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Crowding-out effect of tobacco consumption in Serbia

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ABSTRACT

Background Although smoking prevalence and intensity in Serbia have decreased in recent years, expenditures on tobacco products still represent a significant portion of household budgets. As households have limited resources at their disposal, consuming tobacco means that they spend less on other items such as food, clothing, education and healthcare. This is particularly true for low-income households, for whom the pressure on the household budget is even higher.

Objectives In this research we estimate the effect of tobacco consumption on other consumption items in Serbia, which is the first estimation of this type for the countries in Eastern Europe.

Methods We use microdata from the Household Budget Survey and estimation approach that includes the combination of seemingly unrelated regression and instrumental variables. Besides estimating the overall effect we analyse the differences in effects between low-income, medium-income and high-income households.

Results Expenditures on tobacco reduce consumption on food, clothing and education and increase the budget shares spent on complementary consumption items such as alcohol, hotels, bars and restaurants. In most cases, the effects are more pronounced for low-income households than for other groups. These results suggest that aside from the negative effects of tobacco consumption on health, it also distorts household consumption structure, while affecting intrahousehold allocation and future health and development of other household members.

Conclusions 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 consumption of those who continue smoking changes less than cigarettes prices. 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.

INTRODUCTION

As households have limited resources at their disposal, resources 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 important for poor households, as smoking expenditures put further pressure on their already insufficient budgets. Even in situations where households

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Previous studies have indicated that spending on tobacco crowds out expenditures on food, education, clothing and other consumption. This is particularly important in low-income households as smoking expenditures put further pressure on their already insufficient budgets.

WHAT THIS STUDY ADDS

⇒ Study presents the first estimate of the crowding-out effect in Serbia and within wider region of Eastern Europe. Results indicate that tobacco expenditures crowd out more essential consumption such as food, clothing, education, recreation and culture—the effects of which are particularly strong for low-income households and increase spending on other complementary non-productive consumption such as on alcohol and bars.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Given the inelastic demand for tobacco products, the only way to ensure lower costs is to stop smoking and direct resources spent on tobacco towards more productive purposes. Thus, the Serbian government should adopt new policies and strengthen enforcement of existing tobacco control measures.

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.¹

While early attempts to estimate impact of tobacco expenditures on consumption of other items relied on descriptive statistics, first econometric estimates did not account for the endogeneity of the tobacco expenditures.¹ Econometric methods which rely on instrumental variables (IV) approach to account for the endogeneity were first used to study crowding-out effects in India.² This and a number of subsequent studies which applied similar methodology have indicated that spending on tobacco indeed has a negative impact on expenditures on food, education, clothing, medical care and other consumption, particularly in low-income and middle-income countries.^{1–5}

This research aims to estimate the effects that tobacco consumption has on the consumption of other products in Serbia. Household Budget Survey (HBS) data for the years 2006–2017 and a seemingly unrelated regression (SUR) approach are used to estimate a system of Engel curves that presents a



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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 IV approach is used.¹

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.

This research contribution is threefold. First, we add Serbia, as a middle-income European country, to the pool of the countries for which crowding-out effects are estimated. To the best of our knowledge, this is the first study on the crowding-out effects of tobacco consumption in Serbia and in Western Balkans and more broadly the region of Eastern Europe. Previous investigation of the crowding-out effects in middle-income countries came from different cultures and different continents, such as India, Taiwan, South Africa, Cambodia, Zambia, Turkey, Bangladesh¹ and Vietnam,⁵ where consumption preferences and trade-offs might differ. Serbia is a particularly interesting and important case for study of the crowding-out effects as a country with simultaneously high levels of smoking prevalence and poverty rate. According to the Eurostat data, in 2019 Serbia had the second highest share of daily smokers in Europe—26%, and the highest share of high-intensity smokers—those who smoke more than 20 cigarettes per day—at 15.8% (the European Union (EU) averages were 18.4% and 5.9%, respectively).⁶ In the same year, Serbia had the third highest at risk of poverty rate in Europe—23.2% (compared with the EU average of 16.4%),⁷ suggesting that high spending on tobacco—averaging at 9% of the household budget—exerts enormous pressure on a significant portion of Serbian households who are already in a difficult position.

Second, this study offers methodological novelty by proposing novel IVs that can be used to estimate the effects of tobacco expenditures on other consumption items. Novel IVs are based on the detailed sociodemographic profile of individual smokers, estimated on individual-level data on tobacco consumption in Serbia from another survey⁸ and imputed in the HBS data, as well as municipality-level indicators of prevalence and smoking intensity.

Third, from the policy perspective we provide further arguments in support of further implementation of tobacco control measures and governments' efforts to lower tobacco consumption. Tobacco consumption, besides its adverse effects on health of smokers and their family members, lowers the consumption on more essential and productive consumption, such as food, clothing, education, and recreation and culture. These effects are the strongest for low-income households, which are most likely to give up productive consumption for tobacco smoking, and thus end up in even lower levels of essential consumption than they would be without smoking. Negative impact of tobacco consumption also has implications on intrahousehold allocation, with typically unfavourable outcomes for children, particularly in poor households.⁹ Lowering expenditures on education directly affects the children as it could worsen their educational outcomes and potentially lower their future earning capacities. Furthermore, lowering expenditures on food, clothes and recreation can affect children's (and other household members) current and future health outcomes, particularly in the case of low-income households.

DATA AND STYLISED 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 by the Statistical Office of the Republic of Serbia and used for monitoring expenditure trends and calculation of weights when computing consumer price indices (CPIs). The sample selection for the survey is a two-stage stratified sample, where, in each year, in the first stage enumeration districts are randomly chosen from the region/settlement clusters in proportion to the number of households, and in the second stage households are randomly chosen from the selected enumeration districts. The total number of households that participated in HBS during these 12 years is 62 052. About 40% of these households have positive tobacco expenditures.

In line with the Classification of Individual Consumption According to Purpose (COICOP), household expenditures in HBS are divided into 12 mutually exclusive and exhaustive commodity groups. HBS data allow for further differentiation within the 12 groups, and this feature is used in this research to differentiate between tobacco and alcohol expenditures within the COICOP group 2—alcoholic beverages and tobacco. Therefore, we 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. For the households which quit smoking the resources previously spent on cigarettes could now be used for other consumption items. For households that continued smoking, smoking intensity, measured by number of manufactured cigarette (MC) packs purchased (as MC represents 98.7% of tobacco expenditure), decreased by 30% (column 3). However, since real tobacco CPI increased by about 2.4 times (column 2), there is an increase in smoking households' expenditures by about 56% (column 4), and an increase in the budget share spent on tobacco from 5.8% to 9.1% (column 5).

Figure 1 analyses 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, housing and utilities, and health. 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, clothes, as well as on bars, restaurants and hotels. This indicates that smoking and non-smoking household patterns differ in expenditures on tobacco and in consumption patterns of other products. Similar differences are across the different income groups (online supplemental table A1).

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 product groups is positive. The strongest correlation is with budget shares spent on transportation, bars and restaurants, and clothes (figure 2).

The results in figures 1 and 2 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

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

| Year | Smoking prevalence† (%) | Real tobacco CPI‡ (2006=100) | Smoking households only* | | |
|------|-------------------------|------------------------------|--|--|--|
| | | | Number of MC packs consumed per month§ | Real expenditures on tobacco products (2017=100) | Budget share spent on tobacco products (%) |
| (1) | (2) | (3) | (4) | (5) | |
| 2006 | 49.7 | 100 | 39.1 | 3787 | 5.8 |
| 2007 | 47.9 | 118.6 | 39.2 | 4345 | 6.6 |
| 2008 | 44.1 | 117.5 | 39.0 | 4321 | 6.5 |
| 2009 | 42.0 | 133.4 | 37.9 | 4494 | 7.0 |
| 2010 | 38.8 | 141.5 | 37.0 | 4649 | 7.2 |
| 2011 | 38.5 | 150.7 | 36.2 | 4734 | 7.5 |
| 2012 | 38.1 | 162.8 | 34.3 | 4972 | 7.4 |
| 2013 | 36.7 | 195.8 | 29.6 | 5158 | 8.3 |
| 2014 | 36.6 | 220.3 | 27.7 | 5399 | 8.6 |
| 2015 | 38.4 | 212.4 | 28.9 | 5562 | 8.6 |
| 2016 | 35.9 | 230.6 | 29.1 | 5919 | 9.1 |
| 2017 | 37.0 | 244.0 | 27.2 | 5909 | 9.1 |

Source: Authors' calculations based on Household Budget Survey (HBS) data.

*Excluding non-consumers, including expenditures on both manufactured cigarettes (MC) and roll-your-own (RYO) tobacco.

†Including both MC and RYO tobacco.

‡Consumer price indices from Statistical Office of the Republic of Serbia (SORS).

§Average, excluding non-consumers.

CPI, consumer price index.

the crowding-out effect. For this reason, a formal econometric model is needed to estimate the effect of tobacco consumption on other commodity groups.

ECONOMETRIC MODEL TO EXAMINE THE CROWDING-OUT EFFECT

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 maximises a single utility function—that the household seeks to maximise the utility from the consumption of a distinctive group of products. Consumption of each product group is operationalised with a demand function, which is conditional on the prices of all the products, household characteristics and budget. To estimate the crowding-out effect of tobacco demand is assumed to be predetermined,¹⁰ which enables entering expenditures on tobacco explicitly into the demand functions, which

are now additionally conditional on tobacco consumption. Conditional demand functions can be written as:

$$x_i = g^i(p_1, p_2, \dots, p_{n-1}, x_n, M, b), \quad (1)$$

$$i = 1, 2, \dots, n - 1$$

where the demand for each commodity group (x_i) is a function of the prices of all products (p), demand for tobacco consumption (x_n), total expenditure attenuated for the fixed

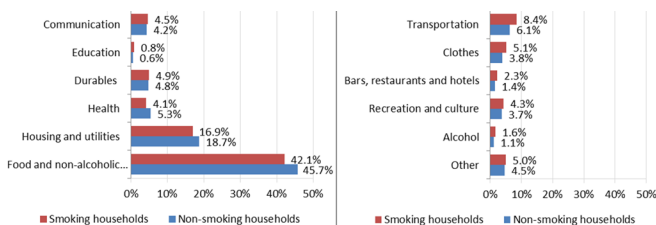


Figure 1 Budget shares spent on products from different commodity groups by smoking and non-smoking households. Note: Budget share in the total expenditures is calculated without expenditures on tobacco. Products are grouped according to Classification of Individual Consumption According to Purpose (COICOP) 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 Household Budget Survey (HBS) data.

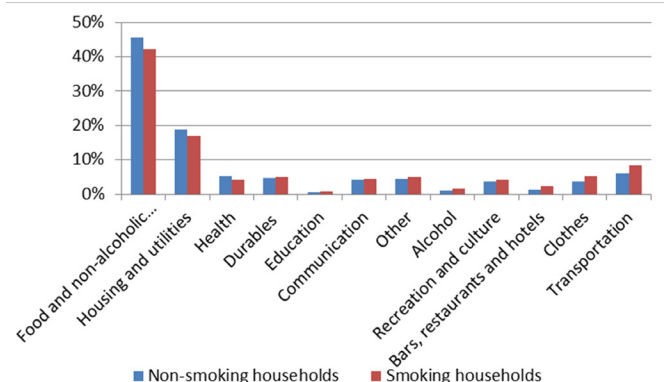


Figure 2 Correlation between expenditures on tobacco products and budget shares spent on products from different commodity groups in smoking households. Note: Budget share in the total expenditures without expenditures on tobacco. Products are grouped according to Classification of Individual Consumption According to Purpose (COICOP) classification. All correlations are statistically significant except for furniture (results of statistical test are available upon request). Source: Authors' calculations based on Household Budget Survey (HBS) data.

expenditures on tobacco (M) and a set of household characteristics (h).

Since the prices of commodity groups are not available due to different measurement units within the commodity groups, 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.¹¹ The system can then be written as:

$$w_i = \beta_{0i} + \beta_{1i} \text{tob_ex} + \beta_{2i} \ln M + \beta_{3i} (\ln M)^2 + \gamma'_i h_i + u_i, \quad (2)$$

$$i = 1, 2, \dots, n - 1$$

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 equation 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.² The vector of household characteristics h includes household size (log), number of children (0–2 years and 3–6 years) and elderly (65 or older), average age and maximum education of the household members, household type, controls for region and urban residence, and year-fixed effects to account for the potential changes in the legislation that might have impacted the preferences.

The coefficient of interest in equation 2 is β_{1i} , which represents the estimation of the crowding-out effect. If the coefficient is negative this indicates that tobacco expenditure decreases the budget share spent on the group of commodities i . Positive coefficient indicates 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.

Estimation of the model

Estimation of the model poses several challenges. First, tob_ex and M in equation 2 are likely to be endogenous due to the simultaneity. This potentially violates the ordinary least squares (OLS) model assumption of the independence of regressors and error terms and, consequently, fails to give causal interpretation to OLS estimates.² The endogeneity problem is typically solved by the IV method, which relies on finding exogenous variable(s) that are (1) correlated with the endogenous regressor (tobacco expenditure) but (2) not correlated with the error term of the equation, that is, not correlated with the dependent variable (other expenditure groups) in equation 2. 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.^{1–3 5} The latter argument is based on the fact that prevalence is typically significantly higher among men than among women, while the ratio of men to women is assumed to be uncorrelated with budget shares on other products.

However, in the case of Serbia, female and male smoking prevalences are not statistically different.¹² Given that, alternative strategies have been considered, relying on a composite measure of smoking prevalence and intensity, inspired by the approach applied by Koch and Tshiswaka-Kashalala.⁴ Unlike their composite measures which rely on aggregate smoking prevalence rates by demographic characteristics, our IVs rely on individual-level data from the Study on Tobacco Consumption in Southeast European (STC-SEE).⁸ In the first step, the variables that have high relevance for tobacco use in the Serbian context (gender, type of residence (urban vs rural), region and age groups, as well as the interaction of these variables¹²) are used to build a sociodemographic profile of the smoker and smoking intensity by using STC-SEE data. Results of the estimation are presented in online supplemental table A2. Estimated coefficients from STC-SEE 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) and aggregated to household level. Instruments obtained in this manner draw their exogeneity from the use of the estimates from another survey and a higher number of the variables used to predict smoking behaviour. We expect these variables to be highly correlated with tobacco expenditures, as they are built based on the profile of individual smokers (and smoking intensity), and have low correlation with other groups of goods.

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, as similar to Deaton's model,¹³ cross-municipality levels of consumption and expenditures are assumed to be the result of genuine price variations, transportation costs, taxes, etc, while within-municipality variations depend on household characteristics. In other words, we expect that municipality-level variations in smoking will highly correlate with expenditures on tobacco, but have low correlation with expenditures on other goods. Full list of variables used in the model, including all IVs used, is presented in online supplemental table A3 and their descriptive statistics are presented in online supplemental table A4.

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). This system can be estimated via the SUR estimator, which allows for different specifications of the instrumented variables when applied with the IV. In order to control for the heteroscedasticity in the model, bootstrap procedure with 1000 replications is used, based on the STATA *bootstrap* procedure, as recommended in the literature.¹

Finally, the third methodological issue is the heterogeneity of the preferences between tobacco users and non-users. Non-users could have zero expenditure because (1) they cannot afford tobacco products (corner solution explanation) and/or (2) because tobacco consumption for them does not increase the overall utility, regardless of the prices (abstention). In the latter case, the users and non-users could have different preferences for different commodity groups. Some evidence of different preferences is already presented in figure 1, 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 potential heterogeneity 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:

$$w_i = \beta_{0i} + \beta_{0di}d + \beta_{1i}\text{tob}_{\text{ex}} + (\beta_{2i} + \beta_{2di}d) \ln M + (\beta_{3i} + \beta_{3di}d) (\ln M)^2 + \gamma_{ji}h_j + u_i, \quad (3)$$

$i = 1, 2, \dots, n - 1$

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-income, middle-income and high-income households.

RESULTS

Before presenting the results of the estimation of the crowding-out effects, the issue of endogeneity is addressed. For $\ln M$, this study follows previous research and uses the log of total tobacco expenditures as an instrument. For tobacco expenditures in addition to adult sex ratio used in previous research we use previously described sets of IVs. Online supplemental table A5 presents the results of testing of relevance of the potential IVs for tobacco expenditures. All instruments show high correlation with the tobacco expenditures, and this correlation is preserved after controlling for household characteristics (b), even when using other IVs in the model (included in a stepwise selection process). Similar evidence is found for the log of total expenditures as instruments for $\ln M$, as the correlation is very high—0.99. This indicates that all instruments satisfy inclusion restriction.

In online supplemental table A6, we present the results of the Wald test that estimates if there are differences in preferences between smoking and non-smoking households. 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.

Online supplemental table A6 also presents the results of the testing if IVs satisfy the exclusion restriction (via Hansen's J coefficient) and if the variables are in fact endogenous by testing the difference in coefficients from simple OLS and IV estimates (Generalized Method of Moments' (GMM) C statistic). As all the variables satisfy inclusion restriction (and their usage is theoretically argued in the Estimation of the model section), the instruments that pass the exclusion restriction are used in the final estimates. The results in online supplemental table A6 (row Hansen's J test) indicate that different combinations of IVs for tobacco expenditures satisfy exclusion restriction for different groups of products (for $\ln M$ we use total expenditures as instruments for all goods). Combinations of two IVs for tobacco expenditures are used for each good, as using more IVs decreases the likelihood of the model satisfying the exclusion restriction. Online supplemental table A7 presents the same tests estimated for low-income, middle-income and high-income households.

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

| | All | Low income | Middle income | High income |
|------------------------------|-----------|------------|---------------|-------------|
| Variables | (1) | (2) | (3) | (4) |
| 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 are available in online supplemental tables A8–A11.

In only two cases, for durables (for low-income and middle-income households) and for recreation and culture (for low-income households), a different IV combination was used at income group level from the combination of IVs used at the overall sample level, as they did not pass the Hansen's J test.

Table 2 presents the results of the estimation of the crowding-out effect for Serbia. Column 1 presents the estimation of the crowding-out effects in the overall sample, while the remaining columns present separate estimations for low-income, middle-income and high-income households. Column 1 indicates that tobacco expenditures crowd out spending (ie, have a negative impact on the budget shares spent) on food, clothing, health and education. Results also indicate tobacco expenditure increases the budget shares spent on hotels, restaurants and bars, as well as on alcohol. 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.

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, as well as on alcohol is reproduced in all income groups. The same is true for the non-significant effects on transport and communications.

However, the negative impact on health expenditures is reproduced only for high-income households, while for low-income households tobacco expenditures are positively associated budget share spent on health, with insignificant coefficient 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-income households.

DISCUSSION, CONCLUSIONS AND POLICY RECOMMENDATIONS

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 12 groups of products, according to COICOP. The results 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 intrahousehold 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 on alcohol. This effect is also reproduced in all income groups. The results indicate that these products and tobacco are complementary, since tobacco and alcohol consumption are often associated,¹⁴ and since there is no ban on smoking in restaurants and bars in Serbia. Therefore, spending on tobacco, besides being unproductive itself, also increases the budget share on other non(less) productive consumption items, such as alcohol and bars.

Furthermore, tobacco expenditures increase the expenditures on health for low-income families and decrease health expenditures for high-income families. 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. For these households, the complementarity effect seems to overwhelm the crowding-out effect. For high-income households 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. Finally, for high-income households, tobacco expenditures crowd out expenditures on durables. The latter two effects for high-income households indicate that their current tobacco consumption reduces investments in the health and durable products.

Since the demand for tobacco products in Serbia is inelastic,¹⁵ increases in tobacco prices lead to increases in the tobacco expenditures. As shown in the Data and stylised facts section, between 2006 and 2017 in Serbia, tobacco expenditures have increased by about 2.4 times, while smoking intensity decreased by about 30%, resulting in an increase in budget share spent on tobacco from 5% to 9%. Therefore, the only way for households to decrease expenditures on tobacco, and consequently direct these funds towards 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 the enforcement of existing tobacco

control measures,¹⁶ such as (1) enforce a comprehensive ban on smoking in bars and restaurants and strengthen the enforcement of current laws restricting smoking at work and in public places, (2) invest more resources in all other tobacco control measures that aim to motivate quitting smoking, such as offering (medical and psychological) help to stop smoking and requiring more visible and graphic warnings about the harmful effects of tobacco and (3) strengthen the 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: Budget shares spent on different groups of products**

| | low-income | | mid-income | | high-income | |
|---------|-------------|---------|-------------|---------|-------------|---------|
| | non-smoking | smoking | non-smoking | smoking | non-smoking | smoking |
| food | 52.4% | 49.2% | 45.7% | 42.1% | 38.4% | 35.9% |
| cloth | 3.3% | 4.4% | 3.8% | 5.4% | 4.2% | 5.6% |
| house | 17.0% | 15.7% | 19.2% | 17.2% | 20.1% | 17.7% |
| furni | 4.8% | 4.9% | 4.7% | 4.9% | 4.9% | 4.9% |
| health | 4.9% | 3.9% | 5.2% | 3.9% | 5.9% | 4.5% |
| trans | 4.5% | 6.2% | 6.1% | 8.3% | 7.9% | 10.4% |
| comm | 4.2% | 4.5% | 4.3% | 4.7% | 4.1% | 4.4% |
| rec_cul | 2.5% | 3.1% | 3.5% | 4.0% | 5.2% | 5.6% |
| edu | 0.3% | 0.4% | 0.5% | 0.7% | 0.9% | 1.1% |
| horeca | 1.0% | 1.6% | 1.4% | 2.2% | 2.0% | 2.9% |
| other | 4.1% | 4.6% | 4.3% | 4.7% | 5.1% | 5.5% |
| alc | 1.0% | 1.4% | 1.1% | 1.6% | 1.2% | 1.7% |

Table A2: Estimation of the smoking prevalence and smoking intensity model (STC-SEE data)

| VARIABLES | Logit | | Two-part model (level) | | | | Two-part model (log) | | | |
|-----------------------------------|-----------|---------|------------------------|---------|----------|---------|----------------------|---------|----------|---------|
| | 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 A3: 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 (in thousands) |
| 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 |
| lnX | Total expenditures (logarithm) |
| lnX2 | Total expenditures (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 |
| 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 A4: Descriptive statistics of the variables used in the regression analysis

| | Mean | Standard deviation | Minimum | Maximum |
|---|---------|--------------------|---------|---------|
| Variables included in the main model | | | | |
| hsize | 2.917 | 1.652 | 1 | 20 |
| maxedu | 11.489 | 3.133 | 2 | 20 |
| mean_age | 53.262 | 14.461 | 18 | 84 |
| nchild02 | 0.060 | 0.259 | 0 | 4 |
| nchild36 | 0.099 | 0.346 | 0 | 5 |
| neld65 | 0.624 | 0.738 | 0 | 4 |
| Labour market status | | | | |
| Unemployed | 0.043 | 0.202 | 0 | 1 |
| Pensioners | 0.344 | 0.475 | 0 | 1 |
| Self-employed | 0.134 | 0.340 | 0 | 1 |
| Employed | 0.480 | 0.500 | 0 | 1 |
| urban | 0.591 | 0.492 | 0 | 1 |
| Region | | | | |
| Belgrade | 0.213 | 0.410 | 0 | 1 |
| Vojvodina | 0.266 | 0.442 | 0 | 1 |
| West Serbia and Šumadija | 0.283 | 0.451 | 0 | 1 |
| East and South Serbia | 0.237 | 0.425 | 0 | 1 |
| lnM | 10.809 | 0.652 | 7.353 | 13.668 |
| lnM2 | 117.264 | 14.016 | 54.066 | 186.814 |
| etobT | 2.019 | 3.394 | 0 | 58.430 |
| Variables used as instruments | | | | |
| hh_logit | 0.321 | 0.118 | 0 | 0.664 |
| hh_probit | 0.324 | 0.117 | 0 | 0.656 |
| hh_exp_tp | 0.568 | 0.243 | 0 | 1.353 |
| hh_lexp_tp | 0.811 | 0.324 | 0 | 1.696 |
| afemaleratio | 0.541 | 0.274 | 0 | 1 |
| adultratio | 0.918 | 0.160 | 0.143 | 1 |
| ncig_m | 13.331 | 7.035 | 0 | 58.538 |
| dtob_m | 0.404 | 0.141 | 0 | 1 |
| lnX | 10.842 | 0.653 | 7.353 | 13.691 |
| lnX2 | 117.985 | 14.069 | 54.066 | 187.447 |

Table A5: 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 |
| Coefficient 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 |
| Coefficient 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 A6: 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 | <i>12.81</i> | <i>17.46</i> | 9.537 | 17.76 | 8.659 | 106.6 | 350.6 |
| Significance | 0.009 | 0.000 | 0.000 | 0.002 | <i>0.005</i> | <i>0.001</i> | 0.023 | 0.000 | 0.044 | 0.000 | 0.000 |
| Hansen J | 2.583 | 2.178 | 2.34 | 3.477 | <i>0.68</i> | <i>1.513</i> | 0.328 | 0.0246 | 1.291 | 2.543 | 3.310 |
| Significance | 0.108 | 0.140 | 0.126 | 0.062 | <i>0.410</i> | <i>0.219</i> | 0.567 | 0.875 | 0.256 | 0.111 | 0.058 |
| Instruments used for tobacco exp | 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)) Instrument used for ln M in all specifications are total expenditures

Table A7: 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 | <i>15.730</i> | 182.500 | 61.670 | <i>3.046</i> | 30.190 | <i>10.320</i> | 33.170 | 267.800 | 47.240 | 32.080 | 163.000 |
| Significance | <i>0.001</i> | 0.000 | 0.000 | <i>0.385</i> | 0.000 | <i>0.016</i> | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Hansen J | <i>0.727</i> | 0.190 | 0.455 | <i>0.376</i> | 0.088 | <i>0.330</i> | 1.501 | 0.539 | 0.965 | 0.001 | 0.913 |
| Significance | <i>0.394</i> | 0.663 | 0.500 | <i>0.540</i> | 0.767 | <i>0.566</i> | 0.221 | 0.463 | 0.326 | 0.969 | 0.339 |
| Instruments used for tobacco exp | 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 | <i>27.110</i> | 163.500 | 19.490 | <i>1.666</i> | 15.840 | <i>8.968</i> | 24.750 | 11.130 | 9.903 | 32.390 | 134.600 |
| Significance | <i>0.000</i> | 0.000 | 0.000 | <i>0.644</i> | 0.001 | <i>0.030</i> | 0.000 | 0.011 | 0.019 | 0.000 | 0.000 |
| Hansen J | <i>3.635</i> | 0.090 | 2.373 | <i>3.724</i> | 2.819 | <i>2.511</i> | 1.880 | 0.780 | 0.034 | 0.112 | 0.563 |
| Significance | <i>0.057</i> | 0.764 | 0.123 | <i>0.050</i> | 0.093 | <i>0.113</i> | 0.170 | 0.377 | 0.855 | 0.738 | 0.453 |
| Instruments used for tobacco exp | 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 | <i>19.180</i> | 74.010 | 14.970 | 17.100 | 6.564 | <i>21.160</i> | 43.070 | 20.940 | 11.340 | 14.840 | 136.100 |
| Significance | <i>0.000</i> | 0.000 | 0.002 | 0.001 | 0.087 | <i>0.000</i> | 0.000 | 0.000 | 0.010 | 0.002 | 0.000 |
| Hansen J | <i>0.706</i> | 1.625 | 0.193 | 1.310 | 1.041 | <i>1.625</i> | 2.797 | 0.478 | 3.624 | 3.107 | 4.631 |
| Significance | <i>0.401</i> | 0.202 | 0.660 | 0.252 | 0.308 | <i>0.202</i> | 0.094 | 0.489 | 0.055 | 0.078 | 0.031 |
| Instruments used for tobacco exp | 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)) nstrument used for ln M in all specifications are total expenditures

Table A8: 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*** (0.000) | -0.025*** (0.001) | 0.003 (0.002) | -0.001 (0.001) | -0.002*** (0.001) | 0.000 (0.000) | 0.000 (0.001) | -0.000 (0.000) | 0.000 (0.000) | 0.011*** (0.001) | 0.018*** (0.001) |
| lnM | -0.031* (0.019) | -0.162*** (0.010) | 0.480*** (0.021) | 0.043*** (0.009) | 0.040*** (0.009) | -0.239*** (0.012) | 0.119*** (0.006) | -0.174*** (0.009) | -0.133*** (0.006) | 0.000 (0.007) | 0.112*** (0.005) |
| lnM2 | -0.005*** (0.001) | 0.009*** (0.000) | -0.022*** (0.001) | -0.002*** (0.000) | -0.001*** (0.000) | 0.014*** (0.001) | -0.006*** (0.000) | 0.009*** (0.000) | 0.007*** (0.000) | 0.000 (0.000) | -0.005*** (0.000) |
| tob | | -0.805*** (0.075) | 0.693*** (0.147) | 0.030 (0.067) | | | -0.010 (0.046) | -0.378*** (0.079) | -0.091* (0.055) | -0.027 (0.051) | 0.918*** (0.040) |
| tob_lnM | | 0.133*** (0.014) | -0.131*** (0.027) | -0.003 (0.012) | | | 0.001 (0.008) | 0.072*** (0.015) | 0.017* (0.010) | 0.011 (0.009) | -0.153*** (0.007) |
| tob_lnM2 | | -0.004*** (0.001) | 0.006*** (0.001) | 0.000 (0.001) | | | 0.000 (0.000) | -0.003*** (0.001) | -0.001* (0.000) | -0.001*** (0.000) | 0.006*** (0.000) |
| hsize | 0.024*** (0.000) | 0.002*** (0.000) | -0.009*** (0.000) | -0.002*** (0.000) | -0.000* (0.000) | -0.005*** (0.000) | 0.001*** (0.000) | -0.002*** (0.000) | -0.000*** (0.000) | -0.003*** (0.000) | -0.002*** (0.000) |
| maxedu | -0.004*** (0.000) | -0.000** (0.000) | -0.002*** (0.000) | -0.000 (0.000) | -0.001*** (0.000) | 0.002*** (0.000) | 0.002*** (0.000) | 0.002*** (0.000) | 0.000*** (0.000) | 0.001*** (0.000) | 0.001*** (0.000) |
| mean_age | 0.001*** (0.000) | -0.001*** (0.000) | 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) | -0.001*** (0.000) | 0.000*** (0.000) |
| nchild02 | 0.005** (0.002) | 0.003*** (0.001) | 0.002 (0.002) | 0.008*** (0.001) | 0.001 (0.001) | -0.000 (0.001) | -0.006*** (0.000) | -0.007*** (0.001) | -0.008*** (0.001) | -0.010*** (0.000) | -0.003*** (0.000) |
| nchild36 | 0.000 (0.002) | -0.000 (0.001) | 0.000 (0.001) | 0.002*** (0.000) | -0.000 (0.001) | 0.000 (0.001) | -0.006*** (0.000) | 0.002** (0.001) | 0.001** (0.000) | -0.006*** (0.000) | -0.000 (0.000) |
| neld65 | -0.003*** (0.001) | -0.002*** (0.000) | 0.004*** (0.001) | -0.001*** (0.000) | 0.004*** (0.000) | -0.005*** (0.001) | -0.001** (0.000) | -0.003*** (0.000) | 0.002*** (0.000) | 0.003*** (0.000) | 0.001*** (0.000) |
| htype2 | -0.019*** (0.003) | -0.000 (0.001) | 0.009*** (0.002) | 0.003*** (0.001) | 0.003** (0.001) | -0.001 (0.002) | 0.006*** (0.001) | 0.004*** (0.001) | 0.002*** (0.001) | -0.001** (0.001) | -0.004*** (0.001) |
| htype3 | -0.008*** (0.003) | -0.000 (0.001) | -0.004 (0.002) | 0.001 (0.001) | -0.013*** (0.001) | 0.012*** (0.002) | 0.006*** (0.001) | -0.002** (0.001) | -0.000 (0.001) | 0.004*** (0.001) | 0.003*** (0.001) |
| htype4 | -0.022*** (0.003) | 0.009*** (0.001) | -0.004 (0.002) | 0.004*** (0.001) | -0.014*** (0.001) | 0.011*** (0.002) | 0.010*** (0.001) | 0.003*** (0.001) | -0.002** (0.001) | 0.007*** (0.001) | -0.001 (0.000) |
| urban | -0.015*** (0.001) | 0.002*** (0.000) | 0.015*** (0.001) | -0.000 (0.000) | 0.000 (0.001) | -0.020*** (0.001) | 0.005*** (0.000) | 0.011*** (0.000) | 0.002*** (0.000) | 0.002*** (0.000) | -0.005*** (0.000) |

Table A8 continues on the next page.

Table A8: 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*** (0.001) | 0.005*** (0.001) | 0.020*** (0.001) | 0.013*** (0.000) | -0.006*** (0.001) | 0.008*** (0.001) | 0.001*** (0.000) | -0.000 (0.001) | -0.001* (0.000) | -0.004*** (0.000) | -0.001*** (0.000) |
| reg3 | -0.033*** (0.001) | 0.013*** (0.001) | 0.011*** (0.001) | 0.011*** (0.000) | -0.010*** (0.001) | 0.019*** (0.001) | -0.001** (0.000) | -0.004*** (0.001) | 0.001*** (0.000) | -0.000 (0.000) | -0.002*** (0.000) |
| reg4 | -0.006*** (0.002) | 0.017*** (0.001) | -0.014*** (0.001) | 0.017*** (0.001) | -0.008*** (0.001) | 0.012*** (0.001) | -0.005*** (0.000) | -0.004*** (0.001) | -0.001*** (0.000) | -0.005*** (0.000) | -0.002*** (0.000) |
| year2 | 0.016*** (0.002) | 0.002** (0.001) | -0.014*** (0.002) | -0.001 (0.001) | 0.002* (0.001) | -0.002 (0.002) | 0.000 (0.001) | -0.000 (0.001) | -0.000 (0.001) | 0.001 (0.001) | -0.005*** (0.001) |
| year3 | 0.024*** (0.002) | 0.002* (0.001) | -0.008*** (0.002) | -0.004*** (0.001) | -0.000 (0.001) | -0.009*** (0.002) | 0.002*** (0.001) | -0.003*** (0.001) | -0.001 (0.001) | 0.002*** (0.001) | -0.006*** (0.001) |
| year4 | 0.019*** (0.002) | 0.002* (0.001) | -0.004* (0.002) | -0.004*** (0.001) | -0.004*** (0.001) | -0.012*** (0.002) | 0.006*** (0.001) | -0.001 (0.001) | -0.001 (0.001) | 0.002** (0.001) | -0.008*** (0.001) |
| year5 | -0.002 (0.002) | 0.003*** (0.001) | 0.002 (0.002) | -0.002* (0.001) | 0.002 (0.001) | -0.010*** (0.002) | 0.011*** (0.001) | -0.003*** (0.001) | -0.001* (0.001) | 0.001 (0.001) | -0.011*** (0.001) |
| year6 | 0.031*** (0.002) | 0.003*** (0.001) | -0.014*** (0.002) | -0.004*** (0.001) | -0.005*** (0.001) | -0.012*** (0.002) | 0.010*** (0.001) | -0.006*** (0.001) | -0.002** (0.001) | 0.001 (0.001) | -0.011*** (0.001) |
| year7 | -0.008*** (0.003) | 0.007*** (0.001) | 0.003 (0.003) | 0.001 (0.001) | 0.002** (0.001) | -0.014*** (0.002) | 0.016*** (0.001) | -0.009*** (0.001) | -0.002** (0.001) | 0.002*** (0.001) | -0.014*** (0.001) |
| year8 | -0.006** (0.003) | 0.011*** (0.001) | -0.000 (0.003) | -0.000 (0.001) | 0.002* (0.001) | -0.010*** (0.002) | 0.015*** (0.001) | -0.005*** (0.001) | -0.001 (0.001) | -0.000 (0.001) | -0.017*** (0.001) |
| year9 | -0.035*** (0.002) | 0.015*** (0.001) | -0.001 (0.003) | -0.000 (0.001) | 0.004*** (0.001) | -0.002 (0.001) | 0.019*** (0.001) | -0.003*** (0.001) | -0.001 (0.001) | 0.001 (0.001) | -0.018*** (0.001) |
| year10 | -0.029*** (0.002) | 0.014*** (0.001) | -0.006* (0.003) | -0.002* (0.001) | 0.001 (0.001) | -0.005*** (0.001) | 0.024*** (0.001) | -0.002** (0.001) | 0.001 (0.001) | 0.002** (0.001) | -0.020*** (0.001) |
| year11 | -0.033*** (0.002) | 0.018*** (0.001) | -0.008*** (0.003) | -0.003** (0.001) | 0.002* (0.001) | -0.006*** (0.001) | 0.024*** (0.001) | -0.002 (0.001) | 0.002*** (0.001) | 0.001 (0.001) | -0.021*** (0.001) |
| year12 | -0.039*** (0.002) | 0.019*** (0.001) | -0.004 (0.003) | -0.003*** (0.001) | 0.002** (0.001) | -0.007*** (0.001) | 0.025*** (0.001) | -0.002** (0.001) | 0.002*** (0.001) | 0.002** (0.001) | -0.022*** (0.001) |
| Constant | 1.338*** (0.100) | 0.759*** (0.052) | -2.411*** (0.112) | -0.218*** (0.045) | -0.251*** (0.048) | 1.043*** (0.062) | -0.575*** (0.032) | 0.837*** (0.050) | 0.701*** (0.034) | 0.025 (0.036) | -0.564*** (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 A9: 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*** (0.001) | -0.043*** (0.003) | 0.048*** (0.006) | 0.000 (0.001) | 0.007*** (0.001) | -0.000 (0.001) | 0.001 (0.002) | -0.070*** (0.003) | -0.011*** (0.001) | 0.011*** (0.002) | 0.034*** (0.002) |
| lnM | 0.039 (0.047) | -0.571*** (0.029) | 0.739*** (0.067) | 0.047*** (0.017) | 0.284*** (0.025) | -0.297*** (0.018) | 0.068*** (0.023) | -0.706*** (0.030) | -0.141*** (0.015) | -0.006 (0.021) | 0.298*** (0.023) |
| lnM2 | -0.008*** (0.002) | 0.030*** (0.001) | -0.036*** (0.003) | -0.002*** (0.001) | -0.014*** (0.001) | 0.017*** (0.001) | -0.003*** (0.001) | 0.037*** (0.002) | 0.007*** (0.001) | 0.000 (0.001) | -0.015*** (0.001) |
| tob | | -0.596*** (0.133) | 0.635** (0.297) | | 0.428** (0.175) | | -0.267*** (0.100) | -0.848*** (0.128) | -0.154** (0.061) | -0.180 (0.111) | 1.270*** (0.177) |
| tob_lnM | | 0.092*** (0.026) | -0.104* (0.056) | | -0.072** (0.033) | | 0.052*** (0.019) | 0.130*** (0.024) | 0.024** (0.012) | 0.042** (0.021) | -0.217*** (0.033) |
| tob_lnM2 | | -0.002 (0.001) | 0.002 (0.003) | | 0.002 (0.002) | | -0.003*** (0.001) | -0.002* (0.001) | -0.000 (0.001) | -0.003*** (0.001) | 0.008*** (0.002) |
| hsize | 0.022*** (0.001) | -0.000 (0.000) | -0.009*** (0.001) | -0.001*** (0.000) | 0.001*** (0.000) | -0.005*** (0.000) | -0.001*** (0.000) | -0.001*** (0.000) | -0.001*** (0.000) | -0.001*** (0.000) | -0.001*** (0.000) |
| maxedu | -0.005*** (0.000) | -0.001*** (0.000) | 0.001*** (0.000) | 0.000 (0.000) | -0.000* (0.000) | 0.002*** (0.000) | 0.002*** (0.000) | -0.001*** (0.000) | -0.000** (0.000) | 0.001*** (0.000) | 0.001*** (0.000) |
| mean_age | -0.000 (0.000) | -0.000*** (0.000) | 0.001*** (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 (0.000) |
| nchild02 | 0.006** (0.003) | 0.007*** (0.001) | -0.007*** (0.002) | 0.006*** (0.001) | -0.004*** (0.001) | -0.003** (0.001) | -0.005*** (0.001) | 0.008*** (0.001) | -0.001** (0.000) | -0.009*** (0.001) | -0.007*** (0.001) |
| nchild36 | 0.006*** (0.002) | -0.000 (0.001) | -0.001 (0.002) | 0.002*** (0.001) | -0.001 (0.001) | -0.001 (0.001) | -0.004*** (0.001) | 0.001 (0.001) | 0.003*** (0.000) | -0.006*** (0.000) | -0.001*** (0.000) |
| neld65 | -0.003* (0.002) | -0.003*** (0.001) | 0.005*** (0.001) | 0.000 (0.000) | 0.004*** (0.001) | -0.002*** (0.001) | -0.000 (0.000) | -0.006*** (0.000) | 0.000 (0.000) | 0.001*** (0.000) | 0.001*** (0.000) |
| htype2 | -0.021*** (0.004) | 0.001 (0.001) | 0.007** (0.003) | 0.003*** (0.001) | 0.001 (0.002) | 0.001 (0.001) | 0.007*** (0.001) | 0.001 (0.001) | 0.001** (0.000) | 0.001 (0.001) | -0.002* (0.001) |
| htype3 | -0.010** (0.004) | -0.007*** (0.001) | 0.017*** (0.004) | 0.001 (0.001) | -0.011*** (0.002) | 0.006*** (0.002) | 0.005*** (0.001) | -0.013*** (0.001) | -0.001** (0.001) | 0.003*** (0.001) | 0.008*** (0.001) |
| htype4 | -0.030*** (0.004) | -0.001 (0.001) | 0.011*** (0.003) | 0.005*** (0.001) | -0.010*** (0.002) | 0.009*** (0.002) | 0.011*** (0.001) | -0.011*** (0.001) | -0.001** (0.001) | 0.006*** (0.001) | 0.006*** (0.001) |
| urban | -0.017*** (0.002) | -0.003*** (0.001) | 0.023*** (0.001) | 0.000 (0.001) | 0.002** (0.001) | -0.018*** (0.001) | 0.004*** (0.000) | 0.002*** (0.001) | -0.000 (0.000) | 0.002*** (0.000) | -0.002*** (0.000) |

Table A9 continues on the next page.

Table A9: 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* (0.003) | -0.006*** (0.001) | 0.020*** (0.002) | 0.005*** (0.001) | -0.005*** (0.001) | -0.008*** (0.001) | -0.003*** (0.001) | -0.002** (0.001) | -0.001** (0.001) | -0.000 (0.001) | 0.002*** (0.001) |
| reg3 | -0.016*** (0.003) | 0.012*** (0.001) | -0.005** (0.002) | 0.008*** (0.001) | -0.010*** (0.001) | 0.007*** (0.001) | -0.004*** (0.001) | 0.008*** (0.001) | 0.001** (0.001) | 0.003*** (0.001) | -0.004*** (0.001) |
| reg4 | 0.012*** (0.003) | 0.020*** (0.001) | -0.033*** (0.003) | 0.013*** (0.001) | -0.014*** (0.002) | 0.000 (0.001) | -0.008*** (0.001) | 0.015*** (0.001) | 0.002*** (0.001) | -0.001 (0.001) | -0.004*** (0.001) |
| year2 | 0.025*** (0.005) | 0.006*** (0.002) | -0.022*** (0.004) | -0.003* (0.001) | -0.004* (0.002) | -0.005** (0.002) | 0.001 (0.001) | 0.014*** (0.002) | 0.003*** (0.001) | 0.000 (0.001) | -0.009*** (0.001) |
| year3 | 0.034*** (0.005) | 0.014*** (0.002) | -0.023*** (0.004) | -0.006*** (0.001) | -0.009*** (0.003) | -0.011*** (0.002) | 0.003** (0.001) | 0.019*** (0.002) | 0.002*** (0.001) | -0.000 (0.001) | -0.014*** (0.001) |
| year4 | 0.027*** (0.005) | 0.014*** (0.002) | -0.028*** (0.004) | -0.003** (0.001) | -0.012*** (0.002) | -0.013*** (0.002) | 0.008*** (0.001) | 0.025*** (0.002) | 0.002*** (0.001) | -0.001 (0.001) | -0.016*** (0.001) |
| year5 | 0.013*** (0.004) | 0.012*** (0.002) | -0.028*** (0.004) | 0.000 (0.001) | -0.005* (0.003) | -0.011*** (0.002) | 0.013*** (0.001) | 0.023*** (0.002) | 0.003*** (0.001) | -0.001 (0.001) | -0.019*** (0.001) |
| year6 | 0.052*** (0.004) | 0.010*** (0.002) | -0.047*** (0.004) | -0.002* (0.001) | -0.016*** (0.003) | -0.015*** (0.002) | 0.011*** (0.001) | 0.024*** (0.002) | 0.004*** (0.001) | 0.000 (0.001) | -0.019*** (0.001) |
| year7 | 0.009* (0.005) | 0.012*** (0.002) | -0.029*** (0.004) | 0.006*** (0.001) | -0.008*** (0.003) | -0.015*** (0.002) | 0.016*** (0.001) | 0.019*** (0.002) | 0.003*** (0.001) | 0.001 (0.001) | -0.019*** (0.001) |
| year8 | 0.008* (0.005) | 0.016*** (0.002) | -0.034*** (0.005) | 0.004*** (0.001) | -0.012*** (0.003) | -0.010*** (0.002) | 0.017*** (0.002) | 0.031*** (0.002) | 0.004*** (0.001) | -0.002 (0.001) | -0.025*** (0.002) |
| year9 | -0.021*** (0.004) | 0.017*** (0.002) | -0.032*** (0.005) | 0.002 (0.001) | -0.006** (0.003) | -0.007*** (0.002) | 0.024*** (0.002) | 0.031*** (0.002) | 0.005*** (0.001) | -0.000 (0.001) | -0.023*** (0.001) |
| year10 | -0.016*** (0.004) | 0.019*** (0.002) | -0.042*** (0.005) | -0.001 (0.001) | -0.014*** (0.003) | -0.009*** (0.002) | 0.029*** (0.002) | 0.038*** (0.002) | 0.008*** (0.001) | 0.001 (0.001) | -0.025*** (0.002) |
| year11 | -0.016*** (0.004) | 0.026*** (0.003) | -0.056*** (0.006) | -0.001 (0.001) | -0.016*** (0.004) | -0.009*** (0.002) | 0.029*** (0.002) | 0.047*** (0.003) | 0.011*** (0.001) | 0.000 (0.002) | -0.029*** (0.002) |
| year12 | -0.022*** (0.004) | 0.026*** (0.002) | -0.050*** (0.005) | -0.003** (0.001) | -0.014*** (0.003) | -0.007*** (0.002) | 0.029*** (0.002) | 0.042*** (0.003) | 0.009*** (0.001) | 0.001 (0.002) | -0.028*** (0.002) |
| Constant | 1.013*** (0.244) | 2.738*** (0.141) | -3.627*** (0.333) | -0.204** (0.082) | -1.970*** (0.205) | 1.355*** (0.089) | -0.353*** (0.115) | 3.360*** (0.143) | 0.692*** (0.075) | 0.038 (0.100) | -1.448*** (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 A10: 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*** (0.001) | -0.024*** (0.002) | -0.001 (0.003) | 0.000 (0.001) | 0.002 (0.002) | -0.000 (0.001) | -0.001 (0.001) | 0.000 (0.001) | -0.005*** (0.001) | 0.008*** (0.001) | 0.013*** (0.001) |
| lnM | 0.333*** (0.068) | -0.511*** (0.039) | 0.163** (0.079) | 0.080*** (0.022) | 0.151*** (0.044) | -0.038 (0.042) | 0.060*** (0.022) | -0.230*** (0.032) | -0.306*** (0.029) | -0.058** (0.023) | 0.234*** (0.019) |
| lnM2 | -0.021*** (0.003) | 0.025*** (0.002) | -0.008** (0.004) | -0.004*** (0.001) | -0.007*** (0.002) | 0.005** (0.002) | -0.003*** (0.001) | 0.011*** (0.002) | 0.015*** (0.001) | 0.003*** (0.001) | -0.011*** (0.001) |
| tob | | -1.682*** (0.223) | 0.817* (0.427) | | -0.202 (0.251) | | -0.424*** (0.127) | -0.519*** (0.200) | -0.631*** (0.147) | 0.304* (0.165) | 1.689*** (0.160) |
| tob_lnM | | 0.304*** (0.042) | -0.157** (0.079) | | 0.038 (0.046) | | 0.076*** (0.023) | 0.095** (0.037) | 0.115*** (0.028) | -0.054* (0.030) | -0.300*** (0.029) |
| tob_lnM2 | | -0.013*** (0.002) | 0.008** (0.004) | | -0.002 (0.002) | | -0.003*** (0.001) | -0.004** (0.002) | -0.005*** (0.001) | 0.002 (0.001) | 0.013*** (0.001) |
| hsize | 0.021*** (0.002) | 0.001 (0.001) | -0.006*** (0.002) | -0.001** (0.001) | -0.001 (0.001) | -0.006*** (0.001) | 0.002*** (0.000) | -0.001 (0.001) | -0.003*** (0.001) | -0.003*** (0.000) | -0.001** (0.000) |
| maxedu | -0.004*** (0.000) | -0.000*** (0.000) | -0.002*** (0.000) | 0.000 (0.000) | -0.001*** (0.000) | 0.002*** (0.000) | 0.002*** (0.000) | 0.002*** (0.000) | -0.000 (0.000) | 0.001*** (0.000) | 0.000*** (0.000) |
| mean_age | 0.001*** (0.000) | -0.001*** (0.000) | 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) | -0.001*** (0.000) | 0.000 (0.000) |
| nchild02 | 0.011*** (0.003) | 0.002 (0.002) | -0.000 (0.003) | 0.008*** (0.001) | 0.001 (0.001) | 0.002 (0.002) | -0.005*** (0.001) | -0.012*** (0.001) | -0.008*** (0.001) | -0.012*** (0.001) | -0.004*** (0.001) |
| nchild36 | 0.002 (0.003) | 0.001 (0.001) | 0.000 (0.002) | 0.002* (0.001) | -0.000 (0.001) | 0.000 (0.002) | -0.006*** (0.001) | -0.000 (0.001) | 0.001* (0.001) | -0.009*** (0.001) | -0.000 (0.000) |
| neld65 | -0.001 (0.002) | -0.000 (0.001) | 0.004** (0.001) | 0.000 (0.001) | 0.003*** (0.001) | -0.007*** (0.001) | -0.001** (0.000) | -0.003*** (0.001) | 0.002*** (0.000) | 0.002*** (0.000) | 0.001*** (0.000) |
| htype2 | -0.017*** (0.006) | -0.002 (0.002) | 0.010* (0.005) | 0.002 (0.002) | 0.008*** (0.002) | -0.002 (0.003) | 0.004*** (0.001) | 0.004** (0.002) | 0.000 (0.002) | -0.000 (0.001) | -0.004*** (0.001) |
| htype3 | -0.007 (0.006) | -0.002 (0.002) | -0.005 (0.005) | 0.001 (0.002) | -0.009*** (0.002) | 0.008** (0.003) | 0.005*** (0.001) | -0.001 (0.002) | -0.002 (0.002) | 0.005*** (0.002) | 0.004*** (0.001) |
| htype4 | -0.019*** (0.006) | 0.006*** (0.002) | -0.005 (0.005) | 0.004** (0.002) | -0.010*** (0.002) | 0.008** (0.003) | 0.009*** (0.001) | 0.003 (0.002) | -0.003 (0.002) | 0.008*** (0.001) | -0.000 (0.001) |
| urban | -0.015*** (0.002) | 0.004*** (0.001) | 0.016*** (0.002) | -0.000 (0.001) | -0.000 (0.001) | -0.022*** (0.001) | 0.006*** (0.000) | 0.012*** (0.001) | 0.002*** (0.000) | 0.001* (0.000) | -0.006*** (0.000) |

Table A10 continues on the next page.

Table A10: 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*** (0.002) | 0.003*** (0.001) | 0.023*** (0.002) | 0.014*** (0.001) | -0.001 (0.001) | 0.004*** (0.001) | 0.001 (0.001) | 0.002*** (0.001) | 0.002*** (0.001) | -0.002*** (0.001) | -0.001** (0.000) |
| reg3 | -0.044*** (0.003) | 0.007*** (0.001) | 0.013*** (0.002) | 0.011*** (0.001) | -0.006*** (0.001) | 0.019*** (0.001) | -0.002*** (0.001) | -0.001 (0.001) | 0.003*** (0.001) | 0.002*** (0.001) | -0.001* (0.000) |
| reg4 | -0.015*** (0.003) | 0.012*** (0.001) | -0.010*** (0.002) | 0.017*** (0.001) | -0.003** (0.001) | 0.008*** (0.002) | -0.005*** (0.001) | -0.002** (0.001) | 0.002*** (0.001) | -0.002*** (0.001) | 0.001 (0.001) |
| year2 | 0.014*** (0.004) | -0.001 (0.002) | -0.012*** (0.004) | 0.000 (0.002) | 0.004* (0.002) | -0.003 (0.003) | 0.001 (0.001) | 0.000 (0.001) | 0.002* (0.001) | 0.002* (0.001) | -0.005*** (0.001) |
| year3 | 0.018*** (0.005) | -0.003 (0.002) | -0.003 (0.004) | -0.003** (0.002) | 0.000 (0.002) | -0.009*** (0.003) | 0.004*** (0.001) | -0.004*** (0.001) | 0.002* (0.001) | 0.004*** (0.001) | -0.005*** (0.001) |
| year4 | 0.021*** (0.004) | -0.001 (0.002) | -0.001 (0.004) | -0.005*** (0.001) | -0.005** (0.002) | -0.012*** (0.003) | 0.008*** (0.001) | -0.003** (0.002) | 0.002 (0.001) | 0.003** (0.001) | -0.007*** (0.001) |
| year5 | -0.000 (0.004) | 0.002 (0.002) | 0.007 (0.004) | -0.002 (0.001) | 0.002 (0.002) | -0.015*** (0.003) | 0.014*** (0.001) | -0.004*** (0.001) | 0.002 (0.001) | 0.002* (0.001) | -0.010*** (0.001) |
| year6 | 0.030*** (0.004) | 0.002 (0.002) | -0.009** (0.004) | -0.004** (0.001) | -0.006** (0.002) | -0.013*** (0.003) | 0.013*** (0.001) | -0.008*** (0.001) | 0.001 (0.001) | 0.002 (0.001) | -0.010*** (0.001) |
| year7 | -0.016*** (0.005) | 0.003 (0.002) | 0.008** (0.004) | 0.001 (0.002) | 0.001 (0.002) | -0.010*** (0.003) | 0.020*** (0.001) | -0.009*** (0.001) | 0.000 (0.001) | 0.004*** (0.001) | -0.011*** (0.001) |
| year8 | -0.011** (0.004) | 0.010*** (0.002) | 0.003 (0.005) | -0.001 (0.001) | 0.003 (0.002) | -0.010*** (0.003) | 0.018*** (0.001) | -0.007*** (0.001) | 0.005*** (0.002) | 0.001 (0.001) | -0.015*** (0.001) |
| year9 | -0.040*** (0.004) | 0.014*** (0.002) | 0.001 (0.005) | -0.001 (0.001) | 0.005* (0.003) | 0.001 (0.003) | 0.022*** (0.001) | -0.003** (0.002) | 0.004*** (0.001) | 0.003** (0.001) | -0.016*** (0.001) |
| year10 | -0.031*** (0.004) | 0.012*** (0.002) | -0.002 (0.005) | -0.002 (0.001) | 0.002 (0.002) | -0.005* (0.003) | 0.026*** (0.001) | -0.006*** (0.001) | 0.006*** (0.001) | 0.003** (0.001) | -0.016*** (0.001) |
| year11 | -0.040*** (0.004) | 0.016*** (0.003) | -0.002 (0.005) | -0.002 (0.001) | 0.001 (0.003) | -0.004 (0.003) | 0.027*** (0.001) | -0.004** (0.002) | 0.007*** (0.002) | 0.003* (0.002) | -0.018*** (0.001) |
| year12 | -0.044*** (0.004) | 0.016*** (0.003) | 0.002 (0.005) | -0.003** (0.001) | 0.001 (0.003) | -0.004* (0.003) | 0.028*** (0.001) | -0.004** (0.002) | 0.009*** (0.002) | 0.004*** (0.002) | -0.018*** (0.001) |
| Constant | -0.633* (0.358) | 2.613*** (0.203) | -0.694* (0.412) | -0.398*** (0.114) | -0.842*** (0.232) | -0.047 (0.216) | -0.242** (0.116) | 1.163*** (0.164) | 1.588*** (0.150) | 0.329*** (0.118) | -1.208*** (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 A11: 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** (0.001) | -0.019*** (0.002) | 0.006 (0.005) | -0.002*** (0.001) | -0.006** (0.003) | 0.001 (0.001) | 0.003* (0.001) | -0.002* (0.001) | -0.008*** (0.002) | 0.005*** (0.002) | 0.017*** (0.001) |
| lnM | 0.352*** (0.050) | -0.174*** (0.031) | 0.163** (0.070) | 0.094*** (0.024) | 0.129*** (0.044) | -0.242*** (0.058) | 0.085*** (0.016) | -0.437*** (0.045) | -0.277*** (0.033) | -0.044** (0.020) | 0.234*** (0.015) |
| lnM2 | -0.022*** (0.002) | 0.008*** (0.001) | -0.009*** (0.003) | -0.004*** (0.001) | -0.005** (0.002) | 0.015*** (0.003) | -0.005*** (0.001) | 0.021*** (0.002) | 0.013*** (0.002) | 0.002** (0.001) | -0.010*** (0.001) |
| tob | | -0.933*** (0.239) | -0.109 (0.465) | 0.282 (0.177) | 0.511* (0.302) | | 0.196* (0.110) | -1.488*** (0.300) | -0.692*** (0.229) | 0.161 (0.164) | 1.550*** (0.140) |
| tob_lnM | | 0.159*** (0.043) | 0.008 (0.082) | -0.048 (0.032) | -0.092* (0.054) | | -0.034* (0.019) | 0.268*** (0.054) | 0.121*** (0.042) | -0.026 (0.029) | -0.264*** (0.025) |
| tob_lnM2 | | -0.006*** (0.002) | -0.000 (0.004) | 0.002 (0.001) | 0.004* (0.002) | | 0.001 (0.001) | -0.012*** (0.002) | -0.005*** (0.002) | 0.001 (0.001) | 0.011*** (0.001) |
| hsize | 0.032*** (0.001) | 0.006*** (0.001) | -0.004*** (0.001) | -0.002*** (0.001) | -0.002*** (0.001) | -0.013*** (0.001) | 0.002*** (0.000) | -0.006*** (0.001) | 0.004*** (0.001) | -0.006*** (0.000) | -0.003*** (0.000) |
| maxedu | -0.003*** (0.000) | 0.001*** (0.000) | -0.003*** (0.000) | -0.000** (0.000) | -0.001*** (0.000) | 0.002*** (0.000) | 0.002*** (0.000) | 0.002*** (0.000) | -0.000 (0.000) | 0.001*** (0.000) | 0.000*** (0.000) |
| mean_age | 0.001*** (0.000) | -0.001*** (0.000) | -0.000* (0.000) | 0.000*** (0.000) | 0.001*** (0.000) | 0.000 (0.000) | -0.000*** (0.000) | -0.000*** (0.000) | -0.001*** (0.000) | -0.001*** (0.000) | 0.000*** (0.000) |
| nchild02 | 0.003 (0.005) | -0.001 (0.002) | -0.001 (0.004) | 0.011*** (0.002) | 0.003* (0.002) | 0.006 (0.005) | -0.006*** (0.001) | -0.008*** (0.003) | -0.017*** (0.002) | -0.012*** (0.001) | 0.002*** (0.001) |
| nchild36 | -0.013*** (0.004) | -0.000 (0.002) | -0.002 (0.003) | 0.003** (0.001) | -0.001 (0.002) | 0.010** (0.004) | -0.005*** (0.001) | 0.005* (0.003) | -0.007*** (0.002) | -0.006*** (0.001) | 0.002*** (0.001) |
| neld65 | -0.006*** (0.002) | -0.003*** (0.001) | 0.011*** (0.002) | -0.004*** (0.001) | 0.006*** (0.001) | -0.007*** (0.002) | -0.000 (0.000) | -0.003*** (0.001) | -0.000 (0.001) | 0.004*** (0.001) | 0.002*** (0.000) |
| htype2 | 0.001 (0.007) | -0.005* (0.003) | -0.004 (0.007) | 0.004 (0.003) | 0.011*** (0.003) | 0.000 (0.004) | 0.001 (0.002) | 0.002 (0.003) | 0.001 (0.003) | -0.005*** (0.002) | -0.004*** (0.001) |
| htype3 | 0.005 (0.007) | 0.002 (0.003) | -0.028*** (0.007) | 0.001 (0.003) | -0.007** (0.003) | 0.025*** (0.005) | 0.004** (0.002) | -0.008** (0.003) | -0.005 (0.003) | 0.006*** (0.002) | 0.001 (0.002) |
| htype4 | 0.003 (0.006) | 0.007*** (0.003) | -0.021*** (0.007) | 0.004 (0.003) | -0.008** (0.003) | 0.018*** (0.004) | 0.002 (0.001) | 0.000 (0.003) | -0.008*** (0.003) | 0.007*** (0.002) | -0.003** (0.001) |
| urban | -0.013*** (0.002) | 0.004*** (0.001) | 0.007*** (0.002) | -0.001 (0.001) | 0.002* (0.001) | -0.021*** (0.002) | 0.005*** (0.000) | 0.015*** (0.001) | 0.003*** (0.001) | 0.002*** (0.001) | -0.006*** (0.000) |

Table A11 continues on the next page.

Table A11: 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*** (0.002) | 0.012*** (0.001) | 0.016*** (0.002) | 0.016*** (0.001) | -0.010*** (0.001) | 0.020*** (0.002) | 0.002*** (0.000) | -0.002* (0.001) | -0.002*** (0.001) | -0.006*** (0.001) | -0.002*** (0.000) |
| reg3 | -0.029*** (0.003) | 0.016*** (0.001) | 0.014*** (0.002) | 0.012*** (0.001) | -0.015*** (0.001) | 0.025*** (0.002) | -0.001** (0.001) | -0.007*** (0.001) | 0.002* (0.001) | -0.003*** (0.001) | -0.002*** (0.001) |
| reg4 | -0.005 (0.003) | 0.017*** (0.001) | -0.014*** (0.003) | 0.020*** (0.001) | -0.012*** (0.002) | 0.019*** (0.002) | -0.004*** (0.001) | -0.002 (0.002) | -0.001 (0.001) | -0.006*** (0.001) | -0.004*** (0.001) |
| year2 | 0.007 (0.005) | 0.002 (0.002) | -0.018*** (0.004) | 0.001 (0.002) | 0.001 (0.003) | 0.003 (0.004) | -0.002** (0.001) | 0.002 (0.002) | 0.002 (0.002) | 0.003** (0.001) | -0.004*** (0.001) |
| year3 | 0.022*** (0.005) | -0.002 (0.002) | -0.011*** (0.004) | -0.003* (0.002) | 0.000 (0.003) | -0.007** (0.004) | -0.003*** (0.001) | 0.001 (0.002) | 0.001 (0.002) | 0.004*** (0.001) | -0.002** (0.001) |
| year4 | 0.013*** (0.005) | -0.004* (0.002) | 0.001 (0.004) | -0.005*** (0.002) | -0.003 (0.003) | -0.012*** (0.004) | 0.001 (0.001) | 0.003 (0.002) | 0.003* (0.002) | 0.005*** (0.001) | -0.006*** (0.001) |
| year5 | -0.019*** (0.005) | -0.001 (0.002) | 0.011** (0.005) | -0.004** (0.002) | -0.000 (0.003) | -0.005 (0.004) | 0.006*** (0.001) | 0.003 (0.002) | 0.003** (0.002) | 0.005*** (0.001) | -0.008*** (0.001) |
| year6 | 0.011** (0.005) | 0.001 (0.002) | -0.002 (0.005) | -0.008*** (0.002) | -0.001 (0.003) | -0.008** (0.004) | 0.003*** (0.001) | -0.002 (0.002) | 0.004** (0.002) | 0.005*** (0.001) | -0.010*** (0.001) |
| year7 | -0.019*** (0.005) | 0.007*** (0.003) | 0.016*** (0.006) | -0.003* (0.002) | 0.007* (0.004) | -0.019*** (0.004) | 0.009*** (0.001) | -0.005** (0.002) | 0.007*** (0.002) | 0.006*** (0.002) | -0.017*** (0.001) |
| year8 | -0.015*** (0.005) | 0.010*** (0.003) | 0.007 (0.006) | -0.005*** (0.002) | 0.004 (0.004) | -0.011*** (0.003) | 0.006*** (0.001) | 0.001 (0.002) | 0.007*** (0.002) | 0.006*** (0.002) | -0.018*** (0.001) |
| year9 | -0.042*** (0.005) | 0.015*** (0.003) | 0.006 (0.007) | -0.002 (0.002) | 0.006 (0.004) | -0.003 (0.003) | 0.007*** (0.001) | 0.002 (0.002) | 0.009*** (0.002) | 0.007*** (0.002) | -0.021*** (0.002) |
| year10 | -0.039*** (0.004) | 0.012*** (0.003) | 0.000 (0.007) | -0.003 (0.002) | 0.004 (0.004) | -0.003 (0.004) | 0.010*** (0.001) | 0.006** (0.002) | 0.011*** (0.002) | 0.010*** (0.002) | -0.023*** (0.002) |
| year11 | -0.042*** (0.004) | 0.014*** (0.003) | 0.002 (0.007) | -0.005*** (0.002) | 0.008* (0.005) | -0.007** (0.003) | 0.010*** (0.001) | 0.006*** (0.002) | 0.013*** (0.003) | 0.009*** (0.002) | -0.024*** (0.002) |
| year12 | -0.049*** (0.004) | 0.017*** (0.003) | 0.007 (0.007) | -0.004** (0.002) | 0.008* (0.005) | -0.011*** (0.004) | 0.011*** (0.001) | 0.006** (0.002) | 0.013*** (0.003) | 0.010*** (0.002) | -0.024*** (0.002) |
| Constant | -0.910*** (0.281) | 0.945*** (0.171) | -0.440 (0.387) | -0.531*** (0.136) | -0.811*** (0.242) | 0.967*** (0.316) | -0.463*** (0.079) | 2.300*** (0.249) | 1.519*** (0.179) | 0.281** (0.111) | -1.270*** (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.