TOBACCO USE AND HOUSEHOLD
EXPENDITURES ON FOOD,
EDUCATION, AND HEALTHCARE
IN UKRAINE

by

Olena Serhieieva

A thesis submitted in partial fulfillment of
the requirements for the degree of

MA in Economic Analysis

Kyiv School of Economics

2021

Thesis Supervisor: _____ Professor Maksym Obrizan

Approved by _____
            Head of the KSE Defense Committee, Professor

            _____

            _____

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Date _____

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Abstract

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Smoking is still one of the top preventable causes of death in the world. However, the deteriorating effect of tobacco on health conditions develops over a long period. In contrast, tobacco expense could immediately decrease the available budget for other costs, even necessary ones. Literature evidence reveals that tobacco expenditures crowd out expenditures on food, clothing, healthcare, and education. As most smokers live in low- and middle-income countries, the crowding-out effect of tobacco expenses also exacerbates inequality across the world.

This work aims to explore the specific case of emerging lower-middle-income economies on the example of Ukraine. Smoking was found to decrease food and beverage expenditures along with healthcare expenses. Concerning increasing excise tax on cigarettes, low-income households are expected to suffer more from crowding out expenses on necessities and improving human capital (healthcare and education).

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ACKNOWLEDGMENTS

The author wishes to express the highest gratitude to her Thesis Supervisor Prof. Dr. Maksym Obrizan, whose professionalism and gentle guidance made this work arise. Inspirational teaching, unabated openness, and instant responses unmeasurably helped to produce this research.

I am also very grateful to all KSE professors, who are always ready to provide peace of valuable advice. Your oversight with attention to detail helped me not to go astray.

LIST OF ABBREVIATIONS

2SLS. Two-stage Least Squares

GMM. Generalized method of moment

HH. Household

IV. Instrument Variable

p.p. Percentage point

QAIDS. Quadratic Almost Ideal Demand System

SUR. Seemingly unrelated regression

UkrStat. State statistic service of Ukraine

WHO. World Health Organization

INTRODUCTION

The World Health Organization states that over 80% of the world's 1.3 billion tobacco users live in low- and middle-income countries. In these countries, the burden of tobacco-related illness and death is the heaviest. According to the Global Adult Tobacco Survey, in 2017, about 23% (8.2 million) of Ukrainian adults (40.1% of males and 8.9% of females) currently use tobacco in any form.

The overall number of smokers in LMICs has been increasing, while the Ukrainian smoking rate has gradually decreased since 2010. It is a considerably positive trend. However, the average smoking Ukrainian household spent around 5.8% of the total annual expenditures on tobacco products in 2018, 5.9% in 2019. The poorest households are the most vulnerable as they spend 8.8% of total expenditures annually in 2018 and 8.5% in 2019.

Healthcare issues and costs from tobacco consumption are beyond discussion and are undeniable. Smoking is related to multiple diseases: from lung cancer to cerebrovascular disease, and is associated with increased healthcare expenditures on the other diseases without direct causal effect. Increasing disease incidence increases healthcare expenditures. Beyond that, productivity loss occurs because of missed days, sick leave, and an overall decrease in labor effectiveness (Max 2001, Block and Webb 2009).

However, tobacco consumption is far beyond the only financial impact on health-related costs. Tobacco control is a matter of sustainable growth and including economic growth (Reddy et al. 2012). Diving in the micro-level consumption

patterns reveals one more mechanism through which smoking affects households. Facing the overall limitation of resources, households with smoking members also deal with the negative crowding-out effect of tobacco-related expenditures.

Potentially, such households could divert resources from essential needs such as nutrition, education, and healthcare. As a result, such undesirable behavior could affect the quality of human capital and end up with additional opportunity costs and productivity losses. The shortfall of quality food, healthcare potentially affects smokers and members of households (Block and Webb 2009). The crowding-out effect is likely to be smaller on food than on education and healthcare because of the less discretionary nature of food consumption and income level in Ukraine.

The increasing share of tobacco expenditures will continue due to the government's plan to increase excise taxes on tobacco products during 2018-2024. According to the government forecast, cigarette prices will rise twice from 40 UAH average retail price to 80 UAH. Such policy has numerous advantages such as decreasing overall cigarette consumption, discouraging effects on those who consider starting and reducing daily consumption for those who already smoke. Moreover, the youth are more responsive to price increases ('WHO | Gender, Women, and the Tobacco Epidemic' n.d.). Moreover, studies find that individuals who have lower income, have less education, or are of lower socioeconomic status (SES) respond more to price changes than individuals who have higher income, have more education, or are of higher SES (Chaloupka 1991, Townsend, Roderick, and Cooper 1994, Aged 1998). Consequently, such policy

may positively affect multiple socioeconomic sectors such as healthcare savings, productivity increase, and reducing opportunity costs.

This master paper investigates the crowding-out effect of tobacco use on the consumption pattern among Ukrainian households differentiating them by income group. Smoking prevalence was studied from the sociological point of view. In other words, what socioeconomic groups are more susceptible to smoking (Gilmore et al. 2001), and how smoking prevalence in Ukraine and other former Soviet Union republics evolves (Andreeva and Krasovsky 2007, Roberts et al. 2012). Because of current policy and market changes portrait of the average smoker alternates. Thus, the thesis could contribute to research on Ukrainian smokers, although it is not the main aim of the thesis.

There are multiple studies on the crowding-out effect of tobacco expenditures on other consumption groups, mainly food, healthcare, and education (Block and Webb 2009, Do and Bautista 2015, Pu et al. 2008). Papers reveal that a malnourished poor smoker in Bangladesh could allow a regular diet in case of quitting smoking (Efroymson et al. 2001). We tried to check whether there is a trade-off between food consumption and smoking around Ukrainian poorest households. Tobacco crowding-out effect on healthcare and expenditures is more persistent and observed among middle and low-income subgroups of the population and across countries. With this master thesis, we hope to contribute to writing on crowding out effect and consumption patterns with extraordinary evidence from Ukraine as both a low-middle-income country and former Soviet Union republic. We expect to find statistically significant changes in consumption patterns of households with smokers compared to non-smoking ones. Using a

more sophisticated model (Quadratic Almost Ideal Demand System) on the national level data, we will estimate results more precisely.

The thesis is structured as follows. In the next chapter, we review relevant literature for tobacco use and household expenditures. Chapter 3 is dedicated to data description. The empirical analysis of the consumption patterns in different Ukrainian households is in Chapter 4. Conclusions and policy implications are presented in Chapter 5.

LITERATURE REVIEW

Evidence of the crowding-out effect of tobacco expenditures from studies in countries with a relatively high share of expenditures on tobacco, such as China, Turkey, India, South Africa, Ghana, Bangladesh, and others, are exhaustive and reproducible (Wang et al. 2006, San and Chaloupka 2016, Efroymson et al. 2001).

For example, the analysis of consumption patterns in rural China, with an average share of tobacco spending in total expenditures 6.5%, indicates that tobacco spending is negatively related to spending on foods, education, farming, medical care, and durable goods. Education, medical care, and farming declined the most. However, tobacco spending was positively associated with increased spending on entertaining, transport, alcohol, and daily goods (Wang et al. 2006).

Do and Bautista (2015) summarized and confirmed deterioration of human capital investment (expenditures on education and healthcare) among smokers in low- and middle-income countries. The World Health Survey was conducted among 40 LMICs. The result is evidence of a negative association between education, healthcare, and tobacco consumption. On average, the effect on education is more significant than on healthcare expenditures. However, it varies depending on the share of expenditures devoted to education and healthcare. The effect on food is inconsistent through the model in this study. Multilevel, mixed-effects linear regression is our empirical estimation strategy. There is space for endogeneity provided by shares of other consumption groups in expenditures. For the elimination of this effect, Seemingly Unrelated Regression Equations (SURE) are used. The large sample size could lead to imperfections in the

estimates for an individual country in this study, so our work is called to refine results for Ukraine.

Within the specific context of LMICs, the high smoking prevalence among males in lower-income groups may be crucial in shrinking a family's resources allocated for other essential expenditures largely. However, according to the disposable data of the Ukrainian households' survey, there are more females in the head of the household, so these findings could not be accurate for Ukraine.

On the other hand, evidence for countries with a low share of tobacco expenditures is not consistent. Signs of crowding out effect are persistent only in the lowest income group across studies. With increasing income crowding out effect of smoking either diminishes or eliminates.

After comparing across income groups in Taiwan, where the expenditure share of tobacco is around 0.8%, the crowding-out effect is much more severe for the lowest income group than for the middle- and highest income groups. Tobacco expenditure for the lowest income group is significantly associated with decreasing share of expenditures for 18 out of the 31 consumption categories. Meanwhile, it was only significantly associated with decreasing expenditure for only 5 and 9 consumption categories for the middle- and highest-income groups, respectively (Pu et al. 2008).

In the Vietnam study, where annual expenditure on tobacco average is 1.9% (2.19% for a low-income group) and is comparable with expenditures in Ukraine, the difference in preferences between tobacco spending and non-spending households is insignificant. GMM 3SLS method was used that mitigate endogeneity and possible occurring bias. Generally, the crowding-out effect of

tobacco spending in Vietnamese households is uncertain. An increase in tobacco expenditure only leads to a fall in the budget shares of education. However, it mainly appears in the case of low-income households (Nguyen and Nguyen 2020).

Despite all inconsistency in effect on different consumption categories and across income subgroups, the crowding-out effect is persistent in the low-income groups. There is a significant variation in the prevalence of use of tobacco based on income level. Moreover, in all studies presented in Systematic Review of the Link Between Tobacco and Poverty, an inverse relationship was observed between income level and the proportion of tobacco spending related to total expenditures. Consequently, smoking could contribute to inequality by lowering education and healthcare expenditures in low-income households and negatively affecting investments in human capital. More tremendous efforts to reduce tobacco use among poor people are needed ('WHO Systematic Review of the Link between Tobacco and Poverty' n.d.).

Education shearing is observable across different studies, even when it is not permanent across income groups. Unlike education, healthcare expenditures have minor discretionary nature. In theory and as reported in previous studies, tobacco use is positively associated with healthcare spending; healthcare expenditures can be higher among households with tobacco users due to the direct health-related costs of tobacco-related diseases. On the other hand, tobacco expenditures short the disposable income that could supplant some healthcare expenditures. Consequently, the direction and magnitude of the association between tobacco use and healthcare expenditure depend on the relative magnitude of these two counteracting effects.

Other methods for evaluating tobacco spending's effect on households are also used. New technics such as machine learning

As a result of the literature review, we expect the insignificant effect of tobacco expenditures on food consumption in Ukraine. A majority of the population is capable of meeting basic needs. However, it might be that the tobacco expenditures in the lowest income group might crowd out even food expenditures.

C h a p t e r   3

METHODOLOGY

Let us consider standard macroeconomics setups: given a vector of household characteristics **a,** its preferences are represented by a utility function $U=U(x_1, ..., x_n ; \mathbf{a})$, where x_i is the consumed amount of ith good. With given a set of prices $\{p_1, ..., p_n\}$ household maximize its utility subject to a particular budget constraint:

$$\text{Max } U=U(x_1,..., x_n;a) \text{ s.t. } \sum_{i=1}^{n} p_i x_i = Y, \qquad (1)$$

where Y is the household's total expenditures. A standard solution is a set of unconditional demand functions for each of the goods.

However, the study assumes that demand for one good (tobacco in our case) is predetermined. Following Pollak (1969), let us denote tobacco as the nth good, the rest of the n-1 goods are traded for the price $\{p_1, ..., p_{n-1}\}$ and the total expenditures on these goods are $E= Y - p_n x_n$, where x_n stands for consumed tobacco. Initial maximization problem transforms in the *Max U= (x_1,..., x_n;a) s.t. $\sum_{i=1}^{n-1} p_i x_i = E$, $x_n = \overline{x_n}$* (where x_n bar is a fixed amount of tobacco. The solution for maximization problem, solving for n-1 goods gives conditional demand on each ith good, given household's allotment of tobacco: $x_i = h^{i,n}(p_1, ..., p_n, E, x_n; \mathbf{a})$. It is a demand for the good (other than tobacco) as a function of prices, total expenditures without tobacco expenditures, and quantities of tobacco consumed. For the study, food, healthcare, and education expenditures would be examined more thoroughly.

Conditional demand would be modeled through an extension of the Almost Ideal Demand System. The Quadratic Almost Ideal Demand System (QAIDS) will be used to consider the effect of different income levels. (Banks, Blundell, and Lewbel 1997, Aepli 2014). The model fits a nonlinear Engel curve for each consumption category on a set of explanatory variables, including a quadratic income term.

The model is specified as follows:

$$w_{ij} = \left(\alpha_{1j} + \alpha_{2j}s + \alpha_{3j}T_i + \delta_j'X_i\right) + \left(\beta_{1j} + \beta_{2j}s\right)\ln E + \left(\gamma_{1j} + \gamma_{2j}s\right)(\ln E)^2, \quad (2)$$

where *wij* - representing the share of expenditure category *j* in total household expenditure for household *i*; *s* – the dummy variable, that takes '1' for tobacco spending households and '0' otherwise; *T* is the total spending on tobacco; *X* is a vector of households characteristics, *E* is total expenditures minus tobacco spending.

The vector of households' characteristics X contains household's size, gender, and age cohort of household head, whether there are children in household, dummy variables of year. Different characteristics incorporate the concept of demographic separability. It formalizes the idea that there are groups of goods with little or no relationship to a specific set of demographic variables (Deaton et al. 1989).

In the extension of demand analysis, the weak separability concept should be discussed. It implies that the marginal effect of substitution between goods of different expenditures (consumption) groups is independent. Therefore, conditional good (tobacco in this study) would have only an income effect. In other words, currently, non-smoking households abstain from tobacco

consumption because of the relatively high price of tobacco and, therefore, its unaffordability.

To test these premises dummy for tobacco spending households is included in the model. The null hypothesis is that zero tobacco expenditures are the corner solution to the maximization problem (high prices). If *s* dummy is significant, it would mean that smoking and non-smoking households have different preferences thus behave differently.

However, the insignificance of the coefficient on binary indicator *s* is not sufficient to say that zeroes are not due to genuine abstention and due to high price. The null hypothesis to test whether non-smoking household consumes zero tobacco because of high relative price is as follows:

$$H0: \alpha_{2j} = \beta_{2j} = \gamma_{2j} = 0 \tag{3}$$

If the null hypothesis is rejected, then households merely have different preferences for smoking.

The model's concern is the endogeneity of total expenditures (E) (Banks et al. 1997). Naturally, expenditures patterns changes as the level of total expenditures increases. As some expenditures could decrease as a share, despite an increase in absolute value. Following Banks et al. (1997), total household expenditure is instrumented by total household income. Intuitively, income increase does not automatically mean increased expenditures, as the household could save extra income. In other words, the expenditure pattern could not change.

Moreover, as dependent variables along the equations could be correlated with the errors of other equations, they are endogenous. Because of this, Seemingly

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Unrelated Regression (SUR) is used. Two-stage Least Squares (2SLS) are used to provide both IV and SUR. This estimation method is robust to the use of instrumental variables with Seemingly Unrelated Regression (SUR). Because the dependent variables of the twelve equations sum up to one for each household, one equation from the system of Engel curves should be dropped. The equation on "non-consumption expenditures" is dropped from the system.

C h a p t e r   4

DATA DESCRIPTION

The cornerstone of the research is detailed data about household expenditures in Ukraine. Dataset is cross-sectional microdata on key indicators of household income, expenditure, and living conditions for 2018-2019 from the State Statistics Service of Ukraine. There are around 16 thousand responders to represent the whole population. Approximately eight thousand households were surveyed each year.

Exogenous variables could affect the expenditure share of cigarettes that could not be accounted for when only a few years are observed. For example, the research of Barnes and Smith (2008) shows increasing in tobacco use associated with an increase in economic insecurity and risk of dismissal. Moreover, education level, employment status, and occupation are missing characteristics, though they could affect expenditures patterns and are present in other researches.

Data collected from self-reports, so income and expenditures measured in UAH are biased and could be underreported or otherwise. The sample is cleaned from outliers to solve this issue. Observations beyond three standard deviations from mean total expenditure were dropped. There were 234 such observations or 1.49% of the sample. Also, all households without a specified number of members were dropped. Overall more than 15 thousand observations were left for further investigation.

A dummy variable, "smokers," was constructed, taking values '1' for positive tobacco spending and '0' otherwise. It is used to divide the sample and to compare the expenditures of smoking households and non-smoking households. Further, it will be used to test whether smoking defines the difference in consumption patterns. There are 4169 smoking households or 26.5% of the whole sample for two years (2144 or 27.6% in 2018, 2025 or 26.2% in 2019). The share of smokers is estimated above the share provided by WHO in 2019 (around 23% adult daily prevalence).

Table 1. Expenditure shares (%) by smoking groups

Expenditure shares	Smoking N=4169	Non-smoking N=11333	Difference (p.p.)	t-statistics
tobacco	5.84	0	-	-
alcohol	1.34	0.635	0.71	-21.257***
food and beverages	39.9	43.0	-3.10	12.432***
education	0.708	0.500	0.21	-4.891***
healthcare	3.40	4.69	-1.29	13.113***
clothes	4.97	4.31	0.66	-8.822***
utilities	12.5	14.4	-1.90	13.159***
appliances	1.64	1.60	0.04	-0.804
transport	3.15	2.23	0.92	-11.6***
communication	2.60	2.55	0.05	-1.648*
leisure	1.13	0.960	0.17	-4.546***
restaurants	1.86	1.48	0.38	-5.901***
others	2.43	2.25	0.18	-3.9***
non-consumption	8.06	8.14	-0.08	-8.041***
food not bought	9.51	10.0	-0.49	2.455**
subsidy	3.12	6.08	-2.96	25.027***
Note:	*p<0.1; **p<0.05; ***p<0.01			

Sources: Survey of living conditions of households by UkrStat

The average expenditure share of tobacco is around 5.8% of total annual expenditures in both years of observations. From Table 1, a clear difference in expenditure patterns between types of households is observed. Smoking HHs on average, spend less on food and healthcare by 3.1 p.p. and 1.3 p.p respectively. On the education, smoking households spend marginally more by 0.2 p.p. The share of the education in the total expenditures across all households are less than 1%.

The difference between means of the expenditures shares through categories is statistically significant. Overall, smoking households could not spend on some goods as much as non-spending households because of the budget constraint. The difference in preferences could make them spend more on luxury goods such as alcohol and restaurants.

Smoking households consistently spend less share of their expenditures on food and healthcare than non-smoking ones. Therefore, despite some speculation about the health of smokers, we could expect a negative effect of tobacco expenditures on healthcare expenditures. Interesting to notice that smoking is associated with a higher share of expenditures on alcohol and less share of subsidies in the total expenditures. That could be a matter of further investigations.
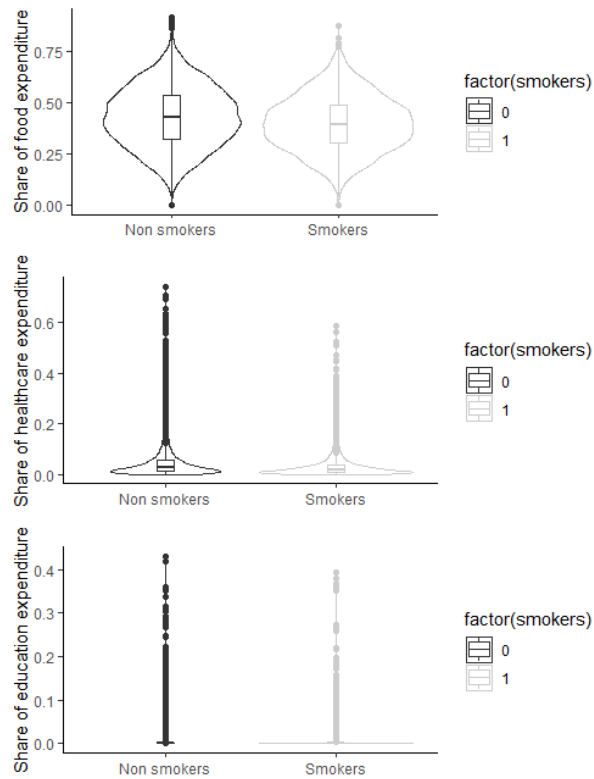
Figure 1. Distribution of shares of interest across smokers and non-smokers

We can observe the distribution of the shares of interest in Figure 3. Share of food and beverages that takes up roughly a half of the expenditures distributed almost generally in contrast to other shares. Both healthcare and education shares have long tails and are much skewed downward from the mean. However, more non-smoking households spend more than average on healthcare compared with

smoking. That could be an additional signal of a negative effect of smoking on healthcare expenditure.

Due to the income effect, some expenditure categories are more sensitive to the overall income level. Income quantiles determined income groups. Total annual income is self-reported so that it could be skewed. However, manual grouping based on quantiles would be more objective than self-identification categories present in the dataset. Any household in the sample reported itself as rich, while three-fourths of the sample (74,5% of households) consider themselves poor. There is also only a 12000 UAH average difference between the annual income of the middle class and lower-middle-class households by self-reported categorization.
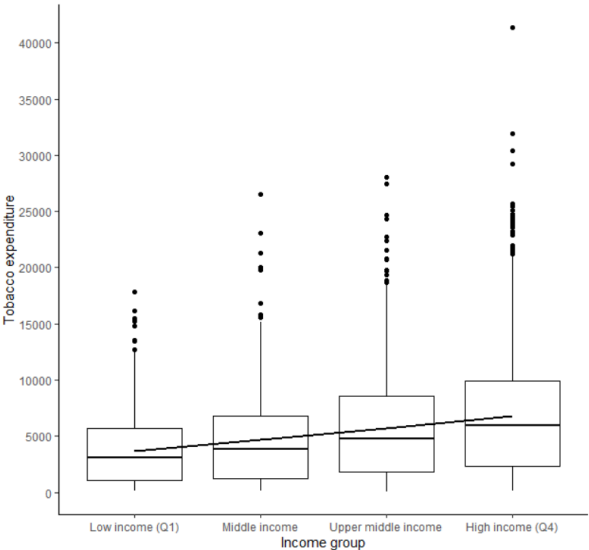

Figure 2. Tobacco expenditures by income groups of HHs

In contrast, quantile-based determination of income group is more even. The lower-income group represents households with income around minimal net wage in Ukraine (3 600 UAH per month on average). In comparison, the middle-income group consists of households with income around the average monthly wage (8 000 UAH). High-income households receive approximately 16 000 UAH per month.

The amount of tobacco expenditures increases with an increase in the total household's income (Figure 2). The tobacco expenditures vary from 3800 UAH for low-income households to 6800 UAH for high-income HHs. For low - income households, annual tobacco expenditures are comparable with the monthly wage of one working member. For a wealthy household, that burden is lighter – around 42% of the monthly income. In absolute terms, high-income households spend on 2 thousand UAH annually more than low-income ones. Both households' types could experience the crowding-out effect of tobacco expenditures to varying degrees.

Table 2 presents the average annual budget share of tobacco, food, healthcare, and education expenditures by income levels. A significant difference in shares of tobacco expenditures is observed.

Despite the higher amount spent on tobacco, the share of expenditures on tobacco decreases with an increase in the income level of HH. Lower-income households have almost 2 p.p. larger share allocated to smoking than average. In contrast, the high-income group has almost 1 p.p. less than the average share allocated to smoking.

Table 2. Expenditure shares (%) by smoking and income groups (unweighted)

	Smoking				Non-smoking			
	Low income (Q1) N=2172	Middle . income N=2074	Upper middle income N=1953	High income (Q4) N=1576	Low income (Q1) N=1704	Middle . income N=1801	Upper middle income N=1923	High income (Q4) N=2299
tobacco	8.70	6.47	5.71	4.70	-	-	-	-
food and beverages	43.9	42.8	40.1	36.8	47.6	43.9	40.7	37.6
healthcare	2.9	3.8	3.6	3.2	5.1	5.0	4.6	3.8
education	0.479	0.484	0.586	1.01	0.238	0.358	0.546	1.01

Sources: Survey of living conditions of households, UkrStat.

The share of food in total expenditures is decreasing while income status increases. It is an expected pattern, signaling that well-being of the households increases, and there are more resources on the other than necessity goods. Healthcare expenditure share has different trend along with smoking and non-smoking households. There is an increase in the share of expenditure on health care between the low-income group and middle-income group of households in smoking households. Then it decreases. For the non-smoking households' share of healthcare, expenditures are decreasing with increasing of income status.

As the age of the household is given by age interval following variables were constructed: "young" – household head is between 18 and 29 years old, "middle age" – between 30 and 59 years old, and "elder" stands for household head older than 60 years old. Considering that life expectancy at birth in Ukraine is around 67 years for males and 77 for females, we believe age cohorts to be fair.
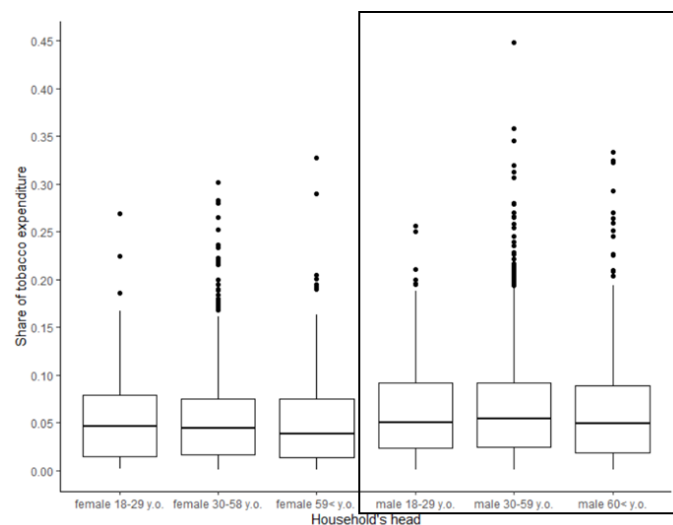
Figure 3. Share of tobacco expenditures by the head of household

The share of tobacco expenditures expectedly higher among households with a male head, as there is a significant gap between smoking prevalence among males and females (Figure 3). There is also no specific trend throughout the age of the HH heads. Additionally to marginally less share of tobacco among households with female head, there are also decreasing trend with increasing age of female HH head.

Table 3 contains a review of the main variables across households with and without children. Around a quarter of households in the whole sample have children. More than 80% of HHs with children belong to the upper-middle and high-income class.

Among HHs with children, 37% are smoking, comparing with 23% among childless HHs. Smoking HHs with and without children spend less on food and

healthcare. The education spending pattern is not constant for different types of HHs.

Table 3. Characteristics of HHs with and without children (unweighted)

	HHs without children (N=11392)	HHs with children (N=3896)
Smoking status (percentage of HHs)		
Smoking	2629 (23.1%)	1442 (37.0%)
Non smoking	8763 (76.9%)	2454 (63.0%)
Mean monthly income by income status in UAH (percentage of HHs)		
Low income (Q1)	3417.26 (32.7%)	3521.71 (3.9%)
Middle income	5860.98 (28.7%)	6121.76 (15.2%)
Upper middle income	8932.1 (22.7%)	9198.51 (33.1%)
High income (Q4)	15338.24 (15.9%)	16035.66 (47.8%)
Expenditure shares for smoking HHs (%)		
tobacco	6.32	5.00
food and beverages	39.6	40.4
education	0.33	1.37
healthcare	3.67	2.93
Expenditure shares for non-smoking HHs (%)		
tobacco	-	-
food and beverages	43.2	42.3
education	0.23	1.45
healthcare	5.16	3.09

Trends along with HHs types (with/without children) are consistent: HHs with children spend more on nutrition and education and less on healthcare regardless of smoking status.

ESTIMATION RESULTS

Firstly, the separability concept should be discussed. Table 4 shows the results of the Wald test (the χ2 statistics) for the consumer separability tests for the dependent variables that are a matter of concern of the study. Separability for tobacco is rejected for food and healthcare. In other words, the null hypothesis about zero expense on tobacco because of the corner solution is rejected. For food and healthcare, smoking and non-smoking consumers, indeed, have different preferences.

Noticeably, that not consumption category, which includes non-consumer monetary expenditures, the value of gifted products and products obtained from personal farms, and self-procurement are also significantly different for smokers and non-smokers.

The separability test is failed for other expenditures categories. The hypothesis about different preferences could not be rejected.

However, suppose the null hypothesis is failed to reject because the binary indicators are not jointly significant. In that case, it will not be sufficient to conclude that zeros are caused by a corner solution (Vermeulen 2003). Conditional preferences may be the same for smokers and non-smokers on the commodities that are left.

Table 4. Test of consumer separability (Wald test results)

Commodities	χ2 statistics
Food and beverages	10.395***
Education	0.027
Healthcare	3.227**
alcohol	1.099***
clothes	0.036
utilities	1.729
appliances	0.07
transport	0.048
communication	0.019
leisure	0.016
restaurant	0.001
non-consumption	2.2e-16 ***
Note:	*p<0.1; **p<0.05; ***p<0.01

Smokers tend to spend less share of their expenditures on food on the 2.56 p.p. compared with non-smokers (Table 5). Engel's law is confirmed, and the income effect on the share of food expenses is negative. However, for the smoking households, its magnitude is lesser than for the non-smoking. Families with young and middle-aged heads spend less on food than HHs with the elder household head (Appendix A). The older household head is more likely to have less income and therefore spend a more significant share of expenditures on necessities. With an increasing number of members share of expenditures spent on food increases as well. In the countryside, HHs spend less share on food in compare with town and city living HHs. Probably, it is due to the subsidiary farms.

The Wald test reveals the joint significance of variables with dummy "smokers" on the 0.001 significance level in the equation for healthcare expenditures.

However, a dummy smoker on its own is not significant, so it could not be interpreted. Instead, the fact that tobacco consumption negatively affects healthcare expenditures could be stated. Income effects on healthcare expenditures are positive. However, it is less for smokers than for non-smokers. Younger household heads are associated with a fewer share of expenditure on healthcare and the presence of children in the household. Households with female heads spend marginally more on healthcare.

Table 5. Key estimation results of SUR model for dependent variables of interest

	Dependent variables:		
	shr.food.beverages	shr.healthcare	shr.educ
	(1)	(2)	(3)
smokers	-2.560***	0.003	0.167
	(0.733)	(0.336)	(0.122)
tobacco expenses	-0.00000*	-0.00000***	-0.00000*
	(0.00000)	(0.00000)	(0.00000)
logIncome	-0.301***	0.106**	0.003
	(0.079)	(0.036)	(0.013)
logIncome^2	0.01**	-0.004**	-0.000
	(0.004)	(0.001)	(0.001)
smokers*logIncome	0.434***	-0.011**	-0.028
	(0.128)	(0.059)	(0.021)
smokers*logIncome^2	0.01**	0.001	-0.000
	(0.004)		(0.001)
Observations	15,505	15,505	15,505
Multiple R-Squared	0.231	0.065	0.118
Adjusted R-Squared	0.23	0.064	0.117
Note:	*p<0.1; **p<0.05; ***p<0.01;		

In the equation for the share of education expenditures, tobacco expenses are marginally significant and negatively affect. HHs with children and with younger household heads expectedly allocate more resources to the education expenditure category. In cities and towns, households tend to allocate a larger share of expenditures on education, and young and middle-aged households' heads spend on education more.

Estimation results for other expenditures categories could be found in Appendix B. Tobacco expenses negatively affect almost all other consumption categories. They are also significant with a high confidence level in all variables except leisure.

Smoking households spend on 0.79 p.p. larger share on alcohol than non-smoking. On average female household's head is associated with the decrease of expense on alcohol, but not a middle-aged female head. Young household's head also is associated with more significant alcohol expense.

A significant economic income effect is observed for the shares of expenditures on utilities. An increase in income is associated with a 0.25 p.p. increase in utility expenses. An increase of income by 10% is associated with a 2.45 p.p. increase in utility share. Noticeably, households with middle-aged female heads tend to spend a relatively more substantial share on clothes and less on transport expenses.

Overall, such demographic characteristics as family size, gender, age of household's head, urban or rural area, and presence of children prove their significance for determining the expenditure pattern. Demographic separability holds.

To provide a robust check model was estimated for the 2018 and 2019 years separately. The magnitude of the dummy variable "smokers" effect increases in 2018 and is slightly less in 2019. The significance of the dummy is much lower for

both models of robust check (0.1% and 1% significance interval, respectively). Demographic separability holds as well as in the primary model.

Overall, separately regressing the models for two years does not change results and conclusions drastically. However, it confirms the importance of year controls, despite their insignificance throughout the primary model. All estimations are available upon request.

CONCLUSIONS AND POLICY RECOMMENDATIONS

This study analyses the crowding-out effect of tobacco spending on household resource allocation in Ukraine using data from microdata on crucial indicators of household income, expenditure, and living conditions for 2018-2019. This paper uses the 2SLS SUR model to mitigate endogeneity and heteroscedasticity problems. However, a significant level of endogeneity comes for income terms and share of tobacco expenses. For the instrumenting tobacco expenditures ratio of an adult male to adult female is often used. However, those are not available in Ukrainian data.

Despite all, results could be used as starting point for further investigations. Studies have shown a noticeable difference in food, healthcare, and alcohol expenses between smoking and non-smoking households. This difference increases along with rising income levels.

One could speculate that it affects the quality of life of separate households and human capital in general. Smoking low-income households are exposed to a higher risk of human capital deterioration by worsening health status and malnutrition. That promotes widening the income gap and inequality.

The Tobacco Control Scale report, which monitors the implementation of tobacco-control policies at the country level across Europe, places Ukraine in joint 20th position out of 36 countries.

Ukraine made a National tobacco-control plan in order to implement the World Health Organization Framework Convention on Tobacco Control (WHO FCTC)

by all six components (MPOWER): Monitor tobacco use and prevention policies, Protect people from tobacco smoke, Offer help to quit tobacco use, Warn about the dangers of tobacco, Enforce bans on tobacco advertising, promotion and sponsorship, Raise taxes on tobacco.

The government should promote methods that affect individuals specifically. Cessation support can more than double the chance of successfully quitting ("Global Tobacco Report 2019" n.d.). In 2017 there was 70% of smokers intended to quit, according to the Global Adult Tobacco Survey. Clinical cessation services are much more cost-effective than most other health-care system activities ('Tobacco Control in Ukraine: Assessment of Current Status of Tobacco Control and Opportunities for Further Development (2020)' n.d.). They are most effective when combined with other MPOWER measures. The basic infrastructure to support tobacco cessation and treatment of tobacco dependence should be established.

Consideration should be given to fully implementing the national cessation guideline to ensure that a standard offer is given to all smokers based on evidence of effectiveness. Cessation programs are essential for smokers in contact with the health service and those seeking support to stop smoking or reduce their level of tobacco consumption. An evidence-based national training program should be developed and delivered to all front-line staff who interact with smokers. All of that should be a part of medical reform.

When resources are available, specialized intensive tobacco-dependence treatments (tobacco-cessation clinics) should be established. Consideration should be given to

establishing tobacco-cessation clinics to provide intensive specialized tobacco-cessation support to tobacco users.

Consideration should be given to ensuring that products such as nicotine replacement are actively promoted and made readily available to smokers identified as wishing to quit. Consideration should also be given to adding nicotine replacement therapy and other products to the national essential drug list and partially or fully covering the cost for tobacco users making supported quit attempts. These products could also be included as part of a program for temporary abstinence, such as when smokers are admitted to the hospital.

Smoke-free policies and Advertising bans also should be improved. The law should be clarified and, if necessary, amended to impose a complete prohibition on the point of-sale advertising, product display, and promotion of tobacco products on all retail premises. Also, standardized packaging should be introduced for all products containing tobacco.

Moreover, the government should continue increasing taxes on tobacco products. Ukraine began a gradual approximation of excise rates for tobacco products as part of the European Association Agreement in 2014; this eventually will lead to the minimum excise tax being at the same level as the EU minimum rate of €90 per 1000 cigarettes. The schedule adopted sets tax rates for tobacco from 2019 to 2025. The minimum excise rate will increase on average by 20% every year. Overall, it is expected to more than double during this period, which is a substantial increase.

A huge step was made when the law on enforcing expose tax on the HTP (heated tobacco products) was adopted. HTPs are subjects of the same minimum excise

tax adopted for cigarettes, started from 2020. The government should also consider the taxation of electronic nicotine delivery systems (ENDS) products.

Conclusively, to avoid opportunity costs and productivity losses, the government should establish and make available cessation and medical support under the essential healthcare treatment of smokers in addition to pricing methods.

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APPENDIX A.

ESTIMATION RESULTS FOR FOOD, EDUCATION, AND HEALTHCARE

Table 6 Full estimation results of SUR model for food, education, and healthcare

	Dependent variable		
	shr.food.beverages	shr.healthcare	shr.educ
	(1)	(2)	(3)
smokers	-2.560***	0.038	0.167
	(0.732)	(0.338)	(0.122)
tobacco expenditures	-0.00000	-0.00000***	-0.00000*
	(0.00000)	(0.00000)	(0.00000)
logIncome	-0.301***	0.109**	0.003
	(0.079)	(0.036)	(0.013)
logIncome^2	0.009**	-0.005**	-0.000
	(0.004)	(0.002)	(0.001)
smokers * logIncome	0.433***	-0.012	-0.028
	(0.128)	(0.059)	(0.021)
smokers * logIncome^2	0.018**	0.001	0.001
	(0.005)	(0.002)	(0.001)
female	0.001	0.004**	-0.000
	(0.003)	(0.001)	(0.001)
young	-0.069***	-0.034***	0.016***
	(0.007)	(0.003)	(0.001)
middle.age	-0.017***	-0.024***	0.002***
	(0.004)	(0.001)	(0.001)
hh head female*young	0.008	0.003	0.005**
	(0.009)	(0.004)	(0.001)
hh head female*middle.age	0.014**	-0.001	0.001
	(0.004)	(0.002)	(0.001)
hhsize_2	0.046***	0.002	-0.000
	(0.003)	(0.001)	(0.001)
hhsize_3	0.063***	0.000	0.002*
	(0.005)	(0.002)	(0.001)
hhsize_4	0.081***	0.000	0.005***
	(0.006)	(0.002)	(0.001)
hhsize_5	0.097***	-0.000	0.002*
	(0.007)	(0.003)	(0.001)
city	0.118***	0.000	0.006***
	(0.002)	(0.001)	(0.000)
town	0.098***	-0.000	0.001*
	(0.003)	(0.001)	(0.000)

TABLE 7 – Continued

	Dependent variable		
	shr.food.beverages	shr.healthcare	shr.educ
	(1)	(2)	(3)
children	0.006***	-0.005**	0.006***
	(0.004)	(0.001)	(0.001)
2019	0.01***	-0.000	0.000
	(0.002)	(0.000)	(0.000)
constant	2.565***	-0.567**	-0.025
	(0.446)	(0.205)	(0.074)
Observations	15,505	15,505	15,505
Multiple R-Squared	0.233	0.065	0.119
Adjusted R-Squared	0.232	0.064	0.118
Note:	*p<0.1; **p<0.05; ***p<0.01		

ESTIMATION RESULTS OF OTHER EXPENDITURE CATEGORIES

Table 7 Estimation results of SUR model for other expenditure groups

	Dependent variables:							
	shr. alcohol	shr. clothes	shr. utilities	shr. appliances	shr. transport	shr. communication	shr. leisure	shr. restaurants
	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
smokers	0.766***	0.138	-0.961.	-0.193	-0.16	-0.1	-0.093	0.024
	(0.086)	(0.211)	(0.501)	(0.134)	(0.222)	(0.098)	(0.116)	(0.184)
tobacco expenditures	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)
logincome	-0.009	-0.017	0.245***	0.000	-0.129***	0.001	-0.035**	-0.151***
	(0.009)	(0.023)	(0.054)	(0.015)	(0.024)	(0.01)	(0.013)	(0.02)
logincome^2	0.000	0.001	-0.011***	0.000	0.006***	-0.000	0.002**	0.007***
	(0.000)	(0.001)	(0.002)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
smokers * logIncome	-0.127***	-0.024	0.161.	0.033	0.025	0.016	0.017	-0.005
	(0.015)	(0.036)	(0.088)	(0.023)	(0.039)	(0.017)	(0.02)	(0.032)
female	-0.004***	-0.000	0.005*	0.001.	-0.006***	0.000	0.000	-0.003***
	(0.000)	(0.001)	(0.002)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
young	0.002**	0.045***	-0.029***	0.001	0.02***	0.011***	0.008***	0.055***
	(0.001)	(0.002)	(0.004)	(0.000)	(0.002)	(0.001)	(0.001)	(0.001)
middle.age	0.002***	0.02***	0.007**	0.000	0.014***	0.007***	0.000	0.008***
	(0.000)	(0.001)	(0.002)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)

TABLE 7 – Continued

	dependent variables:							
	shr. alcohol (4)	shr. clothes (5)	shr. utilities (6)	shr. appliances (7)	shr. transport (8)	shr. communication (9)	shr. leisure (10)	shr. restaurants (11)
hh head female*young	0.001	0.001	-0.002	-0.002.	0.000	-0.003*	-0.006***	0.000
	(0.001)	(0.003)	(0.006)	(0.001)	(0.003)	(0.001)	(0.001)	(0.002)
hh head female*middle.age	0.001**	0.003**	-0.004	0.000	-0.005***	-0.001*	0.001*	0.002*
	0.001	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
hhsize_2	-0.003***	-0.003**	-0.009***	-0.001.	-0.001.	0.003***	-0.003***	-0.011***
	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
hhsize_3	-0.005***	0.002	-0.011***	-0.001	-0.005***	0.006***	-0.005***	-0.014***
	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
hhsize_4	-0.005***	0.003.	-0.017***	-0.003*	-0.008***	0.005***	-0.005***	-0.014***
	(0.001)	(0.002)	(0.004)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
hhsize_5	-0.007***	0.003	-0.021***	-0.004**	-0.012***	0.005***	-0.011***	-0.018***
	(0.001)	(0.002)	(0.004)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
city	0.004***	-0.004***	0.042***	-0.001**	0.000	0.006***	0.011***	0.015***
	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
town	0.001***	0.000	0.023***	0.000	-0.003***	0.006***	0.004***	0.004***
	(0.000)	(0.001)	(0.002)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
children	-0.000	0.009***	-0.006*	-0.001.	-0.001	0.000	0.007***	0.007***
	(0.000)	(0.001)	(0.003)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
2019	-0.001***	-0.002**	0.032***	-0.002***	0.000	0.004***	-0.002***	-0.001
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
constant	0.052	0.064	-1.272***	-0.013	0.666***	0.012	0.169*	0.835***
	(0.052)	(0.129)	(0.305)	(0.082)	(0.135)	(0.06)	(0.071)	(0.112)
Observations	15,505	15,505	15,505	15,505	15,505	15,505	15,505	15,505
Multiple R-Squared	0.108	0.267	0.105	0.029	0.134	0.109	0.115	0.244
Adjusted R-Squared	0.107	0.266	0.103	0.027	0.133	0.108	0.113	0.243