tobaccotaxation
Economic Research Informing
Tobacco Taxation Policy

CROWDING OUT EFFECT OF TOBACCO CONSUMPTION IN SERBIA

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COGNOSCERE EST MUTARE

Institute of Economic Sciences

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EXECUTIVE SUMMARY

Although both smoking prevalence and smoking intensity in Serbia have decreased in recent years (Vladisavljević et al., 2020), expenditures on tobacco products still represent a significant portion of household budgets. According to Household Budget Survey (HBS) data, tobacco expenditures represent, on average, about nine percent of total expenditures for smoking households. As households have limited resources at their disposal, consuming tobacco means that they spend less on other items such as food, clothing, education, and health care. This is particularly true for poor households, and since Serbia has one of the highest poverty rates in Europe (Eurostat, 2020) spending on tobacco exerts significant pressure on the budgets of a significant portion of Serbian households. Furthermore, although some households have sufficient resources to satisfy their basic needs, spending those resources on tobacco means that they are used unproductively, which can put them into so-called secondary poverty (John et al., 2019).

Over the last 15 years a number of studies (John, 2008; Koch & Tshiswaka-Kashalala, 2008; San & Chaloupka, 2015) have investigated the impact of tobacco expenditures on spending on other consumption items. These research, conducted mainly in low- and middle-income countries, suggests higher tobacco expenditures are *the cause* of lower spending on food, education, clothing, medical care, and other consumption items—that is, tobacco consumption crowds out expenditures on other products. To the authors' knowledge, the current study is the first to be conducted on the crowding out effect for Serbia and other countries in the Western Balkans region.

The main goal of this research is to estimate the crowding out effect of tobacco consumption on other consumption items. Research is based on HBS data for Serbia for the years 2006–2017. The study analyzes the effect on 11 product groups, organized according to first-level COICOP[1] groups. The crowding out effect, theoretically based within a system of Engel curves, is estimated via an approach that includes the combination of seemingly unrelated regression (SUR) and instrumental variables (IVs).

The data show that the average budget share spent on cigarettes stagnates during the period, showing only a slight increase from 2.9 in 2006 to 3.4 percent in 2017. However, more detailed analysis shows that this trend is the result of both decreasing prevalence of tobacco consumption (from 50 to 37 percent) and increasing expenditures for the households who continue smoking (whose budget share spent on tobacco increased from 5.8 to 9.1 percent). Meanwhile, for those who give up smoking tobacco, resources can be directed towards other consumption items. The expenditures for those who continue smoking are on the rise despite lower consumption, due to much faster growth in tobacco prices. Similar trends are observed for low-, middle-, and high-income families.

The results of the analysis indicate that tobacco expenditures in Serbia have a negative impact on the overall consumption structure in Serbia. The results indicate that:

[1] COICOP stands for Classification of Individual Consumption According to Purpose – a reference classification published by the United Nations Statistics Division (UN, 2018).

1) **Expenditures on tobacco force households in Serbia—particularly low-income households—to reduce more essential and productive consumption**, such as food, clothing, education and recreation and culture. Aside from the immediate adverse effects of cutting consumption of these products, this finding is also important from the perspective of intra-household allocation, as it can affect children's future health, development, and earning potential.
2) Tobacco expenditures increase the budget shares spent on complementary consumption items such as alcohol, hotels, bars, and restaurants. Therefore, **spending on tobacco—besides being unproductive itself—also increases the budget share spent on other complementary non-productive consumption items**.
3) Moreover, tobacco expenditures crowd out expenditures on health and durables for high-income households as well. **For high-income households, consuming tobacco prevents investment in durables and the health of household members**.

The results from this research underline the negative effect that tobacco expenditures have on consumption of other products. The only way for households to decrease expenditures on tobacco is to stop smoking, as the demand of those who continue smoking changes less than cigarettes prices (Zubović & Vladisavljević, 2020). To ensure that households stop smoking and instead direct their expenditures towards more productive purposes, the Serbian government should adopt new policies and strengthen enforcement of existing tobacco control measures. Specifically, the government should:

1) **enforce a ban on smoking in bars and restaurants** and **strengthen enforcement of current laws restricting smoking at work and in public places**, which would help motivate smokers to quit smoking;
2) **invest more in all other tobacco control measures** that aim to motivate quitting smoking, such as offering (medicinal and psychological) help to stop smoking and requiring more visible and graphic warnings about the harmful effects of tobacco; and
3) **strengthen enforcement of current laws on tobacco advertising**, promotion, and sponsorship, which would decrease the number of new smokers.

1. INTRODUCTION

According to Household Budget Survey (HBS) data, in the period between 2006 and 2017 smoking prevalence in Serbia decreased from 49.7 to 37.0 percent. Previous research in Serbia (Vladisavljević et al., 2020) indicates that this decrease is at least partially due to increases in tobacco excise taxes and consequently tobacco prices, which in real terms have increased by about 2.4 times over the period. Therefore, the previous research confirms that increasing tobacco taxes is an important and relevant policy instrument in reducing smoking prevalence and improving health outcomes.

However, expenditure on tobacco still accounts for a significant portion of household expenditures. In Serbia, HBS data suggest that the budget share spent on tobacco products can comprise up to 52 percent of total household consumption. As households have limited resources at their disposal, a high budget share spent on tobacco means that they have to cut back on consumption of essentials such as food, clothing, or housing. Giving up consumption of other products to spend money on tobacco is called the "crowding out effect" of tobacco spending. This effect can be particularly difficult for poor households, as smoking expenditures put further pressure on their already insufficient budgets. However, even in situations where households have sufficient resources to meet their basic needs these resources can be used unproductively when spent on tobacco, therefore putting the households into so-called secondary poverty (John et al., 2019). These households are associated with secondary poverty since their disposable income, after spending on tobacco, is lower than the threshold used to officially classify households as poor.

Over the last 15 years a number of studies have indicated that spending on tobacco crowds out expenditures on food, education, clothing, medical care, and other consumption, particularly in low- and middle-income countries (John, 2008; San & Chaloupka 2016; Koch & Tshiswaka-Kashalala, 2008). To the authors' knowledge, this is the first study on the crowding out effects of tobacco consumption in Serbia (as well as the entire region of the Western Balkans).

This research aims to estimate the effects that tobacco consumption has on the consumption of other products. HBS data for the years 2006 to 2017 and a seemingly unrelated regression (SUR) approach are used to estimate a system of Engel curves that presents a theoretical framework for the analysis of crowding out effects. Since tobacco expenditures are endogenous to other consumption items, to assess the impact of tobacco consumption an instrumental variables (IV) approach is used. The results show that tobacco expenditures: 1) crowd out more essential and more productive consumption such as food, clothing, education, recreation, and culture—the effects of which are particularly strong for low-income households; 2) decrease investments in durables and health for high-income households; and 3) increase spending on other complementary consumption items, such as alcohol and spending on bars and restaurants.

Evidence on how tobacco expenditures affect other components of consumption can help policy makers by providing further arguments in support of the implementation of tobacco control measures. Furthermore, the crowding out effect of tobacco consumption is

important as it highlights the negative impact of tobacco consumption on intra-household allocation, with typically unfavorable outcomes for women and children, particularly in poor households (John et al., 2019; Thomson et al., 2002). Therefore, as adult men are the most likely smokers in low-income households, reducing their tobacco expenditures through tobacco control measures increases their spending on other goods and services, consequently pushing intra-household allocation towards children and women.

2. DATA AND STYLIZED FACTS

In order to estimate the crowding out effects of tobacco consumption, this study uses HBS data for the years 2006–2017. HBS is a nationally representative survey, conducted annually as a repeated cross section (that is, without a panel structure) by the Statistical Office of the Republic of Serbia (SORS). The survey is used for monitoring national expenditure trends and for calculation of weights when computing consumer price indices (CPIs). HBS is conducted in all European countries with a comparable methodology and coordinated by Eurostat. HBS is the only survey in Serbia that provides detailed information on household expenditures, other economic and socio-demographic characteristics, and population weights that are needed for the estimation of the effects of tobacco expenditures on other consumption. The total number of households that participated in HBS during these 12 years is 62,052. About 40 percent of these households have positive tobacco expenditures.

In line with the Classification of Individual Consumption According to Purpose (COICOP), developed by the United Nations Statistics Division, household expenditures in HBS are divided into 12 mutually exclusive and exhaustive commodity groups.[2] HBS data allow for further differentiation within the 12 groups, and this feature is utilized in this research to differentiate between tobacco and alcohol expenditures within the COICOP group 2 – Alcoholic beverages and tobacco. Therefore, a total of 13 mutually exclusive and exhaustive expenditure variables are used for the estimation of the crowding out effect in this study. The main goal is to estimate the effect of tobacco expenditures on the expenditure for the other 12 commodity groups.

Table 1 presents trends in tobacco consumption and expenditures between 2006 and 2017. In this period, both smoking prevalence and smoking intensity decrease substantially. Prevalence decreases by about 13 percentage points (from almost 50 to 37 percent, in Column 1), indicating that for the households in which a member or members quit smoking the resources previously spent on cigarettes could now be used for other consumption items. For households that continued smoking, although smoking intensity—measured by number of manufactured cigarette (MC) packs purchased[3]—decreases by about 12 sticks (or by 30 percent, in Column 2), real tobacco prices—measured by tobacco CPI—increase by about 2.4 times (Column 3). This results in the increase of smoking households' real tobacco expenditures by about 56 percent (Column 4), and an increase of the budget share spent on tobacco from 5.8 to 9.1 percent (Column 5).

[2] These groups are: 01 - Food and non-alcoholic beverages; 02 - Alcoholic beverages and tobacco; 03 - Clothing and footwear; 04 - Housing, water, gas, electricity, and other fuels; 05 - Furnishings, household equipment, and routine maintenance of the house; 06 - Health; 07 - Transport; 08 - Communications; 09 - Recreation and culture; 10 - Education; 11 - Restaurants and hotels; and 12 - Miscellaneous goods and services.

[3] In HBS, data on roll-your-own (RYO) tobacco are collected in kilograms (not in sticks), and therefore RYO consumption could not be included together with MC to assess the overall quantity trends. As MC expenditure on average represents 98.7% of total expenditures on tobacco (own calculation based on HBS data), the number of MC smoked is the best approximation for the trend of the overall intensity (quantity) of tobacco consumption. As the crowding out model uses expenditures expressed in national currency, RYO expenditures can and will be included in total tobacco expenditures.

The overall change in expenditure (including both smoking and non-smoking households) on tobacco is positive, with about 15-percent-higher real expenditures on tobacco in 2006 than in 2017 (Column 6). At the same time the budget share spent on tobacco increases slightly, from 2.9 to 3.4 percent (Column 7). This relatively stagnant trend is the result of two opposing trends: for households who quit smoking, resources previously spent on tobacco can now be directed towards other commodity groups; however, for those who continue smoking, the expenses are higher, although the intensity of their smoking is lower.

Table 1. *Trends in tobacco consumption and expenditures between 2006 and 2017*

				Smoking households only[4]		All households[5]	
Year	Smoking prevalence[1]	Number of MC packs consumed per month[2]	Real tobacco CPI[3] (2006=100)	Real expenditures on tobacco products (2017=100)	Budget share spent on tobacco products	Real expenditures on tobacco products (2017=100)	Budget share spent on tobacco products
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
2006	49.7%	39.1	100	3,787	5.8%	1,884	2.9%
2007	47.9%	39.2	118.6	4,345	6.6%	2,084	3.2%
2008	44.1%	39.0	117.5	4,321	6.5%	1,907	2.9%
2009	42.0%	37.9	133.4	4,494	7.0%	1,888	2.9%
2010	38.8%	37.0	141.5	4,649	7.2%	1,805	2.8%
2011	38.5%	36.2	150.7	4,734	7.5%	1,821	2.9%
2012	38.1%	34.3	162.8	4,972	7.4%	1,896	2.8%
2013	36.7%	29.6	195.8	5,158	8.3%	1,892	3.0%
2014	36.6%	27.7	220.3	5,399	8.6%	1,975	3.2%
2015	38.4%	28.9	212.4	5,562	8.6%	2,137	3.3%
2016	35.9%	29.1	230.6	5,919	9.1%	2,124	3.3%
2017	37.0%	27.2	244.0	5,909	9.1%	2,185	3.4%

Notes:
[1] Including both manufactured cigarettes (MC) and roll-your-own (RYO) tobacco
[2] Average, excluding non-consumers
[3] Consumer Price Indices from Statistical office of the Republic of Serbia (SORS)
[4] Excluding non-consumers, including expenditures on both MC and RYO tobacco
[5] Including non-consumers, including expenditures on both MC and RYO tobacco

Source: Authors' calculations based on HBS data

Figure 1 analyzes the main trends from the above table by income groups.[4] The prevalence of tobacco consumption (including both MC and RYO), decreases the most over time for the low-income group (Figure 1, left panel), who reduce their tobacco consumption by about 14 percentage points (from 47.9 to 33.9 percent). This group is closely followed by households from the middle-income group, who reduce their consumption by about 13.8 percentage points, although they started from a higher initial prevalence (from 53.4 to 39.7 percent).

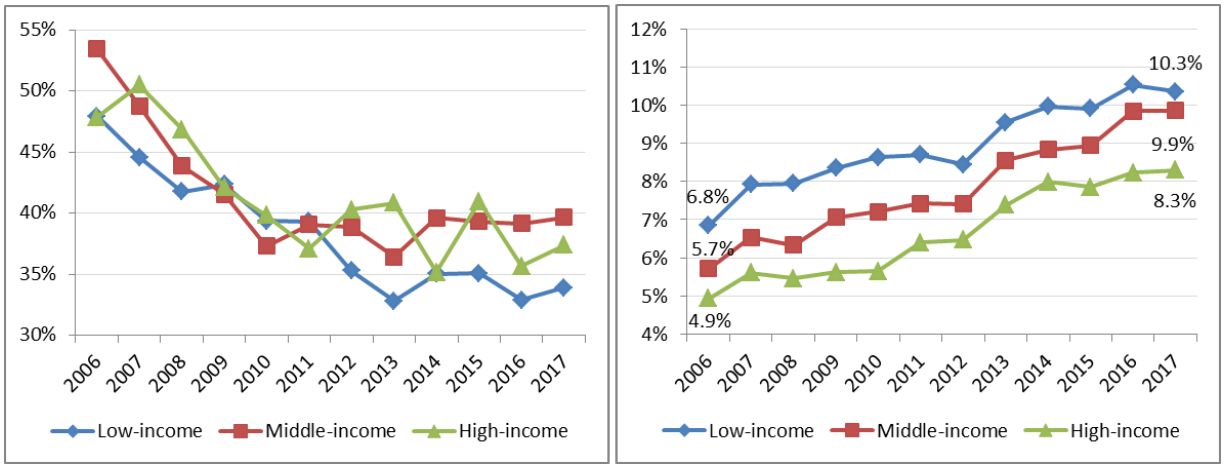
[4] To maintain consistency within the research framework and due to issues regarding representativeness of income variables in HBS, the authors use consumption as a proxy for income to formulate income groups.

The decrease in prevalence is the lowest for the high-income group, at 10.5 percentage points (from 47.8 to 37.4 percent).

On the other hand, for the households that continue smoking, the budget share spent on tobacco increases similarly. Between 2006 and 2017 the budget shares for low-, middle-, and high-income households increase by 3.5, 4.1, and 3.4 percent, respectively. In accordance with expectations, the budget share spent on tobacco is the highest in the low-income group, where it represents 10.3 percent of expenditures in 2017, followed by the middle-income group, where the budget share spent on tobacco represents 9.9 percent. The budget share spent on tobacco is the lowest in the high-income group, at 8.3 percent.

Overall, including both smoking and non-smoking households, the budget share spent on tobacco products remains the same for low-income households (at 3.3 percent), while increasing slightly by 0.7 percentage points for middle- and high-income households (from 3.1 to 3.7 for middle-income and from 2.4 to 3.1 percent for high-income households). For all three groups, this relatively stagnant budget share results from two opposing trends: households that have quit smoking can spend more on other goods and services, while households that continue smoking (although decreasing their consumption) face increasing pressure on their budgets.

Figure 1. *Prevalence of tobacco consumption (left panel) and budget shares spent on tobacco by smoking households (right panel), by income groups*



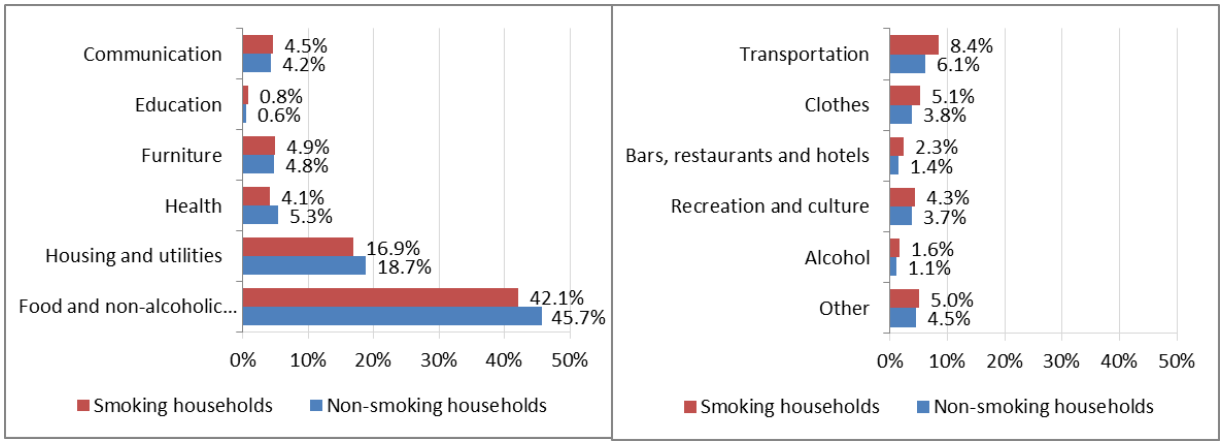
Notes: Left panel – prevalence of tobacco consumption includes both manufactured cigarettes (MC) and roll-your-own (RYO) tobacco; right panel – budget share spent on cigarettes excludes non-consumers but includes expenditures on both MC and RYO tobacco

Source: Authors' calculations based on HBS data

Figure 2 analyzes the budget shares, in total expenditures excluding tobacco consumption, that smoking and non-smoking households spend on other commodity groups. Non-smoking households spend a higher share of their budgets on food and non-alcoholic beverages (by 3.6 percentage points), housing and utilities (by 1.8 percentage points), and health (by 1.2 percentage points). On the other hand, smoking households spend higher budget shares on all other commodity groups, with the differences being most pronounced in expenditures on transport (by 2.5 percentage points), clothes (by 1.4 percentage points),

and bars, restaurants, and hotels (by 0.8 percentage points). The differences in expenditure patterns of smoking and non-smoking households suggest that their expenditure patterns differ not only in expenditures on tobacco but also in preferences in consumption patterns of other products.

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



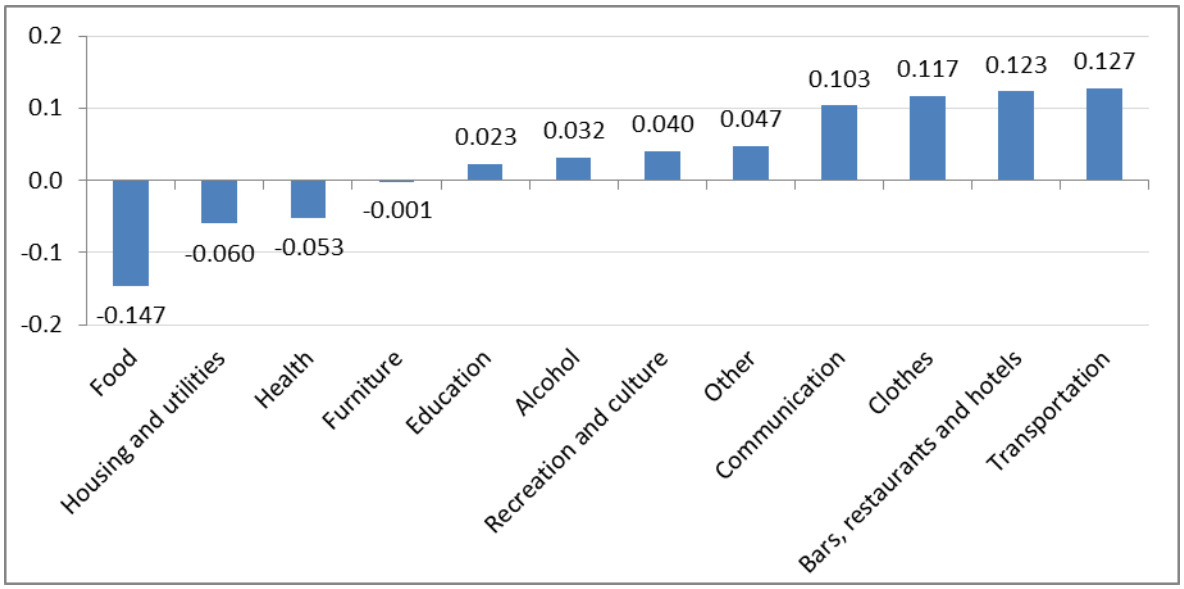
Notes: Budget share in the total expenditures is calculated without expenditures on tobacco. Products are grouped according to COICOP classification. All differences between the groups are statistically significant (results of the t-test comparing the differences are available upon request).

Source: Authors' calculations based on HBS data

Similarly, among the households with positive tobacco expenditures the expenditure on tobacco products is negatively correlated with the budget shares spent on food, housing, and health. The correlation with budget shares spent on furniture is insignificant, whereas the correlation of tobacco expenditures with all other products groups is positive. The strongest correlation is with budget shares spent on transportation, bars and restaurants, and clothes (Figure 3).

The results in Figure 2 and Figure 3 suggest that tobacco expenditure crowds out expenditures on food, housing, and health. However, this analysis does not control for household income, size, and composition, as well as for other household characteristics, and it lacks an identification strategy for the estimation of the crowding out effect. For this reason, a formal econometric model is needed to estimate the effect of tobacco consumption on other commodity groups.

Figure 3. *Correlation between expenditures on tobacco products and budget shares spent on products from different groups in smoking households*



Notes: Budget share in the total expenditures without expenditures on tobacco. Products are grouped according to COICOP classification. All correlations are statistically significant except for furniture (results of statistical test are available upon request).

Source: Authors' calculation based on HBS data

3. ECONOMETRIC MODEL TO EXAMINE THE CROWDING OUT EFFECT

3.1. THEORETICAL FRAMEWORK AND ECONOMETRIC MODEL

The starting point for the estimation of a crowding out effect is consumption theory. Since HBS data are collected on the household level, the theoretical model must first assume that the household maximizes a single utility function—that is, that the household seeks to maximize the utility from the consumption of a distinctive group of products, where consumption of each product group is operationalized with a demand function. Each demand function is conditional on the prices of all the products in the basket of goods, household characteristics, and the available household budget. To estimate the crowding out effect of tobacco consumption it is also necessary to assume that tobacco demand is predetermined (Pollak, 1969).[5] This assumption enables entering expenditures on tobacco explicitly into the demand functions, which are now conditional on tobacco consumption. Conditional demand functions can be written as:

$$x_i = g^i(p_1, p_2, \dots, p_{n-1}, x_n, M, \boldsymbol{h}), \qquad i = 1, 2, \dots, n-1 \qquad (1)$$

where the demand for each commodity group (x_i) is a function of the prices of all products (p_i), demand for tobacco consumption (x_n), total expenditure attenuated for the fixed expenditures on tobacco (M), and a set of household characteristics (h).

Since the prices of commodity groups are not available,[6] the effect of tobacco expenditures on expenditures for other groups can be estimated only via Engel curves, which use the expenditures of different commodity groups in the specification (Banks et al., 1997). The model can be written as

$$w_i = \beta_{0i} + \beta_{1i} tob\_ex + \beta_{2i} lnM + \beta_{3i} (lnM)^2 + \gamma_{ji}' h_j + u_i, \quad i = 1, 2, \dots, n-1 \qquad (2)$$

where w_i is the budget share of the group of products i in the household budget after tobacco expenditures are deducted, *tob_ex* are expenditures on tobacco, and M and h are, as before, total expenditure attenuated for the fixed expenditures on tobacco and the set of household characteristics, respectively. The last term u_i is the demand equation model error. The presence of quadratic terms in the equations (2) permits differences in preferences at different levels of income—that is, the same commodity group can at some income levels be seen as a luxury, while at others it is a necessity (John, 2008). The vector of household characteristics h includes household size (log), number of children aged from 0 to 2 years, number of children aged from 3 to 6 years, number of elderly (65 or older), average age of the household, maximum education of the household members, household type,

[5] Discussion on this assumption is provided in section 3.2.

[6] In the case of a single good (such as cigarettes) the approximation of prices could be obtained via calculating the unit value of the good (ratio between expenditures on the good and consumption of the good). However, as each group of products consists of numerous products within that group, calculation of the unit value is not possible, since they are presented in different measurement units.

controls for region and type of residence (rural or urban), and year-fixed effects to account for the potential changes in the legislation that might have impacted the preferences.

The coefficient of interest in the equation (2) is β_{1i}, which represents the estimation of the crowding out effect. If the coefficient β_{1i} is negative and statistically significant, this means that expenditure on tobacco indeed decreases the budget share spent on the group of commodities *i*, and therefore that the crowding out effect occurs. If the coefficient is positive, this means that the demand for that commodity group and tobacco consumption are complements: higher tobacco consumption is associated with higher levels of budget shares for these products.

3.2. ESTIMATION OF THE MODEL

Estimation of the model poses several challenges. First, *tob_ex* and *M* in the equation (2) are likely to be endogenous, due to the simultaneity. This potentially violates the OLS assumption of the independence of regressors and error terms and, consequently, fails to give causal interpretation to OLS estimates (John et al., 2019). The endogeneity problem is typically solved by the instrumental variable (IV) method, which relies on finding exogenous variable(s) that are 1) correlated with the endogenous regressor but 2) not correlated with the error term of the equation (2). The first condition is called identification (inclusion) condition, while the second is called exclusion restriction. Since the IV method is less efficient than OLS if the regressors are not endogenous or if IVs are not valid, the estimation procedure should first establish if any of the regressors are endogenous (via Durbin-Wu-Hausman, Wooldridge score test) and test the relevance and validity of the proposed instruments (via Sargan test or Hansen-Sargan test). In addition to providing statistical evidence that the instrument is valid, the validity of the instrument must be strengthened by persuasive argument based on economic theory or previous research.

Previous research on the crowding out effect uses total value of household assets or total expenditures as an instrument for total expenditures without tobacco (*M*) and the ratio of (adult) women and men in the household (sex ratio) as an instrument for tobacco expenditure (John, 2008; San & Chaloupka, 2016). The latter argument is based on the fact that prevalence is typically higher among men than among women, while the ratio of men to women is typically assumed to be uncorrelated with budget shares on other products.

However, according to Zubović et al. (2020) in the case of Serbia female and male smoking prevalence is not statistically different, although men typically smoke and spend more on tobacco than women. Given that the gender differences are not as pronounced in Serbia as in other countries, an alternative strategy will be considered, relying on a composite measure of smoking prevalence and intensity, in line with the approach applied by Koch and Tshiswaka-Kashalala (2008). The composite measure is calculated in two steps. In the first step, the data from STC-SEE[7] are used to build a sociodemographic profile of the smoker

[7] Study on Tobacco Consumption in Southeast European (STC-SEE) countries is a unique survey on tobacco consumption in the SEE region. It was conducted in 2019, with 2,000 respondents from Serbia. Along with detailed information on tobacco consumption, STC-SEE provides information on sociodemographic characteristics of the respondents.

and their intensity of smoking. In the second step, the estimated coefficients from STC-SEE to HBS demographic data (only data in HBS that are collected on an individual level) are used to calculate the probability of smoking for each member of the household and then aggregate the probability of smoking and predicted smoking intensity within the household. These variables will then be used as IVs for tobacco consumption.

Since previous research relied on households' male (or female) ratio only, this methodology extends this approach by taking not only the gender composition of the household but also other relevant sociodemographic characteristics of smoking prevalence, therefore strengthening the exogeneity of the instrument. By building a profile of a tobacco consumer with more variables than only gender, this approach further strengthens the instrument as it increases the likelihood of its correlation with tobacco expenditures and decreases the likelihood of correlation with budget shares spent on other products. Furthermore, the fact that the instrument is based on the coefficients from another survey further boosts its exogeneity. The sociodemographic variables that have proven to have high relevance in the Serbian context are gender, type of residence (urban versus rural), region, and age groups, as well as the interaction of these variables (Zubović et al., 2020).

The need to apply the IV approach and suitability of the instrument are tested with the methods described above. The final set of instruments is created from the HBS data by aggregating smoking prevalence and the number of cigarettes smoked on municipality levels for each year. Their exogeneity is drawn from the higher level of aggregation. Similar to Deaton's model, cross-municipality levels of consumption and expenditures are assumed to be the result of genuine price variations, transportation costs, taxes, and different local preferences, while within a municipality variations depend on household characteristics.

The second methodological challenge is potential correlations of the dependent variables in each of the *i* demand equations with the error terms of other equations (contemporaneous correlation). As all the equations have the same variables on the right-hand side of the equation this system can be estimated via the seemingly unrelated regression (SUR) estimator.[8] In order to control for the heteroscedasticity in the model the authors use the bootstrap procedure, with 1,000 replications.

Finally, the third methodological issue is the heterogeneity of the preferences between tobacco users and non-users. Non-users could have zero expenditures because 1) they cannot afford tobacco products (that is, the corner solution explanation) and/or 2) because tobacco consumption for them does not increase the overall utility, regardless of the prices (that is, abstention). In the latter case, the users and non-users could have different

[8] In the case of addition of the instrumental variables to the system of Engel curves, the three-stage least squares (3SLS) estimator is viewed as more efficient than the combination of SUR estimator and IV approach (John, 2008). In the presence of heteroscedasticity, GMM 3SLS estimator can be used instead of 3SLS to obtain more efficient estimations (John et al., 2019). However, as the initial attempts to estimate the GMM 3SLS failed to converge, the authors opted for estimating using the SUR system. SUR estimates are sufficient for efficient estimation of the model, since all the equations have the same variables on the right-hand side, and there are no variables that are on the left-hand side in one equation and on the right-hand side in another. As the sample size is very large (more than 60,000 observations), finite sample bias is not an issue in the application of the SUR estimators.

preferences for different commodity groups. Some evidence of different preferences is already presented in figures 1 and 2, as non-smoking households spend higher budget shares on food, housing, and health, while smoking households spend more on other commodity groups. To formally include this potential difference in preferences in the model, the equation (2) model can be extended to allow for different preferences and enable a more precise estimation of the effects. The extended model can be written as

$$w_i = \beta_{0i} + \beta_{0di}d + \beta_{1i}tob_{ex} + (\beta_{2i} + \beta_{2di}d)lnM + (\beta_{3i} + \beta_{3di}d)(lnM)^2 + \gamma_{ji}'h_j + u_i, \quad i = 1, 2, \dots, n-1 \quad (2)$$

where *d* is the binary variable, which takes the value of 1 if the household has positive expenditures on tobacco and 0 if there are no tobacco expenditures. If the coefficients β_{0di}, β_{2di}, and β_{3di} are jointly significant (Wald test), this would indicate different consumption preferences of tobacco-using and non-using households.

The above-described models are estimated for the overall sample of respondents as well as for three different income groups: low-, middle-, and high-income households.

4. RESULTS

4.1. ENDOGENEITY, INSTRUMENTS' VALIDITY, AND HETEROGENEITY OF PREFERENCES

Before presenting the results of the estimation of the crowding out effects, the estimation issues raised in section 3.2 are addressed. First, the issue of endogeneity is addressed. For *lnM,* this study follows previous research and uses the log of total tobacco expenditures as an instrument. For tobacco expenditures the additional instruments are used since, as suggested, the adult sex ratio used in previous research might not be sufficient.

As mentioned in the methodology section, STC-SEE data are used to build a sociodemographic profile of the smoker and the intensity of smoking. Table A1 in the appendix reports the results of the estimation of the coefficients of prevalence model, as well as the expenditures model.[9] The results suggest that prevalence and expenditures are associated with age, gender, marital status, type of residence, and region, as well as the interaction between gender and type of residence and gender and marital status. These coefficients are then applied to the HBS demographic variables to predict individual-level likelihood of smoking (logit and probit) and smoking expenditures (in levels and logs). These variables are then aggregated to the household level and added to the set of potential instrumental variables (IVs) for the effect of tobacco expenditures. The final list of IVs includes three groups:

- "Classic" instruments: adult sex ratio and adult ratio (share of persons aged 18 or older in the household)
- Instruments from STC-SEE: predicted probability of being a smoking household (probit and logit) and predicted household expenditures (in levels and in logs)
- Municipal-level instruments: municipality prevalence and average number of cigarettes smoked in the municipality

Table A3 presents the results of testing of relevance of the potential IVs. All instruments show high correlation with the tobacco expenditures, and this correlation is preserved after controlling for household characteristics (*h*), even when using other IVs in the model (included in a stepwise selection process). This indicates that all instruments satisfy inclusion restriction.

Since more than one IV for tobacco expenditures is available (that is, an over-identified model), in the next phase individual IV regressions (GMM estimator) for each product *i* are performed to estimate coefficients from equation (2).[10] These initial estimates are used to test if the IVs satisfy the exclusion restriction (via Hansen's J coefficient) and if the variables are in fact endogenous—that is, whether the coefficients from simple OLS estimates are different from IV estimates (via GMM C statistic). At the same time, these estimates are

[9] The prevalence model is estimated via a logit and probit model, while the overall demand model is estimated via a two-part model where expenditures are presented in levels and in logs. The results of the probit model are largely similar to the ones for the logit model and are available upon request.

[10] Similar results are obtained if a 2SLS estimator is applied instead of the GMM estimator (available upon request).

used to test the heterogeneity of the preferences between smoking and non-smoking households. The authors use the combinations of two IVs, as using more IVs decreases the likelihood of the model satisfying the exclusion restriction. The results of these tests are presented in Table A4 in the Appendix. The results indicate significant differences (heterogeneity) in the preferences between smoking and non-smoking households for all the product groups except for food, health, and transport. The models for these three consumption groups are then re-estimated by using the form of equation (1). The results further indicate that different IVs are valid for different groups of products. Table A5 presents the same tests estimated for low-, middle-, and high-income households.[11]

4.2. ESTIMATION RESULTS

Table 2 presents the results of the estimation of the crowding out effect for Serbia. The second column presents the results for all households, while the remaining columns present the results when the estimation is performed separately for low-, middle-, and high-income households. Results of the overall model indicate that tobacco expenditures have a negative impact on the budget shares spent on food, clothing, health, and education. In other words, tobacco consumption crowds out spending on food, clothing, health, and education. On the other hand, tobacco consumption has a positive impact on budget shares spent on hotels, restaurants, and bars, as well as alcohol consumption. Finally, the results suggest that in the overall sample tobacco expenditures have no impact—that is, that they are separable from the budget shares spent on housing and fuel, durables, transport, communication, and recreation and culture.

Table 2. *Estimation results for crowding out effect of tobacco spending (for all households and by income groups)*

VARIABLES	all	low-income	middle-income	high-income
Food	-0.004***	-0.007***	-0.004***	-0.003**
Clothing	-0.025***	-0.043***	-0.024***	-0.019***
Housing and fuel	0.003	0.048***	-0.001	0.006
Durables	-0.001	0.000	0.000	-0.002***
Health	-0.002***	0.007***	0.002	-0.006**
Transport	0.000	-0.000	-0.000	0.001
Communications	0.000	0.001	-0.001	0.003
Recreation and culture	-0.000	-0.070***	0.000	-0.002*
Education	-0.009***	-0.011***	-0.005***	-0.008***
Hotels, bars, and restaurants	0.009***	0.011***	0.008***	0.005***
Alcohol	0.018***	0.034***	0.013***	0.017***

*** p<0.01, ** p<0.05, * p<0.1, full results available in tables A6 to A9 in the Appendix

[11] In only two cases, for durables (for low- and middle-income households) and for recreation and culture (for low-income households), a different IV combination was used as the original combination of variables did not pass the Hansen J test. See table A5 for details.

Results by income group suggest that the effects observed in the overall sample are largely reproduced across income groups. The crowding out effect of tobacco expenditure is significant for food, clothing, and education for all three groups, with the effect being the highest in the low-income group. Similarly, the complementary (positive) effect of tobacco expenditures on budget shares spent on hotels, bars and restaurants, and alcohol is reproduced in all income groups. The same is true for the non-significant effects on transport and communications.

On the other hand, the negative effects on health expenditures are not reproduced in all the income groups. Tobacco expenditures are positively associated with the budget share spent on health services for low-income households but negatively associated for high-income households, while the coefficient is not significant for middle-income households. Furthermore, a positive effect of tobacco consumption on budget share spent on housing and fuel for low-income households is observed, as well as the negative effect on durables for high-income households. Finally, a negative effect—that is, crowding out—of expenditures on recreation and culture is observed for low- and high-income households, although for high-income households the effect is much smaller and only marginally significant.

5. DISCUSSION AND CONCLUSIONS

This research uses HBS data from 2006 to 2017 and a system of Engel curves to estimate the effects tobacco expenditures have on the consumption of other groups of products. The authors analyze the effect on 11 consumption groups, according to COICOP. From 2006 to 2017, the average budget share spent on tobacco in Serbia stagnates. However, this stagnation is the result of two opposing trends: decreasing smoking prevalence and increasing expenditures on tobacco products for those who continue smoking. For households who quit smoking, resources previously spent on tobacco can now be directed towards other commodity groups. For those who continue smoking the expenses are higher, although their smoking intensity drops by about 30 percent the prices go up by 2.4 times, thereby increasing their budget shares spent on cigarettes from about five to nine percent over the period.

The results of this research show that **tobacco expenditures are crowding out expenditures on essential consumption items such as food or clothing, as well as on education**. This effect is consistent across income groups and is particularly strong for low-income households. As low-income households have the lowest budgets, tobacco expenditures extract the largest portion of the budget shares spent on these groups of products. Additionally, **for low-income households, expenditures on tobacco also reduce budget shares spent on recreation and culture**. Therefore, this research confirms that in Serbia—as in other countries where the crowding out effect has been estimated—in order to consume tobacco, households, and particularly low-income households, cut down on more essential and more productive consumption. Furthermore, **cutting down on food, clothing, education, and recreation and culture is** also important from the perspective of intra-household resource allocation. These items are **particularly important for children, as lower consumption of these items can affect their current and future health, as well as their future earning potential**.

In addition, **tobacco consumption has a positive effect on budget share spent on hotels, restaurants, and bars, as well as alcohol consumption. This effect is also reproduced in all income groups**. These products can be viewed as complementary, since tobacco and alcohol consumption are often associated (Room, 2004), and since there is no ban on smoking in restaurants and bars in Serbia. Additionally, the positive link between expenditures on bars and restaurants and tobacco could also be explained by the motivation of non-smokers to avoid tobacco smoke in these establishments. Therefore, **spending on tobacco—besides being unproductive itself—also increases the budget share on other non-productive consumption items**, such as alcohol and bars.

The overall effect of spending on health differs across income groups, as **higher tobacco expenditures increase the expenditures on health for low-income families and decrease health expenditures for high-income families**. More detailed analysis of health services in Serbia indicates that expenditures on health in Serbia are dominated by spending on medicines (including vitamins and minerals)—which comprise about two-thirds of the total costs—as most of the health services are covered by the (almost) universal public health

care system. Additional expenditures go to other medical products, dental, and other (SORS, 2018). **The positive impact of tobacco spending for low-income households could be due to higher expenditures on medicines (or services) associated with tobacco-related diseases**, as for these households the complementarity effect seems to overwhelm the crowding out effect.

On the other hand, for high-income households the crowding out effect dominates, since it is possible that their health consumption involves a higher share of items that are not associated with current necessities, such as preventive medications (vitamins and minerals) and services. Additionally, for high-income households, tobacco expenditures crowd out expenditures on durables. These two effects **for high-income households** indicate that their **current tobacco consumption reduces investments in the health of household members, while also preventing them from investing in durable products**.

6. POLICY RECOMMENDATIONS

The results from this research underscore the negative effect that tobacco expenditures have on the consumption of other products. First, tobacco crowds out more essential and more productive consumption of items such as food, clothing, education, recreation, and culture, and these effects are particularly strong for low-income households. In addition, the authors find that for high-income households, tobacco expenditures reduce investments in durables and future health. Finally, tobacco consumption increases spending on other non-productive consumption items, such as alcohol and spending on bars. In light of the trends in the tobacco market described in Section 2, the only way for households to decrease expenditures on tobacco, and consequently direct these funds toward a more productive consumption and improve long-term health outcomes, is to stop smoking.

Therefore, to ensure that household expenditures are directed towards more productive purposes the Serbian government should adopt new policies and strengthen enforcement of existing tobacco control measures (Ngo et al., 2017) such as:

1) **enforce a comprehensive ban on smoking in bars and restaurants** and **strengthen enforcement of current laws restricting smoking at work and in public places**, which would motivate smokers to quit smoking. These resources could then be used for expenditures on more essential goods and services;
2) **invest more resources in all other tobacco control measures** that aim to motivate quitting smoking, such as offering (medicinal and psychological) help to stop smoking and requiring more visible and graphic warnings about the harmful effects of tobacco;
3) **strengthen enforcement of current laws on tobacco advertising**, promotion, and sponsorship, which would decrease the number of new smokers.

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APPENDIX: ADDITIONAL TABLES FROM THE ANALYSIS

Table A1: Estimation of the smoking prevalence and smoking intensity model (STC-SEE data)

	Logit		Two-part model (level)				Two-part model (log)			
VARIABLES	coef	se	logit	se	glm	se	logit	se	glm	se
Age	0.146***	(0.024)	0.168***	(0.028)	0.012	(0.010)	0.166***	(0.028)	0.004	(0.005)
Age squared	-0.002***	(0.000)	-0.002***	(0.000)	-0.000*	(0.000)	-0.002***	(0.000)	-0.000	(0.000)
Female	-0.375**	(0.157)	-0.452**	(0.220)	0.064	(0.126)	-0.402***	(0.153)	0.013	(0.044)
Married	-0.384***	(0.117)	-0.418***	(0.152)	0.168**	(0.083)	-0.387***	(0.137)	0.035	(0.023)
Female*Married			0.070	(0.205)	-0.207*	(0.118)				
Labour market status = Employed	omitted									
Labour market status = Unemployed	0.078	(0.169)								
Labour market status = Inactive	-0.252*	(0.151)								
Urban	-0.188	(0.156)	-0.177	(0.159)	0.220**	(0.095)	-0.186	(0.157)	0.098*	(0.052)
Female*Urban	0.479**	(0.205)	0.510**	(0.212)	-0.233**	(0.096)	0.499**	(0.208)	-0.102**	(0.048)
Region = Belgrade	omitted									
Region = Vojvodina	0.667***	(0.145)	0.687***	(0.140)	-0.142	(0.088)	0.669***	(0.140)	-0.087**	(0.042)
Region = West Serbia	0.482***	(0.147)	0.505***	(0.117)	-0.118*	(0.068)	0.495***	(0.116)	-0.079**	(0.036)
Region = East Serbia	0.615***	(0.166)	0.616***	(0.173)	-0.060	(0.092)	0.616***	(0.172)	-0.066	(0.042)
Constant	-3.337***	(0.525)	-3.804***	(0.612)	0.492*	(0.252)	-3.775***	(0.607)	0.993***	(0.120)
Observations	1,907		1,939		1,939		1,939		1,939	

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A2: List of variables used in the analysis

Dependent variables	Budget share (in total expenditures without tobacco) spent on
food	Food and non-alcoholic beverages (COICOP group 1)
cloth	Clothing and footwear (COICOP group 3)
house	Housing, water, electricity, gas and other fuels (COICOP group 4)
furni	Furnishings, household equipment and routine household maintenance (COICOP group 5)
health	Health (COICOP group 6)
trans	Transport (COICOP group 7)
comm	Information and communication (COICOP group 8)
rec_cul	Recreation, sport and culture (COICOP group 9)
edu	Education services (COICOP group 10)
horeca	Restaurants and accommodation services (COICOP group 11)
alc	Alcoholic beverages (COICOP group 2.1)
Instrumented variables	
etobT	Expenditures on tobacco
lnM	Total expenditures without tobacco (logarithm)
lnM2	Total expenditures without tobacco (logarithm, squared)
Instrumental variables used to instrument expenditures on tobacco	
hh_logit	Imputed probability of smoking from the STC-SEE data (logit model)
hh_probit	Imputed probability of smoking from the STC-SEE data (probit model)
hh_exp_tp	Imputed smoking intensity from the STC-SEE data (linear model)
hh_lexp_tp	Imputed smoking intensity from the STC-SEE data (log model)
afemaleratio	ratio of women in the total number of adults
adultratio	ratio of adults in total number of household members
ncig_m	average number of cigarettes smoked in the municipality
dtob_m	smoking prevalence in the municipality
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
Control variables	
hsize	Household size
maxedu	Maximum education of the household members
mean_age	Average age of the household members
nchild02	Number of children aged between 0 and 2 years
nchild36	Number of children aged between 3 and 6 years
neld65	Number of elderly (65 years old or older)
htype2	Household type: Pensioners
htype3	Household type: Self-employed
htype4	Household type: Employed
urban	Settlement type: urban = 1
reg2 - reg4	Region (NUTS2) fixed effects
year2 - year12	Year (2006-2017) fixed effects

Table A3: Testing the relevance of the instrumental variables

	hh_logit	hh_probit	hh_exp_tp	hh_lexp_tp	afemaleratio	adultratio	ncig_m	dtob_m
Correlation with tob_ex	0.1355	0.1345	0.1735	0.1511	-0.1123	-0.0983	0.2075	0.2062
Coefficent in tob_ex equation (individual)	4.407***	4.386***	2.479***	1.727***	-0.688***	2.205***	0.109***	4.282***
T stat in tob_ex eq	28.444	28.255	29.706	29.255	-14.283	19.672	51.268	44.694
Coefficent in tob_ex equation (stepwise)	1.280***		1.225***		-0.417***	0.649***	0.094***	0.650***
T stat in tob_ex eq	3.068		5.171		-9.858	4.794	26.051	4.026

Table A4: Heterogeneity of preferences, exogeneity and exclusion restriction tests for the overall sample

	food	cloth	house	furni	health	trans	comm	rec_cul	edu	horeca	alc
Wald test	6.41	163.9	70.86	29.97	5.328	5.989	16.37	36.7	14.05	80.34	269.4
Significance	0.080	0.000	0.000	0.000	0.149	0.112	0.001	0.000	0.003	0.000	0.000
GMM C statistic	*11.46*	290.3	66.08	14.41	*12.81*	*17.46*	9.537	17.76	8.659	106.6	350.6
Significance	*0.009*	0.000	0.000	0.002	*0.005*	*0.001*	0.023	0.000	0.044	0.000	0.000
Hansen J	*2.583*	2.178	2.34	3.477	*0.68*	*1.513*	0.328	0.0246	1.291	2.543	3.310
Significance	*0.108*	0.140	0.126	0.062	*0.410*	*0.219*	0.567	0.875	0.256	0.111	0.058
Instruments used	ncig_m dtob_m	hh_probit adultratio	hh_probit hh_lexp_tp	hh_probit adultratio	hh_probit hh_lexp_tp	ncig_m dtob_m	dtob_m hh_lexp_tp	ncig_m dtob_m	dtob_m hh_probit	dtob_m hh_probit	hh_exp_tp hh_lexp_tp

Notes: * values in italic obtained after re-estimating the model in accordance with results of the Wald test (i.e. equation (1))

Table A5: Heterogeneity of preferences, exogeneity and exclusion restriction tests for low-, mid- and high-income households

Low-income	**food**	**cloth**	**house**	**furni**	**health**	**trans**	**comm**	**rec_cul**	**edu**	**horeca**	**alc**
Wald test	4.905	40.790	27.330	1.863	17.110	5.427	23.370	39.180	25.500	25.930	64.610
Significance	0.179	0.000	0.000	0.601	0.001	0.143	0.000	0.000	0.000	0.000	0.000
GMM C statistic	*15.730*	182.500	61.670	*3.046*	30.190	*10.320*	33.170	267.800	47.240	32.080	163.000
Significance	*0.001*	0.000	0.000	*0.385*	0.000	*0.016*	0.000	0.000	0.000	0.000	0.000
Hansen J	*0.727*	0.190	0.455	*0.376*	0.088	*0.330*	1.501	0.539	0.965	0.001	0.913
Significance	*0.394*	0.663	0.500	*0.540*	0.767	*0.566*	0.221	0.463	0.326	0.969	0.339
Instruments used	ncig_m dtob_m	hh_probit adultratio	hh_probit hh_lexp_reg	hh_probit hh_lexp_tp	hh_probit hh_lexp_tp	ncig_m dtob_m	dtob_m hh_lexp_tp	hh_probit hh_lexp_tp	dtob_m hh_probit	dtob_m hh_probit	hh_exp_tp hh_lexp_tp
Middle-income	food	cloth	house	furni	health	trans	comm	rec_cul	edu	horeca	alc
Wald test	1.925	64.920	20.230	6.937	9.062	5.135	27.270	21.840	29.030	24.860	123.600
Significance	0.588	0.000	0.000	0.074	0.029	0.162	0.000	0.000	0.000	0.000	0.000
GMM C statistic	*27.110*	163.500	19.490	*1.666*	15.840	*8.968*	24.750	11.130	9.903	32.390	134.600
Significance	*0.000*	0.000	0.000	*0.644*	0.001	*0.030*	0.000	0.011	0.019	0.000	0.000
Hansen J	*3.635*	0.090	2.373	*3.724*	2.819	*2.511*	1.880	0.780	0.034	0.112	0.563
Significance	*0.057*	0.764	0.123	*0.050*	0.093	*0.113*	0.170	0.377	0.855	0.738	0.453
Instruments used	ncig_m dtob_m	hh_probit adultratio	hh_probit hh_lexp_reg	hh_probit hh_lexp_tp	hh_probit hh_lexp_tp	ncig_m dtob_m	dtob_m hh_lexp_tp	ncig_m dtob_m	dtob_m hh_probit	dtob_m hh_probit	hh_exp_tp hh_lexp_tp
High-income	food	cloth	house	furni	health	trans	comm	rec_cul	edu	horeca	alc
Wald test	1.316	33.250	29.730	20.230	11.400	6.971	26.210	43.750	14.380	12.670	80.000
Significance	0.725	0.000	0.000	0.000	0.010	0.073	0.000	0.000	0.002	0.005	0.000
GMM C statistic	*19.180*	74.010	14.970	17.100	6.564	*21.160*	43.070	20.940	11.340	14.840	136.100
Significance	*0.000*	0.000	0.002	0.001	0.087	*0.000*	0.000	0.000	0.010	0.002	0.000
Hansen J	*0.706*	1.625	0.193	1.310	1.041	*1.625*	2.797	0.478	3.624	3.107	4.631
Significance	*0.401*	0.202	0.660	0.252	0.308	*0.202*	0.094	0.489	0.055	0.078	0.031
Instruments used	ncig_m dtob_m	hh_probit adultratio	hh_probit hh_lexp_reg	hh_probit adultratio	hh_probit hh_lexp_tp	ncig_m dtob_m	dtob_m hh_lexp_tp	ncig_m dtob_m	dtob_m hh_probit	dtob_m hh_probit	hh_exp_tp hh_lexp_tp

Notes: * values in italic obtained after re-estimating the model in accordance with results of the Wald test (i.e. equation (1))

Table A6: Estimation results for crowding out effect of tobacco spending - all households

VARIABLES	food	cloth	house	furni	health	trans	comm	rec_cul	edu	horeca	alc
etobT	-0.004***	-0.025***	0.003	-0.001	-0.002***	0.000	0.000	-0.000	0.000	0.011***	0.018***
	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
lnM	-0.031*	-0.162***	0.480***	0.043***	0.040***	-0.239***	0.119***	-0.174***	-0.133***	0.000	0.112***
	(0.019)	(0.010)	(0.021)	(0.009)	(0.009)	(0.012)	(0.006)	(0.009)	(0.006)	(0.007)	(0.005)
lnM2	-0.005***	0.009***	-0.022***	-0.002***	-0.001***	0.014***	-0.006***	0.009***	0.007***	0.000	-0.005***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
tob		-0.805***	0.693***	0.030			-0.010	-0.378***	-0.091*	-0.027	0.918***
		(0.075)	(0.147)	(0.067)			(0.046)	(0.079)	(0.055)	(0.051)	(0.040)
tob_lnM		0.133***	-0.131***	-0.003			0.001	0.072***	0.017*	0.011	-0.153***
		(0.014)	(0.027)	(0.012)			(0.008)	(0.015)	(0.010)	(0.009)	(0.007)
tob_lnM2		-0.004***	0.006***	0.000			0.000	-0.003***	-0.001*	-0.001***	0.006***
		(0.001)	(0.001)	(0.001)			(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
hsize	0.024***	0.002***	-0.009***	-0.002***	-0.000*	-0.005***	0.001***	-0.002***	-0.000***	-0.003***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
maxedu	-0.004***	-0.000**	-0.002***	-0.000	-0.001***	0.002***	0.002***	0.002***	0.000***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
mean_age	0.001***	-0.001***	0.000***	0.000***	0.001***	-0.000***	-0.000***	-0.000	-0.000***	-0.001***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nchild02	0.005**	0.003***	0.002	0.008***	0.001	-0.000	-0.006***	-0.007***	-0.008***	-0.010***	-0.003***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
nchild36	0.000	-0.000	0.000	0.002***	-0.000	0.000	-0.006***	0.002**	0.001**	-0.006***	-0.000
	(0.002)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
neld65	-0.003***	-0.002***	0.004***	-0.001***	0.004***	-0.005***	-0.001**	-0.003***	0.002***	0.003***	0.001***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
htype2	-0.019***	-0.000	0.009***	0.003***	0.003**	-0.001	0.006***	0.004***	0.002***	-0.001**	-0.004***
	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
htype3	-0.008***	-0.000	-0.004	0.001	-0.013***	0.012***	0.006***	-0.002**	-0.000	0.004***	0.003***
	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
htype4	-0.022***	0.009***	-0.004	0.004***	-0.014***	0.011***	0.010***	0.003***	-0.002**	0.007***	-0.001
	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
urban	-0.015***	0.002***	0.015***	-0.000	0.000	-0.020***	0.005***	0.011***	0.002***	0.002***	-0.005***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Table A6: Estimation results for crowding out effect of tobacco spending - all households, continued

VARIABLES	food	cloth	house	furni	health	trans	comm	rec_cul	edu	horeca	alc
reg2	-0.036***	0.005***	0.020***	0.013***	-0.006***	0.008***	0.001***	-0.000	-0.001*	-0.004***	-0.001***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
reg3	-0.033***	0.013***	0.011***	0.011***	-0.010***	0.019***	-0.001**	-0.004***	0.001***	-0.000	-0.002***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
reg4	-0.006***	0.017***	-0.014***	0.017***	-0.008***	0.012***	-0.005***	-0.004***	-0.001***	-0.005***	-0.002***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
year2	0.016***	0.002**	-0.014***	-0.001	0.002*	-0.002	0.000	-0.000	-0.000	0.001	-0.005***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year3	0.024***	0.002*	-0.008***	-0.004***	-0.000	-0.009***	0.002***	-0.003***	-0.001	0.002***	-0.006***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year4	0.019***	0.002*	-0.004*	-0.004***	-0.004***	-0.012***	0.006***	-0.001	-0.001	0.002**	-0.008***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year5	-0.002	0.003***	0.002	-0.002*	0.002	-0.010***	0.011***	-0.003***	-0.001*	0.001	-0.011***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year6	0.031***	0.003***	-0.014***	-0.004***	-0.005***	-0.012***	0.010***	-0.006***	-0.002**	0.001	-0.011***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year7	-0.008***	0.007***	0.003	0.001	0.002**	-0.014***	0.016***	-0.009***	-0.002**	0.002***	-0.014***
	(0.003)	(0.001)	(0.003)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year8	-0.006**	0.011***	-0.000	-0.000	0.002*	-0.010***	0.015***	-0.005***	-0.001	-0.000	-0.017***
	(0.003)	(0.001)	(0.003)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year9	-0.035***	0.015***	-0.001	-0.000	0.004***	-0.002	0.019***	-0.003***	-0.001	0.001	-0.018***
	(0.002)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year10	-0.029***	0.014***	-0.006*	-0.002*	0.001	-0.005***	0.024***	-0.002**	0.001	0.002**	-0.020***
	(0.002)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year11	-0.033***	0.018***	-0.008***	-0.003**	0.002*	-0.006***	0.024***	-0.002	0.002***	0.001	-0.021***
	(0.002)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year12	-0.039***	0.019***	-0.004	-0.003***	0.002**	-0.007***	0.025***	-0.002**	0.002***	0.002**	-0.022***
	(0.002)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	1.338***	0.759***	-2.411***	-0.218***	-0.251***	1.043***	-0.575***	0.837***	0.701***	0.025	-0.564***

VARIABLES	food	cloth	house	furni	health	trans	comm	rec_cul	edu	horeca	alc
	(0.100)	(0.052)	(0.112)	(0.045)	(0.048)	(0.062)	(0.032)	(0.050)	(0.034)	(0.036)	(0.028)
Observations	61,022	61,022	61,022	61,022	61,022	61,022	61,022	61,022	61,022	61,022	61,022
R-squared	0.369	0.239	0.086	0.030	0.154	0.254	0.230	0.143	0.066	0.168	0.073

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1; etobT, lnM, lnM2 instrumented; list of instruments for each dependent variable in table A4.

Table A7: Estimation results for crowding out effect of tobacco spending – low-income households

VARIABLES	food	cloth	house	furni	health	trans	comm	rec_cul	edu	horeca	alc
etobT	-0.007***	-0.043***	0.048***	0.000	0.007***	-0.000	0.001	-0.070***	-0.011***	0.011***	0.034***
	(0.001)	(0.003)	(0.006)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)
lnM	0.039	-0.571***	0.739***	0.047***	0.284***	-0.297***	0.068***	-0.706***	-0.141***	-0.006	0.298***
	(0.047)	(0.029)	(0.067)	(0.017)	(0.025)	(0.018)	(0.023)	(0.030)	(0.015)	(0.021)	(0.023)
lnM2	-0.008***	0.030***	-0.036***	-0.002***	-0.014***	0.017***	-0.003***	0.037***	0.007***	0.000	-0.015***
	(0.002)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
tob		-0.596***	0.635**		0.428**		-0.267***	-0.848***	-0.154**	-0.180	1.270***
		(0.133)	(0.297)		(0.175)		(0.100)	(0.128)	(0.061)	(0.111)	(0.177)
tob_lnM		0.092***	-0.104*		-0.072**		0.052***	0.130***	0.024**	0.042**	-0.217***
		(0.026)	(0.056)		(0.033)		(0.019)	(0.024)	(0.012)	(0.021)	(0.033)
tob_lnM2		-0.002	0.002		0.002		-0.003***	-0.002*	-0.000	-0.003***	0.008***
		(0.001)	(0.003)		(0.002)		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
hsize	0.022***	-0.000	-0.009***	-0.001***	0.001***	-0.005***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
maxedu	-0.005***	-0.001***	0.001***	0.000	-0.000*	0.002***	0.002***	-0.001***	-0.000**	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
mean_age	-0.000	-0.000***	0.001***	0.000	0.001***	-0.000***	-0.000***	0.000***	-0.000***	-0.000***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nchild02	0.006**	0.007***	-0.007***	0.006***	-0.004***	-0.003**	-0.005***	0.008***	-0.001**	-0.009***	-0.007***
	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
nchild36	0.006***	-0.000	-0.001	0.002***	-0.001	-0.001	-0.004***	0.001	0.003***	-0.006***	-0.001***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
neld65	-0.003*	-0.003***	0.005***	0.000	0.004***	-0.002***	-0.000	-0.006***	0.000	0.001***	0.001***
	(0.002)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
htype2	-0.021***	0.001	0.007**	0.003***	0.001	0.001	0.007***	0.001	0.001**	0.001	-0.002*
	(0.004)	(0.001)	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
htype3	-0.010**	-0.007***	0.017***	0.001	-0.011***	0.006***	0.005***	-0.013***	-0.001**	0.003***	0.008***
	(0.004)	(0.001)	(0.004)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
htype4	-0.030***	-0.001	0.011***	0.005***	-0.010***	0.009***	0.011***	-0.011***	-0.001**	0.006***	0.006***
	(0.004)	(0.001)	(0.003)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
urban	-0.017***	-0.003***	0.023***	0.000	0.002**	-0.018***	0.004***	0.002***	-0.000	0.002***	-0.002***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)

Table A7: Estimation results for crowding out effect of tobacco spending – low-income households – continued

VARIABLES	food	cloth	house	furni	health	trans	comm	rec_cul	edu	horeca	alc
reg2	-0.005*	-0.006***	0.020***	0.005***	-0.005***	-0.008***	-0.003***	-0.002**	-0.001**	-0.000	0.002***
	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
reg3	-0.016***	0.012***	-0.005**	0.008***	-0.010***	0.007***	-0.004***	0.008***	0.001**	0.003***	-0.004***
	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
reg4	0.012***	0.020***	-0.033***	0.013***	-0.014***	0.000	-0.008***	0.015***	0.002***	-0.001	-0.004***
	(0.003)	(0.001)	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year2	0.025***	0.006***	-0.022***	-0.003*	-0.004*	-0.005**	0.001	0.014***	0.003***	0.000	-0.009***
	(0.005)	(0.002)	(0.004)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
year3	0.034***	0.014***	-0.023***	-0.006***	-0.009***	-0.011***	0.003**	0.019***	0.002***	-0.000	-0.014***
	(0.005)	(0.002)	(0.004)	(0.001)	(0.003)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
year4	0.027***	0.014***	-0.028***	-0.003**	-0.012***	-0.013***	0.008***	0.025***	0.002***	-0.001	-0.016***
	(0.005)	(0.002)	(0.004)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
year5	0.013***	0.012***	-0.028***	0.000	-0.005*	-0.011***	0.013***	0.023***	0.003***	-0.001	-0.019***
	(0.004)	(0.002)	(0.004)	(0.001)	(0.003)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
year6	0.052***	0.010***	-0.047***	-0.002*	-0.016***	-0.015***	0.011***	0.024***	0.004***	0.000	-0.019***
	(0.004)	(0.002)	(0.004)	(0.001)	(0.003)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
year7	0.009*	0.012***	-0.029***	0.006***	-0.008***	-0.015***	0.016***	0.019***	0.003***	0.001	-0.019***
	(0.005)	(0.002)	(0.004)	(0.001)	(0.003)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
year8	0.008*	0.016***	-0.034***	0.004***	-0.012***	-0.010***	0.017***	0.031***	0.004***	-0.002	-0.025***
	(0.005)	(0.002)	(0.005)	(0.001)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
year9	-0.021***	0.017***	-0.032***	0.002	-0.006**	-0.007***	0.024***	0.031***	0.005***	-0.000	-0.023***
	(0.004)	(0.002)	(0.005)	(0.001)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
year10	-0.016***	0.019***	-0.042***	-0.001	-0.014***	-0.009***	0.029***	0.038***	0.008***	0.001	-0.025***
	(0.004)	(0.002)	(0.005)	(0.001)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
year11	-0.016***	0.026***	-0.056***	-0.001	-0.016***	-0.009***	0.029***	0.047***	0.011***	0.000	-0.029***
	(0.004)	(0.003)	(0.006)	(0.001)	(0.004)	(0.002)	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)
year12	-0.022***	0.026***	-0.050***	-0.003**	-0.014***	-0.007***	0.029***	0.042***	0.009***	0.001	-0.028***
	(0.004)	(0.002)	(0.005)	(0.001)	(0.003)	(0.002)	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)
Constant	1.013***	2.738***	-3.627***	-0.204**	-1.970***	1.355***	-0.353***	3.360***	0.692***	0.038	-1.448***
	(0.244)	(0.141)	(0.333)	(0.082)	(0.205)	(0.089)	(0.115)	(0.143)	(0.075)	(0.100)	(0.112)
Observations	20,597	20,597	20,597	20,597	20,597	20,597	20,597	20,597	20,597	20,597	20,597
R-squared	0.286	0.264	0.081	0.032	0.156	0.241	0.267	0.147	0.042	0.134	0.074

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1; etobT, lnM, lnM2 instrumented; list of instruments for each dependent variable in table A5.

Table A8: Estimation results for crowding out effect of tobacco spending – middle-income households

VARIABLES	food	cloth	house	furni	health	trans	comm	rec_cul	edu	horeca	alc
etobT	-0.004***	-0.024***	-0.001	0.000	0.002	-0.000	-0.001	0.000	-0.005***	0.008***	0.013***
	(0.001)	(0.002)	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
lnM	0.333***	-0.511***	0.163**	0.080***	0.151***	-0.038	0.060***	-0.230***	-0.306***	-0.058**	0.234***
	(0.068)	(0.039)	(0.079)	(0.022)	(0.044)	(0.042)	(0.022)	(0.032)	(0.029)	(0.023)	(0.019)
lnM2	-0.021***	0.025***	-0.008**	-0.004***	-0.007***	0.005**	-0.003***	0.011***	0.015***	0.003***	-0.011***
	(0.003)	(0.002)	(0.004)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
tob		-1.682***	0.817*		-0.202		-0.424***	-0.519***	-0.631***	0.304*	1.689***
		(0.223)	(0.427)		(0.251)		(0.127)	(0.200)	(0.147)	(0.165)	(0.160)
tob_lnM		0.304***	-0.157**		0.038		0.076***	0.095**	0.115***	-0.054*	-0.300***
		(0.042)	(0.079)		(0.046)		(0.023)	(0.037)	(0.028)	(0.030)	(0.029)
tob_lnM2		-0.013***	0.008**		-0.002		-0.003***	-0.004**	-0.005***	0.002	0.013***
		(0.002)	(0.004)		(0.002)		(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
hsize	0.021***	0.001	-0.006***	-0.001**	-0.001	-0.006***	0.002***	-0.001	-0.003***	-0.003***	-0.001**
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
maxedu	-0.004***	-0.000***	-0.002***	0.000	-0.001***	0.002***	0.002***	0.002***	-0.000	0.001***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
mean_age	0.001***	-0.001***	0.000***	0.000**	0.001***	-0.000**	-0.000***	0.000	-0.000***	-0.001***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nchild02	0.011***	0.002	-0.000	0.008***	0.001	0.002	-0.005***	-0.012***	-0.008***	-0.012***	-0.004***
	(0.003)	(0.002)	(0.003)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
nchild36	0.002	0.001	0.000	0.002*	-0.000	0.000	-0.006***	-0.000	0.001*	-0.009***	-0.000
	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
neld65	-0.001	-0.000	0.004**	0.000	0.003***	-0.007***	-0.001**	-0.003***	0.002***	0.002***	0.001***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
htype2	-0.017***	-0.002	0.010*	0.002	0.008***	-0.002	0.004***	0.004**	0.000	-0.000	-0.004***
	(0.006)	(0.002)	(0.005)	(0.002)	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
htype3	-0.007	-0.002	-0.005	0.001	-0.009***	0.008**	0.005***	-0.001	-0.002	0.005***	0.004***
	(0.006)	(0.002)	(0.005)	(0.002)	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
htype4	-0.019***	0.006***	-0.005	0.004**	-0.010***	0.008**	0.009***	0.003	-0.003	0.008***	-0.000
	(0.006)	(0.002)	(0.005)	(0.002)	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
urban	-0.015***	0.004***	0.016***	-0.000	-0.000	-0.022***	0.006***	0.012***	0.002***	0.001*	-0.006***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)

Table A8: Estimation results for crowding out effect of tobacco spending – middle-income households – continued

VARIABLES	food	cloth	house	furni	health	trans	comm	rec_cul	edu	horeca	alc
reg2	-0.050***	0.003***	0.023***	0.014***	-0.001	0.004***	0.001	0.002***	0.002***	-0.002***	-0.001**
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
reg3	-0.044***	0.007***	0.013***	0.011***	-0.006***	0.019***	-0.002***	-0.001	0.003***	0.002***	-0.001*
	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
reg4	-0.015***	0.012***	-0.010***	0.017***	-0.003**	0.008***	-0.005***	-0.002**	0.002***	-0.002***	0.001
	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year2	0.014***	-0.001	-0.012***	0.000	0.004*	-0.003	0.001	0.000	0.002*	0.002*	-0.005***
	(0.004)	(0.002)	(0.004)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year3	0.018***	-0.003	-0.003	-0.003**	0.000	-0.009***	0.004***	-0.004***	0.002*	0.004***	-0.005***
	(0.005)	(0.002)	(0.004)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year4	0.021***	-0.001	-0.001	-0.005***	-0.005**	-0.012***	0.008***	-0.003**	0.002	0.003**	-0.007***
	(0.004)	(0.002)	(0.004)	(0.001)	(0.002)	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
year5	-0.000	0.002	0.007	-0.002	0.002	-0.015***	0.014***	-0.004***	0.002	0.002*	-0.010***
	(0.004)	(0.002)	(0.004)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year6	0.030***	0.002	-0.009**	-0.004**	-0.006**	-0.013***	0.013***	-0.008***	0.001	0.002	-0.010***
	(0.004)	(0.002)	(0.004)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year7	-0.016***	0.003	0.008**	0.001	0.001	-0.010***	0.020***	-0.009***	0.000	0.004***	-0.011***
	(0.005)	(0.002)	(0.004)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year8	-0.011**	0.010***	0.003	-0.001	0.003	-0.010***	0.018***	-0.007***	0.005***	0.001	-0.015***
	(0.004)	(0.002)	(0.005)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
year9	-0.040***	0.014***	0.001	-0.001	0.005*	0.001	0.022***	-0.003**	0.004***	0.003**	-0.016***
	(0.004)	(0.002)	(0.005)	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
year10	-0.031***	0.012***	-0.002	-0.002	0.002	-0.005*	0.026***	-0.006***	0.006***	0.003**	-0.016***
	(0.004)	(0.002)	(0.005)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
year11	-0.040***	0.016***	-0.002	-0.002	0.001	-0.004	0.027***	-0.004**	0.007***	0.003*	-0.018***
	(0.004)	(0.003)	(0.005)	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
year12	-0.044***	0.016***	0.002	-0.003**	0.001	-0.004*	0.028***	-0.004**	0.009***	0.004***	-0.018***
	(0.004)	(0.003)	(0.005)	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
Constant	-0.633*	2.613***	-0.694*	-0.398***	-0.842***	-0.047	-0.242**	1.163***	1.588***	0.329***	-1.208***
	(0.358)	(0.203)	(0.412)	(0.114)	(0.232)	(0.216)	(0.116)	(0.164)	(0.150)	(0.118)	(0.101)
Observations	20,595	20,595	20,595	20,595	20,595	20,595	20,595	20,595	20,595	20,595	20,595
R-squared	0.267	0.269	0.076	0.032	0.174	0.241	0.246	0.111	0.056	0.163	0.084

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1; etobT, lnM, lnM2 instrumented; list of instruments for each dependent variable in table A5.

Table A9: Estimation results for crowding out effect of tobacco spending – high-income households

VARIABLES	food	cloth	house	furni	health	trans	comm	rec_cul	edu	horeca	alc
etobT	-0.002**	-0.019***	0.006	-0.002***	-0.006**	0.001	0.003*	-0.002*	-0.008***	0.005***	0.017***
	(0.001)	(0.002)	(0.005)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
lnM	0.352***	-0.174***	0.163**	0.094***	0.129***	-0.242***	0.085***	-0.437***	-0.277***	-0.044**	0.234***
	(0.050)	(0.031)	(0.070)	(0.024)	(0.044)	(0.058)	(0.016)	(0.045)	(0.033)	(0.020)	(0.015)
lnM2	-0.022***	0.008***	-0.009***	-0.004***	-0.005**	0.015***	-0.005***	0.021***	0.013***	0.002**	-0.010***
	(0.002)	(0.001)	(0.003)	(0.001)	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
tob		-0.933***	-0.109	0.282	0.511*		0.196*	-1.488***	-0.692***	0.161	1.550***
		(0.239)	(0.465)	(0.177)	(0.302)		(0.110)	(0.300)	(0.229)	(0.164)	(0.140)
tob_lnM		0.159***	0.008	-0.048	-0.092*		-0.034*	0.268***	0.121***	-0.026	-0.264***
		(0.043)	(0.082)	(0.032)	(0.054)		(0.019)	(0.054)	(0.042)	(0.029)	(0.025)
tob_lnM2		-0.006***	-0.000	0.002	0.004*		0.001	-0.012***	-0.005***	0.001	0.011***
		(0.002)	(0.004)	(0.001)	(0.002)		(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
hsize	0.032***	0.006***	-0.004***	-0.002***	-0.002***	-0.013***	0.002***	-0.006***	0.004***	-0.006***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
maxedu	-0.003***	0.001***	-0.003***	-0.000**	-0.001***	0.002***	0.002***	0.002***	-0.000	0.001***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
mean_age	0.001***	-0.001***	-0.000*	0.000***	0.001***	0.000	-0.000***	-0.000***	-0.001***	-0.001***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nchild02	0.003	-0.001	-0.001	0.011***	0.003*	0.006	-0.006***	-0.008***	-0.017***	-0.012***	0.002***
	(0.005)	(0.002)	(0.004)	(0.002)	(0.002)	(0.005)	(0.001)	(0.003)	(0.002)	(0.001)	(0.001)
nchild36	-0.013***	-0.000	-0.002	0.003**	-0.001	0.010**	-0.005***	0.005*	-0.007***	-0.006***	0.002***
	(0.004)	(0.002)	(0.003)	(0.001)	(0.002)	(0.004)	(0.001)	(0.003)	(0.002)	(0.001)	(0.001)
neld65	-0.006***	-0.003***	0.011***	-0.004***	0.006***	-0.007***	-0.000	-0.003***	-0.000	0.004***	0.002***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
htype2	0.001	-0.005*	-0.004	0.004	0.011***	0.000	0.001	0.002	0.001	-0.005***	-0.004***
	(0.007)	(0.003)	(0.007)	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)	(0.003)	(0.002)	(0.001)
htype3	0.005	0.002	-0.028***	0.001	-0.007**	0.025***	0.004**	-0.008**	-0.005	0.006***	0.001
	(0.007)	(0.003)	(0.007)	(0.003)	(0.003)	(0.005)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
htype4	0.003	0.007***	-0.021***	0.004	-0.008**	0.018***	0.002	0.000	-0.008***	0.007***	-0.003**
	(0.006)	(0.003)	(0.007)	(0.003)	(0.003)	(0.004)	(0.001)	(0.003)	(0.003)	(0.002)	(0.001)
urban	-0.013***	0.004***	0.007***	-0.001	0.002*	-0.021***	0.005***	0.015***	0.003***	0.002***	-0.006***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)

Table A9: Estimation results for crowding out effect of tobacco spending – high-income households – continued

VARIABLES	food	cloth	house	furni	health	trans	comm	rec_cul	edu	horeca	alc
reg2	-0.044***	0.012***	0.016***	0.016***	-0.010***	0.020***	0.002***	-0.002*	-0.002***	-0.006***	-0.002***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
reg3	-0.029***	0.016***	0.014***	0.012***	-0.015***	0.025***	-0.001**	-0.007***	0.002*	-0.003***	-0.002***
	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
reg4	-0.005	0.017***	-0.014***	0.020***	-0.012***	0.019***	-0.004***	-0.002	-0.001	-0.006***	-0.004***
	(0.003)	(0.001)	(0.003)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
year2	0.007	0.002	-0.018***	0.001	0.001	0.003	-0.002**	0.002	0.002	0.003**	-0.004***
	(0.005)	(0.002)	(0.004)	(0.002)	(0.003)	(0.004)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
year3	0.022***	-0.002	-0.011***	-0.003*	0.000	-0.007**	-0.003***	0.001	0.001	0.004***	-0.002**
	(0.005)	(0.002)	(0.004)	(0.002)	(0.003)	(0.004)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
year4	0.013***	-0.004*	0.001	-0.005***	-0.003	-0.012***	0.001	0.003	0.003*	0.005***	-0.006***
	(0.005)	(0.002)	(0.004)	(0.002)	(0.003)	(0.004)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
year5	-0.019***	-0.001	0.011**	-0.004**	-0.000	-0.005	0.006***	0.003	0.003**	0.005***	-0.008***
	(0.005)	(0.002)	(0.005)	(0.002)	(0.003)	(0.004)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
year6	0.011**	0.001	-0.002	-0.008***	-0.001	-0.008**	0.003***	-0.002	0.004**	0.005***	-0.010***
	(0.005)	(0.002)	(0.005)	(0.002)	(0.003)	(0.004)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
year7	-0.019***	0.007***	0.016***	-0.003*	0.007*	-0.019***	0.009***	-0.005**	0.007***	0.006***	-0.017***
	(0.005)	(0.003)	(0.006)	(0.002)	(0.004)	(0.004)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
year8	-0.015***	0.010***	0.007	-0.005***	0.004	-0.011***	0.006***	0.001	0.007***	0.006***	-0.018***
	(0.005)	(0.003)	(0.006)	(0.002)	(0.004)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
year9	-0.042***	0.015***	0.006	-0.002	0.006	-0.003	0.007***	0.002	0.009***	0.007***	-0.021***
	(0.005)	(0.003)	(0.007)	(0.002)	(0.004)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
year10	-0.039***	0.012***	0.000	-0.003	0.004	-0.003	0.010***	0.006**	0.011***	0.010***	-0.023***
	(0.004)	(0.003)	(0.007)	(0.002)	(0.004)	(0.004)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
year11	-0.042***	0.014***	0.002	-0.005***	0.008*	-0.007**	0.010***	0.006***	0.013***	0.009***	-0.024***
	(0.004)	(0.003)	(0.007)	(0.002)	(0.005)	(0.003)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
year12	-0.049***	0.017***	0.007	-0.004**	0.008*	-0.011***	0.011***	0.006**	0.013***	0.010***	-0.024***
	(0.004)	(0.003)	(0.007)	(0.002)	(0.005)	(0.004)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
Constant	-0.910***	0.945***	-0.440	-0.531***	-0.811***	0.967***	-0.463***	2.300***	1.519***	0.281**	-1.270***
	(0.281)	(0.171)	(0.387)	(0.136)	(0.242)	(0.316)	(0.079)	(0.249)	(0.179)	(0.111)	(0.082)
Observations	19,830	19,830	19,830	19,830	19,830	19,830	19,830	19,830	19,830	19,830	19,830
R-squared	0.273	0.206	0.105	0.039	0.153	0.222	0.204	0.115	0.084	0.184	0.069

Standard errors in parentheses . *** p<0.01, ** p<0.05, * p<0.1; etobT, lnM, lnM2 instrumented; list of instruments for each dependent variable in table A5.