from different groups by smoking and non-smoking households

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[4] It is difficult to say why the middle-income households show the smallest increase in tobacco prevalence from 2018 to 2022 while, at the same time, there is an increase in tobacco prevalence in 2020 and 2021. Some potential explanation can be in the socioeconomic conditions in the country and the COVID-19 situation. In particular, people were staying at home and spending less on many goods and services, which let funds in some households to accumulate. That, along with the regulated increase in the minimum wage—that transferred to other salary levels and increased the overall standard of living—may have led to the increase in tobacco prevalence among middle-income households for the period of interest. Additionally, tobacco consumption might become a coping mechanism during times of uncertainty or it may be more prone to peer influence and social norms related to tobacco use within middle-income households.
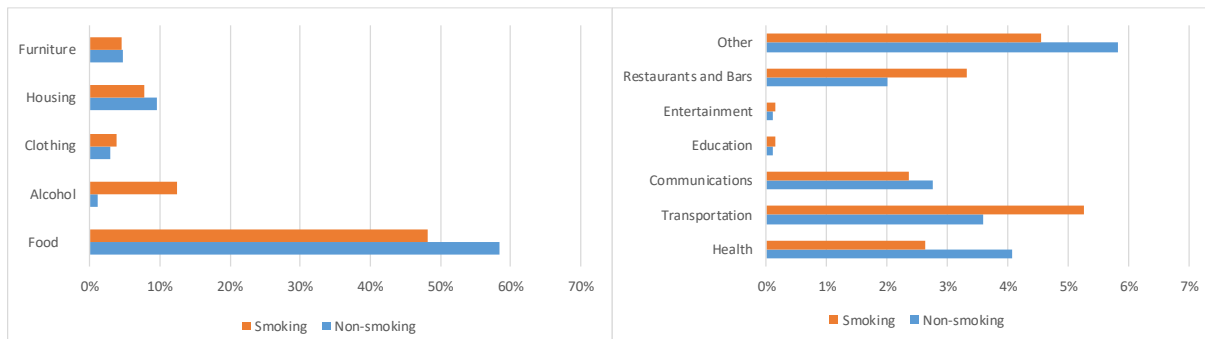
Source: Authors' calculations based on HBS data

Figure 2 and Table 2 present the budget shares of total expenditures that smoking and non-smoking households spend on other commodities. Non-smoking households spend a higher share of their available budgets on food and beverages, 10.3 percentage points (p.p.) higher than smoking households. The share spent on housing and utilities by non-smoking households is 1.8 p.p. higher relative to smoking households; the share spent on health by non-smoking households is 1.4 p.p. higher relative to smoking households; the share spent on communications by non-smoking households is 0.4 p.p. higher relative to smoking households; and the share spent on furniture by non-smoking households is 0.2 p.p. higher relative to smoking households. On education, both types of households spend similar percentages of their budgets, but this can be linked to the fact that primary and secondary education in the country are mandatory and free of charge, hence they have small spending on that category and very similar amounts. On the other hand, smoking households relative to non-smoking households spend more of their budget shares on transportation (1.6 p.p.), bars and restaurants (1.3 p.p.), clothing (0.8 p.p.), and entertainment (0.2 p.p). The most pronounced difference is in the case of alcohol (11.3 p.p), which suggests that tobacco and alcohol are complementary goods.

Table 2. Budget shares spent on different groups of products by smoking and non-smoking households

	Non-smoking households	Smoking households	Difference	T-stat
Tobacco	0.0%	10.9%	-10.9%	120***
Food	58.3%	48.2%	10.1%	16.034***
Alcohol	1.1%	12.5%	-11.4%	-2.045***
Clothing	3.0%	3.8%	-0.8%	-9.300***
Housing	9.5%	7.7%	1.8%	-4.208***
Furniture	4.7%	4.5%	0.2%	-3.954***

Health	4.1%	2.6%	1.5%	0.625
Transportation	3.6%	5.3%	-1.7%	-11.839***
Communications	2.8%	2.4%	0.4%	-5.018***
Education	0.1%	0.1%	0.0%	-4.784
Entertainment	0.1%	0.1%	0.0%	0.000***
Restaurants and Bars	2.0%	3.3%	-1.3%	-11.360***
Other	5.8%	4.6%	1.2%	-4.262***

Source: Authors' calculations based on HBS data

From the spending patterns of the different types of households, one can conclude that tobacco-using households have different preferences for consumption of other commodities compared to non-smoking households. These results suggest that there is a significant difference in the preferences between smoking and non-smoking households when it comes to expenditures on food and alcoholic beverages, housing, and utilities. Small, yet significant, differences are observed in expenditures on communications and furniture. From the descriptive statistics, one can conclude that there is no difference in preferences when spending on entertainment, and there is not a statistically significant difference detected in expenditures on health and education.

These results suggest that spending on tobacco in smoking households crowds out food and housing and crowds in spending on alcohol and restaurants and bars. Of course, this is a very rudimentary approach to the crowding-out effect of tobacco to the rest of household consumption. In this step, we do not control for other demographic and household characteristics that add to the identification strategy of the crowding-out model. That is why, in the next phase, we will continue with the empirical analysis of the phenomenon, by introducing other variables and estimating the effect through a conventional econometric approach.

As the data are collected at the household level, we use the sociodemographic characteristics of the head of household. That means, along with the COICOP-defined spending, for the purpose of our empirical analysis, we will include additional sociodemographic variables like: tobacco consumption in the household, household size, average age of household, maximum education of the household (this variable is constructed by taking into account all household members and taking the education of the one with highest education), number of elderly members in the household, number of children under 2 years, household type defined by economic activity (unemployed, pensioners,

employed), region (there are 8 statistical regions in North Macedonia), urban dummy, year fixed effects, and additional variables in line with the theory and the available literature.

According to the model equation (2), tobacco spenders, the log of non-tobacco spenders, and its square are endogenous regressors. To instrumentalize tobacco spenders, we include the male-to-adult ratio, as it is assumed that men tend to smoke more compared to women. Following the existing literature, we also include the log of total expenditures and its square as instruments for the endogenous log on non-tobacco spenders. Additional instrumental variables will be included based on the model's needs and data availability (detailed variable explanations in Appendix 1).

Results

We begin the analysis by looking into the correlation of tobacco expenditures and the rest of the household expenditures. In Table 3, we can see that, for most of the expenditure categories, there is a negative and significant correlation with tobacco expenditures. These links are consistent among different income-level households, with slight differences in the intensity. From Table 3, we can see that there is a negative correlation between the budget share spent on tobacco and budget shares spent on food, housing, furniture, health, and communications. There is a positive correlation detected between the budget share spent on tobacco and the budget shares spent on alcohol, with a small positive correlation also found within budgets spent on clothes and restaurants and bars. This indicates that the increase in budget share spent on tobacco decreases the budget share allocated for other goods and services like food, housing, and health—items that add value to the living standard of the household members and their quality of life.

Table 3. Correlation between tobacco spending and expenditures on other commodities

	Overall	Low income	Middle income	High income
Food	-0.2750*	-0.4066*	-0.2482*	-0.1508*
Alcohol	0.7437*	0.8477*	0.7820*	0.7452*
Clothes	0.0539*	0.0153	0.0330*	0.0289
Housing	-0.0680*	-0.0773*	-0.1137*	-0.1442*
Furniture	-0.0491*	-0.0651*	-0.0605*	-0.0384*
Health	-0.1188*	-0.1124*	-0.1537*	-0.1345*

Transportation	0.1312*	0.0616*	0.1061*	0.1276*
Communication	-0.0231*	-0.0479*	-0.0731*	-0.0376*
Recreation	0.008	-0.0228	-0.0186	-0.0028
Education	0.0091	-0.0086	0.0043	0.0041
Restaurants and Bars	0.0970*	0.0620*	0.0822*	0.0858*

Source: Authors' calculations based on HBS data

Using Table 3 as a starting point, we continue the analysis by estimating the Engel curves, with which we can analyze the actual crowding-out effect while accounting for important household-specific characteristics.

Before going into the crowding-out analysis, we check the diagnostics. For this purpose, we run statistical tests for exogeneity, validity of the instruments, and heterogeneity of the preferences among different household types and income groups (the results of testing the heterogeneity of preferences, exogeneity, and exclusion restriction in the overall sample and by income groups are given in Appendix 2). The results suggest that there is a significant difference in preference between smoking and non-smoking households. In other words, the price of tobacco is not likely a factor influencing a household's decision to consume tobacco in Macedonia.

Looking into the income-level groups, we can see that there is a difference in preferences for most of the items in the low- and middle-income households, whereas in the high-income households a difference in preferences is not confirmed by the conventional statistical test. Estimation of the crowding-out effect was done by traditional 3SLS estimation approach, because the GMM 3SLS did not converge. Table 4 presents the estimated results for all households and by income group.

Table 4. Estimated crowding-out effect by income groups

	Overall sample	Low income	Middle income	High income
Food	0.00000369	0.0000134	-0.00000569	0.00000137
Alcohol	0.0000197***	0.0000286***	0.0000138***	0.0000117**
Clothes	-0.000013***	-0.0000111**	-0.00000941***	-0.00000795*
Housing	-0.0000086	-0.0000349***	-0.00000832	0.00000699

Furniture	-0.0000129***	0.000000942	0.00000161	-0.0000108**
Health	-0.00000567*	-0.00000989*	-0.00000165	-0.00000199
Transportation	0.00000602**	-0.00000549	0.00000825**	0.00000095
Communication	-0.00000104	-0.00000825**	-0.0000036	-0.00000173
Recreation	-0.00000296*	-0.00000135	-0.000000818	-0.00000315
Education	-0.000000729	-0.00000204	-0.00000155**	0.00000147
Restaurants	0.0000188***	0.0000141**	0.0000103***	0.00000826**

Source: Authors' calculations based on HBS data

The results for the overall sample of households and by income groups, presented in Table 4, suggest that the crowding-out effect of tobacco on the rest of consumption is present in Macedonian households and is similar to households from other low- and middle-income countries. Overall, spending on tobacco crowds out spending on clothes, health, furniture, and recreation. Looking into different households, defined by different income levels, we can see some divergent results in terms of sign, statistical significance, and magnitude of the crowding-out effect. For example, the crowding-out effect of tobacco on clothes is evident in all three income-group definitions, with only a difference in the intensity—that is, there is more pronounced crowding out in the low-income households, whereas the effect is smallest in the high-income households. A statistically significant crowding-out effect of tobacco on health is also found for low-income households, along with the overall sample. A statistically significant crowding-out effect of tobacco on furniture was only found for the high-income households. A significant crowding-out effect of tobacco is found in the segment of housing only for the poorest households, whereas for the rest (middle- and high-income), we can see that there is reduction in the magnitude of the effect, however we did not detect statistical significance. There are similar findings for the crowding-out effect for communications: the only significant effect is detected for the low-income households. In the case of spending on education, this effect is significant only among the middle-income households. This might be due to the fact that in Macedonia primary and secondary education is mandatory and

free of charge, but here it is possible that it can be a result of spending on extracurricular activities and more quality educational means. We do not find statistical significance of the effect of tobacco expenditures on food. Nevertheless, it is important to point out that non-smoking households spend a greater share (10 p.p.) of their budget on food compared to smoking households, which indicates current and future problems within smoking households.

In line with the existing literature, this study finds that tobacco users tend to reduce spending on necessities and items that are important for quality of life and living standards due to expenditures on less productive goods. In particular, the results suggest that there is crowding in from tobacco expenditures on the budget shares spent on alcohol and restaurants and bars. These effects are also confirmed among all income groups, with slight differences in the magnitude.

Conclusions

Tobacco consumption in North Macedonia is high and persistent. Households with smoking members devote significant shares of their household budgets to tobacco, at the expense of spending on productive goods and services that add value to the living standard and lifestyle. In 2022, the average budget share households spent on tobacco and tobacco products was 13 percent. With such a big budget sacrifice, many of the smoking households in North Macedonia tend to fall into secondary poverty.

This analysis was made based on Household Budget Survey data for a period of five years (2018–2022). Engel curves were estimated to detect the effects of expenditures on tobacco on other household expenditures. Overall results confirm that spending on tobacco decreases spending on more productive items and services like clothing, health, and furniture, and, at the same time, increases expenditures on less productive items and services like alcohol and bars and restaurants. The results from the overall sample are mainly similar to the results from different income groups. Some differences were expected due to different budget sizes and, with that, different priorities.

Some of the limitations from this study are: first, the study is conducted on limited years of HBS data, so we cannot observe smoking prevalence and spending habits over a longer time. The start of the sample period coincides with some relaxations in tobacco control measures, when smoking in closed terraces was allowed once again, unlike before when smoking was prohibited in all closed spaces. Another potential limitation is that the HBS data are self-reported, so there is some measurement error. Despite the limitations, this study, as the first

on this topic for North Macedonia, adds value to the empirical and policy-level knowledge in this field.

Despite some of the limitations of the study, this pioneering analysis for North Macedonia reveals some preliminary findings on how tobacco expenditures affect households' budget allocations, thereby informing policy recommendations. It is important to stress that this study is consistent with other studies conducted in low- and middle-income countries that also detect crowding-out effects of tobacco expenditures on households' budgets which potentially affect the overall quality of life within households. Thus, policy makers must think of policies that drive down tobacco use more, along with strengthening implementation of existing tobacco control measures to reduce tobacco spending, which would benefit households but also the overall population's well-being and quality of life. Based on the findings of this working paper, several recommendations can be proposed to address the challenges posed by high tobacco consumption and its impact on household welfare in North Macedonia:

- **Implement comprehensive tobacco control policies**. Strengthening tobacco control measures, including higher taxes on tobacco products, stricter regulations on tobacco advertising and promotion, and reinforcing the smoking ban in all public spaces can help reduce tobacco consumption and its associated health and economic burdens.
- **Strengthen tobacco control enforcement**, particularly the implementation of tobacco control policies that ban smoking in public places and restrict access to tobacco products for underage people. Namely, policy makers should reintroduce and strongly enforce the ban on smoking in all closed spaces, bars, and restaurants that was in place previously, but was relaxed in the past seven years.
- **Enhance public health campaigns**. Launch targeted public health campaigns to raise awareness about the harmful effects of tobacco use and encourage smoking cessation. These campaigns should be tailored to reach diverse population groups, including low-income households who may be particularly vulnerable to the negative consequences of smoking. In addition, there should be more campaigning about the negative effects of cigarettes for the young non-smoking population that is at risk of becoming smokers (as mentioned earlier, most of the smokers in North Macedonia begin before the age of 21).
- **Expand access to smoking cessation programs.** Invest in smoking cessation programs and support services to assist individuals in quitting smoking. This could include providing access to counseling, nicotine replacement therapy, and other evidence-based cessation aids, especially

for disadvantaged populations. Support for quitting smoking through primary medical care programs and general practitioners should take into account smoking behaviors of patients and play an active role in helping them quit the harmful habit.

By implementing these recommendations in a coordinated manner, policy makers and stakeholders can work towards reducing tobacco consumption, protecting public health, and improving the well-being of households in North Macedonia.

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Appendix

Appendix 1. Variable description

Dependent variables	Budget share (in total expenditures without tobacco)
food	*Food and non-alcoholic beverages (COICOP group 1)* This category includes all breads and cereals, meat, fish, milk, other dairy products, oils and fats, fruits and vegetables (both fresh and dried), desserts, ready-made food, coffee and tea, other non-alcoholic beverages, and "other" included in the food category.
clothes	*Clothing and footwear (COICOP group 3)* This category includes clothes and shoes, along with all complementary products and services for their maintenance.
housing	*Housing, water, electricity, gas, and other fuels (COICOP group 4)* This is a broad category of goods and services used for household maintenance (such as electricity, water and waste, rent, cleaning, and similar).
furniture	*Furnishings, household equipment, and routine household maintenance (COICOP group 5) and appliances.*
health	*Health (COICOP group 6)* – all expenses related to health, like hospital checks, interventions, medications.
transportation	*Transport (COICOP group 7)* – local transport, cost of fuels and maintenance of vehicles; buying new vehicles.
communication `	*Information and communication (COICOP group 8)* – telephone and internet, post office expenses, purchase of new appliances for communication.
recreation	*Recreation, sport, and culture (COICOP group 9)* This is a very broad category that includes newspapers and magazines, equipment for recreation and communication such as TV sets, toys, plants and equipment for gardening, pets and equipment for pets, veterinary services, cinemas, and travel arrangements.
education	*Education services (COICOP group 10)* – all expenses related to education from preschool to higher education.
Restaurants	*Restaurants and accommodation services (COICOP group 11)* This category includes expenses related to going out to bars and restaurants, but also touristic accommodation, canteens, touristic centers, and different facilities at campsites, etc.
alcohol	*Alcoholic beverages (COICOP group 2.1)* – all alcoholic drinks.
Endogenous variables	
tobacco	Expenditures on tobacco (COICOP group 2.3)
lnM	Total expenditures without tobacco (logarithm)
lnM2	Total expenditures without tobacco (logarithm, squared)
Heterogeneity variables	
tob	Smoking household (tob = 1)
tob_lnM	Interaction: Smoking household (tob = 1) and lnM
tob_lnM2	Interaction: Smoking household (tob = 1) and lnM2
Instrumental variables used to instrument expenditures on tobacco	

mfratio	Ratio of men in the total number of adults
adultratio	Ratio of adults in total number of household members
lnX	Total household expenditure (logarithm)
lnX2	Total household expenditure (logarithm, squared)
Control variables	
hh_size	Household size
hhmaxedu	Maximum education of the household members
mean_age	Average age of the household members
nchild02	Number of children aged between 0 and 2 years
neld65	Number of elderly (65 years old or older)
employed	Employment status: Employed=1
hh_type2	Household type: Pensioners
hh_type3	Household type: Employed
urban	Settlement type: Urban = 1
region	Region fixed effects
Skopje	Region Skopje=1
Pelagonia	Region Pelagonia=1
Southeast	Region Southeast=1
Polog	Region Polog=1
Vardar	Region Vardar=1
East	Region East=1
Southwest	Region Southwest=1
Northeast	Region Northeast=1
y1- y5	Year (2018–2022) fixed effects

Appendix 2. Statistical tests

Overall sample											
	Food	Alcohol	Clothes	Housing	Furniture	Health	Transpo rtation	Communic ation	Recreat ion	Educatio n	Restaurant s
Heteroskedasticity test Pagan-Hall general test statistic	0.081	8.761	29.716	39.057	65.368	146.466	73.276	83.616	191.59 3	44.007	17.234
p-value	0.776	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LM test statistic for underidentification (Kleibergen-Paap rk LM-test)	13.418	13.418	13.418	13.418	13.418	13.418	13.418	13.418	13.418	13.418	13.418
p-value	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
F statistic for weak identification (Kleibergen-Paap rk Wald F statistic)	2.712	2.712	2.712	2.712	2.712	2.712	2.712	2.712	2.712	2.712	2.712
GMM distance test statistic of endogeneity	92.157	200.392	12.908	4.410	15.076	8.551	13.603	1.979	5.062	2.657	35.988
p-val	0.000	0.000	0.005	0.220	0.002	0.036	0.003	0.577	0.167	0.448	0.000
Household preference test (chi2)	159.700	1517.302	7.964	4.883	11.234	5.185	10.415	4.104	3.823	2.490	20.895
p-val	0.000	0.000	0.047	0.181	0.011	0.159	0.015	0.250	0.281	0.477	0.000

Low-income

	Food	Alcohol	Clothes	Housing	Furniture	Health	Transportation	Communication	Recreation	Education	Restaurants
Heteroskedasticity test Pagan-Hall general test statistic	0.432	0.807	133.522	10.323	3.354	70.759	79.897	46.897	14.193	0.000	49.437
p-value	0.511	0.369	0.000	0.001	0.067	0.000	0.000	0.000	0.000	1.000	0.000
LM test statistic for underidentification (Kleibergen-Paap rk LM-test)	14.848	14.848	14.848	14.848	14.848	14.848	14.848	14.848	14.848	14.848	14.848
p-value	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
F statistic for weak identification (Kleibergen-Paap rk Wald F statistic)	3.184	3.184	3.184	3.184	3.184	3.184	3.184	3.184	3.184	3.184	3.184
GMM distance test statistic of endogeneity	21.405	1.706	6.018	16.667	13.420	2.546	16.424	8.079	5.191	0.012	32.457
p-val	0.000	0.636	0.111	0.001	0.004	0.467	0.001	0.044	0.158	1.000	0.000
Household preference test (chi2)	26.582	0.252	6.169	17.259	13.415	2.466	3.168	11.593	3.236	0.111	17.420
p-val	0.000	0.969	0.104	0.001	0.004	0.481	0.366	0.009	0.357	0.990	0.001

MIddle-income

	Food	Alcohol	Clothes	Housing	Furniture	Health	Transportation	Communication	Recreation	Education	Restaurants
Heteroskedasticity test Pagan-Hall general test statistic	38.206	2.517	136.193	4.571	10.505	89.460	63.814	60.807	7.436	12.201	30.015
p-value	0.000	0.113	0.000	0.033	0.001	0.000	0.000	0.000	0.006	0.000	0.000
LM test statistic for underidentification (Kleibergen-Paap rk LM-test)	24.679	24.679	24.679	24.679	24.679	24.679	24.679	24.679	24.679	24.679	24.679
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
F statistic for weak identification (Kleibergen-Paap rk Wald F statistic)	5.237	5.237	5.237	5.237	5.237	5.237	5.237	5.237	5.237	5.237	5.237
GMM distance test statistic of endogeneity	5.813	12.336	8.226	6.502	9.034	3.763	9.816	3.354	0.803	5.944	8.193
p-val	0.121	0.006	0.042	0.090	0.029	0.288	0.020	0.340	0.849	0.114	0.042
Household preference test (chi2)	9.682	8.332	6.107	5.390	6.942	2.545	15.073	17.130	1.618	4.164	11.700
p-val	0.021	0.040	0.107	0.145	0.074	0.467	0.002	0.001	0.655	0.244	0.008

High-income

	Food	Alcohol	Clothes	Housing	Furniture	Health	Transportation	Communication	Recreation	Education	Restaurants

Heteroskedasticity test Pagan-Hall general test statistic	31.776	2.743	19.194	18.225	40.762	56.794	40.522	5.578	74.694	25.210	36.000
p-value	0.000	0.098	0.000	0.000	0.000	0.000	0.000	0.018	0.000	0.000	0.000
LM test statistic for underidentification (Kleibergen-Paap rk LM-test)	5.614	5.614	5.614	5.614	5.614	5.614	5.614	5.614	5.614	5.614	5.614
p-value	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132
F statistic for weak identification (Kleibergen-Paap rk Wald F statistic)	1.165	1.165	1.165	1.165	1.165	1.165	1.165	1.165	1.165	1.165	1.165
GMM distance test statistic of endogeneity	3.540	12.375	2.028	6.460	10.177	4.063	1.685	2.677	3.205	3.780	12.493
p-val	0.316	0.006	0.567	0.091	0.017	0.255	0.640	0.444	0.361	0.286	0.006
Household preference test (chi2)	3.491	3.165	4.244	3.554	3.403	2.325	1.370	2.371	2.338	1.399	10.558
p-val	0.322	0.367	0.236	0.314	0.334	0.508	0.713	0.499	0.505	0.706	0.014

Appendix 3. Estimation results 3SLS

Overall sample

	Food	Alcohol	Clothes	Housing	Furniture	Health	Transportation	Communication	Recreation	Education	Restaurants
exptob	0.00000369	0.0000197***	0.000013***	-0.0000086	0.0000129***	0.00000567*	0.00000602**	-0.00000104	-0.00000296*	0.000000729	0.0000188***
lnM	1.803*	0.498	-1.778***	-2.951***	1.366**	0.649	-1.206**	0.159	0.0912	-0.117	-0.406
lnM2	-0.0934**	-0.0228	0.0832***	0.140***	-0.0620**	-0.0291	0.0568**	-0.00614	-0.0036	0.00546	0.0191
tob	6.311	6.241***	-9.603***	-17.09***	8.896***	3.344	-7.601***	0.786	1.193	-0.504	-2.861
tobM	-1.278	-1.043***	1.774***	3.152***	-1.628***	-0.618	1.390***	-0.144	-0.218	0.0935	0.512
tobM2	0.0629	0.0427***	-0.0808***	-0.144***	0.0750***	0.0287	-0.0636***	0.00656	0.0101	-0.00427	-0.024
hhmaxedu	0.00436***	0.000693	-0.00170**	-0.00505***	0.00195***	-0.00208***	0.000536	0.0000693	0.000000796	0.000198	0.00443***
hh_size	0.0226***	-0.00437***	0.00268***	-0.0150***	0.000806	-0.00589***	-0.00260***	-0.00187***	-0.00140***	0.000247	-0.000786
nchild02	0.00125	0.000469	-0.00215	0.000865	-0.00144	0.00447**	-0.00227	-0.00435***	-0.00187*	-0.000712	0.00245
neld65	0.00213	0.000587	-0.00263	0.00397	-0.00264	0.00744***	-0.00364**	-0.000567	-0.000601	0.000175	-0.00247
hh_type2	0.00173	0.00272	-0.00269	-0.00253	0.00262	0.0161***	-0.00339	-0.00504***	-0.00111	-0.00159**	0.000423
hh_type3	-0.000538	0.00256	0.00817**	-0.0145***	0.00337	-0.00514*	0.00837***	-0.00123	-0.00117	-0.000657	0.00344
urban	0.00727**	-0.00410**	0.00204	-0.000781	0.00218	-0.000389	-0.00576***	-0.00146	0.00150*	0.000317	0.00147
y2	-0.00384	-0.00226	0.00699*	0.00727	-0.00324	0.00179	0.00509	-0.000995	-0.0014	0.00103	-0.00404
y3	0.0193***	-0.00173	0.00241	0.00362	0.00085	-0.00235	-0.000116	-0.00368**	-0.00213	0.000061	-0.0106***
y4	0.0285***	-0.003	0.00252	0.006	-0.00134	-0.00302	0.000455	-0.00377*	-0.00371**	-0.000183	-0.0128***
y5	0.0436***	0.000722	0.00654	-0.0086	-0.00695*	-0.00626	0.00659*	-0.00839***	-0.00485**	0.00037	-0.00912**
Skopje	0.0541***	-0.00558***	0.0121***	-0.0266***	0.00864**	0.00404**	0.0129***	-0.00840***	0.0000318	0.000189	-0.00520**
Southeast	-0.0121**	0.00147	0.0123***	0.00507	0.00835**	0.0155***	0.00396	-0.00177	-0.00449***	0.000552	-0.00305
Polog	-0.0981***	-0.0130***	0.00957**	0.0946***	0.0325***	0.000542	-0.00952**	0.0389***	-0.00543***	-0.000842	-0.0173***
Northeast	-0.0395***	-0.0025	0.0161***	0.0166***	-0.00594**	0.0125***	0.00994***	0.00581***	-0.0019	-0.000464	-0.00193
Constant	-8.048	-2.689	9.493***	15.70***	-7.432**	-3.537	6.417**	-0.963	-0.549	0.628	2.159

Observations	11523	11523	11523	11523	11523	11523	11523	11523	11523	11523	11523
R-squared	0.495	0.676	-0.608	-0.055	-0.789	-0.007	-0.048	0.161	-0.016	-0.024	-1.556

Low-income

	Food	Alcohol	Clothes	Housing	Furniture	Health	Transportation	Communication	Recreation	Education	Restaurants
exptob	0.0000134	0.0000286***	0.0000111**	0.0000349**	0.00000942	-0.00000989*	-0.00000549	-0.00000825**	-0.00000135	-0.00000204	0.0000141***
lnM	-0.0072536	0.3724735	0.1988664	-0.6645017	2.588721**	-0.571727	-1.183598**	-0.3838133	0.0406241	0.0011937	-0.5296407
lnM2	-0.0097775	0.0182004	0.0079901	0.0371283	-0.1266541**	0.0283391	0.0599436**	0.0199913	0.0021899	-0.0000567	0.0260269
tob	-8.122504	0.8000149	2.300062	-0.4348321	11.17571**	-2.50902	-3.43772	-0.9161037	-0.1118426	0.0063914	-2.486327
tobM	1.387616	-0.0276552	0.4331629	0.1452909	-2.182635**	0.4839256	0.6755024	0.1961708	0.0239224	-0.0012019	0.459454
tobM2	-0.0601828	0.005073	0.0210199	-0.0078758	0.1062189**	-0.0227732	-0.0327334	0.0098995	0.0011865	0.0000576	-0.021998
hhmaxedu	0.006139**	-0.0008142	0.0024368***	0.0034984**	0.0002311	-0.001451	-0.001655*	-0.0009327	-0.0002131	-0.00000547	0.0025221***
hh_size	0.0150227*	-0.0045579***	0.0014501	-0.0081235*	0.0065957**	-0.004936*	-0.0048451*	0.0019001	0.0001552	0.00000273	-0.0018814
nchild02	-0.0050639	0.002023	-0.0008681	-0.0077335	0.001534	0.00146	-0.0075957***	0.0042169**	0.0004981	0.0000188*	0.0054438**
neld65	-0.0020317	-0.0009626	0.0011989	0.009779*	-0.0035358	0.0023589	-0.0015116	0.0017991	0.0010157*	0.00000231	-0.0032353
hh_type2	-0.0128709	-0.0008208	0.0034043	0.0021144	0.0035717	0.0119373***	-0.0019024	0.0020478	0.0019613**	-0.0000264*	-0.0039031
hh_type3	-0.0173319*	-0.0017234	0.0084188**	0.012028	0.0024655	-0.0038827	0.0047923	0.0042313*	0.0020698**	-0.0000309*	0.0028382
urban	0.002973	-0.0027467*	-0.0006388	0.0053185	-0.0011874	0.0041675*	-0.0042482*	-0.0007329	-0.0000435	0.0000105	0.0018985
y2	-0.0001194	-0.0033238	0.0011752	-0.0032243	0.0001748	0.0024233	-0.0053454*	-0.0002302	-0.00186**	-0.0000134	0.0031282
y3	0.0241794***	-0.0041284*	0.0077273***	-0.0104503*	0.0034517	0.0056187*	-0.0057966*	0.0025061	-0.0021542***	-0.0000171	-0.0014246
y4	0.0302443***	-0.0004505	-0.0078536***	-0.0007308	-0.0006542	0.0032938	-0.005682*	-0.0007957	-0.0020564***	-0.0000117	0.0084535***
y5	0.0330519***	-0.009979***	-0.0099548***	0.0198385**	0.0062546*	-0.000688	-0.0040698	-0.0048736**	-0.0025025***	-0.0000183	0.0073516***
Skopje	0.0771852***	-0.0039098	0.0154966***	0.0403802**	-0.0002579	0.0034692	-0.0079397**	0.0085837***	-0.0014449	-0.0000188	0.0014236
Southeast	-0.0008404	-0.0018996	-0.0040402	-0.0106621	0.0036692	0.0081761	0.0033467	0.0014837	0.0018813	-0.00000693	-0.0004182

	Food	Alcohol	Clothes	Housing	Furniture	Health	Transportation	Communication	Recreation	Education	Restaurants
Polog	0.0084431	-0.0101572**	-0.0167536***	0.0126791	0.0115034*	-0.0104739	-0.0284573***	0.0123185***	0.0020025	-0.0000156	-0.0112032**
Northeast	-0.0353422***	0.0090255***	-0.0117598***	0.0074026	0.0011737	0.0261632***	0.0019055	0.0036389*	0.0008565	-0.00000645	-0.000535
_cons	1.739942	1.926082	1.165372	2.979265	-13.17554**	2.925102	5.870166**	1.846903	0.1895383	-0.0062099	2.699159
Observations	3469	3469	3469	3469	3469	3469	3469	3469	3469	3469	3469
R-squared	0.2062	0.8185	-0.2755	-0.7534	-0.4004	-0.0684	0.0015	-0.2967	-0.0352	-0.0672	-0.86

Middle-income

	Food	Alcohol	Clothes	Housing	Furniture	Health	Transportation	Communication	Recreation	Education	Restaurants
exptob	-0.00000569	0.0000138***	0.00000941***	-0.00000832	0.00000161	-0.00000165	0.00000825**	-0.0000036	-0.00000818	0.00000155*	0.0000103***
lnM	0.0366535	-0.1238503	-1.410406***	0.2398779	1.301948**	1.092906*	-0.7684669*	0.1980504	-0.0483443	-0.2210504**	-0.3928766
lnM2	-0.013417	0.0061399	0.0674277***	-0.0062709	-0.0609121**	-0.0507411**	0.0379822*	0.0111048	0.0025791	0.0103384**	0.0193814
tob	-7.424817*	5.4361***	-4.87115**	2.284171	5.607395**	4.603447*	-5.30314***	-0.6586429	-0.2624864	-0.9168139**	-2.557325
tobM	1.255943*	-0.8875997***	0.9032338**	-0.4181497	-1.034396**	-0.8607008**	0.9681248***	0.1132595	0.05009	0.171499**	0.4559186
tobM2	-0.0529365	0.0356757***	0.0411256**	0.0195401	0.0474348**	0.0401087**	-0.0445606***	0.0050197	-0.0023234	-0.0078934**	0.0209216
hhmaxedu	0.0034661*	0.000512	0.0010514	0.0059498**	0.0006623	-0.0017957*	0.0004245	-0.000538	-0.0001127	0.0001705	0.0039663***
hh_size	0.0277992***	-0.0049932***	0.0058907*	0.0172337**	0.0087977**	0.0005732	-0.0120016***	-0.0046667**	-0.0006144	-0.000309	-0.0047015
nchild02	0.008856	-0.0013857	0.0019884	-0.0037284	0.0008418	0.0064693**	-0.0038803	0.0042083**	-0.000219	-0.0011656*	-0.0030526
neld65	0.0013274	-0.0008022	0.0003769	0.0029568	0.0021784	0.0086597***	-0.0014854	0.0029598*	0.000104	0.0002037	-0.0026129
hh_type2	0.01008	0.0017119	0.0110008**	-0.0181246**	0.0077387*	0.0210175***	-0.0006568	0.0033403	0.0008598	-0.0033635***	0.005377
hh_type3	0.0087531	-0.003077	0.0016376	0.0267245**	0.0056348*	-0.0005684	0.0092225**	0.0001545	0.0007962	-0.0030352***	0.0097207**
urban	-0.0145391***	0.0023956**	0.0030962	-0.0075567**	0.0006833	-0.0040529*	-0.0072288***	0.0014703	0.0023482***	-0.0001003	0.0030924
y2	0.0018648	-0.0003669	0.0018555	-0.0037251	-0.0062737*	0.0034687	0.0015671	0.0019978	0.0003577	0.0022615***	0.0036945
y3	0.0174803**	-0.0002539	0.0030143	-0.0022676	0.0051313	0.0048368	-0.0024625	0.0033686	0.0018539	0.0009598	0.0096134**

	Food	Alcohol	Clothes	Housing	Furniture	Health	Transportation	Communication	Recreation	Education	Restaurants
y4	0.0392253***	0.0006551	-0.0014742	-0.0119287	-0.0098059***	-0.000091	-0.0030764	-0.0033622	-0.0028304*	0.0011273	-0.0065574
y5	0.0627555***	0.0038085**	0.0021527	0.0298498***	-0.0093967***	0.0052635	0.00412	0.0105123***	0.0019522	0.0007059	-0.0050514
Skopje	0.0673547***	-0.0061375***	-0.014914***	0.032303***	-0.0070344***	0.0055866**	0.0168878***	-0.0097291***	0.0011162	-0.0001278	-0.0121947***
Southeast	0.0209462***	0.0020317	0.0145283***	0.0138698**	-0.0060416*	0.0191414***	0.0039032	-0.002858	0.0012226	-0.000082	-0.0095345***
Polog	-0.1248261***	-0.0139115**	-0.0209063***	0.0984788***	-0.0224204***	0.0066887	-0.0086667*	0.0441827***	-0.0030725*	-0.0025725**	-0.0247558***
Northeast	0.0468008***	-0.006561***	0.0261682***	0.0204463**	-0.0071692*	0.0170589***	0.0153376***	0.0062173**	-0.001266	-0.0006241	-0.0101908***
_cons	1.629111	0.6488198	7.405788***	-1.659965	-6.918228***	-5.835831*	3.922878*	0.8886713	0.2300754	1.181898**	1.994573
Observations	4630	4630	4630	4630	4630	4630	4630	4630	4630	4630	4630
R-squared	0.4122	0.4122	0.4122	0.1592	-0.0762	0.0745	-0.0419	0.1524	0.1524	0.1524	-0.3205

High-income

	Food	Alcohol	Clothes	Housing	Furniture	Health	Transportation	Communication	Recreation	Education	Restaurants
tobacco	0.00000137	0.0000117**	-0.00000795*	0.00000699	-0.000000108*	-0.00000199	0.00000095	-0.00000173	-0.00000315	0.00000147	0.00000826***
lnM	-0.0121	0.172	-0.865**	-1.106	0.110	1.477***	0.271	0.729***	0.108	-0.0938	-1.097***
lnM2	-0.00910	-0.00754	0.0388**	0.0521*	-0.00637	-0.0641***	-0.0104	0.0313***	-0.00365	0.00415	0.0481***
tob	-1.443	4.412***	-5.345**	-9.954**	1.744	8.724***	0.228	3.908***	1.436	-0.496	-7.252***
tobM	0.186	-0.695***	0.950**	1.712**	-0.290	-1.535***	-0.0340	-0.685***	-0.248	0.0846	1.256***
tobM2	-0.00562	0.0268***	-0.0416**	-0.0740**	0.0127	0.0674***	0.00125	0.0300***	0.0109	-0.00371	-0.0548***
hhmaxedu	0.00416**	0.000392	-0.00161	-0.00536**	-0.00372**	-0.00277*	0.000581	0.000526	0.000778	0.000570	0.00450***
hh_size	0.0264***	0.00297**	0.0157***	-0.0364***	-0.000260	-0.00629**	-0.00309	0.00168	-0.00422*	0.000439	0.00276
nchild02	-0.000649	0.000432	-0.00292	0.0101	0.00275	0.00462	0.00302	-0.00449	-0.00663**	-0.000533	0.00450
neld65	0.00235	0.000822	-0.00285	0.00494	-0.000336	0.0136***	-0.00695*	0.00168	-0.00301	0.000556	-0.00454

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
hh_type2	0.0139	0.00178	-0.00623	0.0107	0.00370	0.0192**	-0.00232	-0.0212***	-0.00547	-0.00249	-0.00304
hh_type3	0.0150	0.00302	0.00888	-0.0314**	0.00232	-0.00591	0.0194**	-0.0126***	-0.00652	-0.000556	0.00500
urban	0.00568	-0.00481**	-0.000778	-0.00915	0.000949	0.00151	-0.00148	0.000301	-0.00166	0.000715	0.00193
y2	0.0159*	-0.000101	0.000511	-0.0113	0.00326	-9.57e-06	0.0134**	-0.00359	-0.00173	-0.00107	-0.0108**
y3	0.0489***	0.00249	-0.0102*	-0.0141	0.00749	-0.0105*	0.000396	-0.00323	-0.00135	-0.00198	-0.0162***
y4	0.0531***	0.00137	-0.01000*	-0.00767	0.00914*	-0.0127**	0.00187	-0.00450	-0.00493	-0.00320**	-0.0177***
y5	0.0777***	0.00261	-0.00220	-0.0381***	0.00105	-0.0125**	0.00709	-0.0105***	-0.00669	-0.00208	-0.0113**
Skopje	0.0173***	0.000237	0.00682*	-0.0276***	0.00132	0.00901**	0.0177***	-0.0110***	-0.00574*	-0.000231	-0.0115***
Southeast	-0.0171***	0.00149	0.0273***	0.00132	0.00393	0.0163***	-0.00270	-0.00488*	-0.00731**	0.00247*	-0.0122***
Polog	-0.127***	-0.0153***	-0.0111*	0.109***	-0.0279**	0.0111	-0.0218***	0.0447***	-0.00515	-0.0014	-0.0300***
Northeast	-0.0316***	-0.00215	0.0144**	0.0279**	0.00622	-0.00527	0.00415	0.00621	-0.0055	0.000691	-0.00952
Constant	1.622	-0.952	4.840**	6.124	0.489	-8.402***	-1.689	-4.181***	-0.729	0.529	6.251***
Observations	3,424	3,424	3,424	3,424	3,424	3,424	3,424	3,424	3,424	3,424	3,424
R-squared	0.444	0.726	-0.053	0.058	-0.212	0.006	0.086	0.081	0.007	-0.066	-0.304