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ORIGINAL PAPER

Determinants of Household Alcohol and Tobacco Expenditures in Turkey

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Abstract
In line with the recommendation by the World Health Organization (WHO), prices are used as policy instruments in many countries in discouraging the consumption of alcohol and tobacco products. Due to the complexity in the interplay of the household sociodemographic and economic factors in these countries, the effectiveness of price-related intervention tends to be limited in scope and unsustainable. We aim at determining the key factors in the spending decisions and the levels of spending on alcohol and tobacco products using a multivariate sample selection model, estimated with recent survey data collected by the Turkish Statistical Institute. We identify a number of sociodemographic and economic factors related to the excessive use of these products in the country. These findings can inform policy deliberation in curbing the use of alcohol and tobacco products.

Keywords Alcohol · Households · Sample selection · Tobacco · Turkey

JEL Classification C24 · D12 · I18

Introduction

Consumption of alcohol and tobacco products has increased dramatically in Turkey since the legalization of imports and the inclusion of private firms in the production process (Özkul and Sarı 2008). Excessive consumption of tobacco and alcohol products has been a prominent economic and public health issue in Turkey and the rest of the world alike (Yanbaeva et al. 2007). The economic cost of tobacco and alcohol consumption is not limited to the price paid for the products. When the costs of various chronic health problems, including cancer, lung diseases, and cardiovascular diseases, are taken into consideration, the excessive consumption of alcohol and tobacco products brings a tremendous burden on a country's economy (Room et al. 2005; Wang et al. 2006; Sen 2009; Do and Bautista 2015; WHO 2016). To ameliorate the negative health effects of these products, the law no. 4207 was introduced in Turkey in 1996, which prohibited smoking in enclosed spaces and advertising of any tobacco product (San and Chaloupka 2015). Consumption decreased initially upon the introduction of the law and public-broadcast campaigns nationwide but increased again for alcoholic drinks after 2007 and tobacco products after 2010 (Fig. 1). Such increases may be due to factors such as increased per capita income, the interaction of the social environment, work and life stresses, and depression resulting from the lack of employment, and the lack of supervision in workplaces where tobacco and alcohol use is prohibited.

Tobacco consumption and cigarette addiction are seen in the world as a non-contagious disease epidemic (Warner and Mackay 2006). Consumption of alcohol, while at a rate lower than that of tobacco in Turkey, has dramatically destructive social and economic outcomes for consumers and non-consumers alike (Anderson and Baumberg 2006). There is mounting evidence that alcohol and tobacco consumption interferes with the development of individuals, families, and nations (Eriksen et al. 2015; Perera et al. 2017). Tobacco and alcohol use is seen as the most significant preventable source of morbidity and mortality. Tobacco use causes around 5 million deaths every year around the globe, accounting for 20 percent of all deaths in males and 5 percent in females

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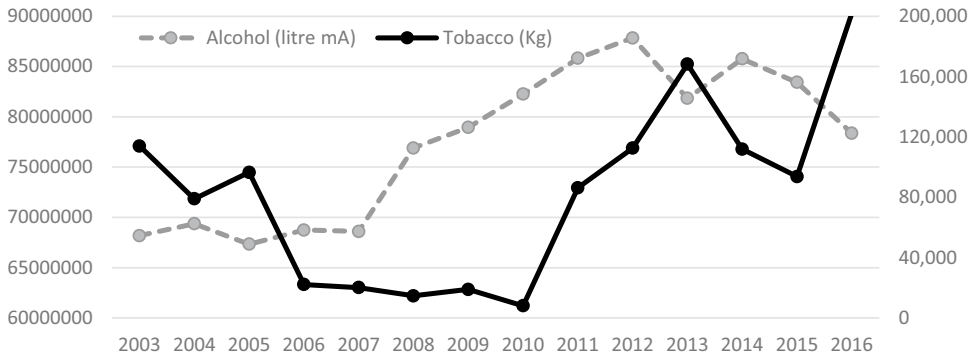


Fig. 1 Consumption of alcohol and tobacco in Turkey (2003–2016) (Source: (TAPDK 2018))

(WHO 2014a). Worldwide, 8.5 million people annually die of diseases related to tobacco and alcohol use (WHO 2014a), 5 million of which are related to tobacco use and 3.5 million to alcohol usage (WHO 2014a). According to a projection study conducted in 2006, 5.4 million deaths are related to tobacco use in 2005 and 8.3 million are projected in 2030 (Mathers and Loncar 2006).

The high health burden of tobacco and alcohol products leads to a large economic and public health problem for society, particularly for individuals. This threat leads to more destructive outcomes, especially in developing countries where consumption of tobacco and alcohol products is higher, preventive measures are insufficient, and healthcare and financial resources are lacking. These economic and public health issues are particularly dramatic in developing countries which consume more than 70% of the world's tobacco products (Doskoch 2008).

The negative effects of tobacco and alcohol products in developing countries are not limited to issues of public health. They are also destructive in terms of household economics. For example, more than 10% of the household expenditure in a low-income household in Egypt are devoted to tobacco and alcohol products. In low income levels, the rate of expenditures on alcohol and tobacco products increases dramatically. In India, people who are not homeowners spend more on alcohol and tobacco products than they do on food. In some parts of China, 17% of household income is spent on alcohol and tobacco products (Jagoe et al. 2002).

The public health issues with alcohol and tobacco usage have attracted much attention in the last 20 years in Turkey and the world alike. Due to its detrimental effects on human health and the economy, much effort is made in each country to curtail the consumption of tobacco and alcohol products. Along with the World Health Organization (WHO) at the world level, the Grand National Assembly of Turkey (TBMM) and the Ministry of Health (MH) are the major policy players in Turkey. The most comprehensive step taken to limit tobacco use is the "Framework Convention on Tobacco Control" accepted by the WHO in 2003, ratified by TBMM in 2004, and signed into law shortly thereafter. The convention aims at determining, planning, and implementing strategies against tobacco use. To that end, MH prepared the "Action Plan for National Control of Tobacco," with the main goal of raising the percentage of non-smokers beyond 80% among individuals age 15 and above and close to 100% among those under the age of 15 (Hayrullahoğlu 2015). As part of this action plan, the government in the last 15 years increased the taxes levied on alcohol and tobacco products and enacted a law that limits the sale and usage of various tobacco and alcohol products (Hayrullahoğlu 2015). By levying higher taxes, the Turkish government aimed to reduce the demand for alcohol and tobacco products directly. Although these demands-limiting policies have proven successful in countries like the United States (US), studies by Chaloupka (2013) in Egypt and the Philippines indicated that the reduction in consumption due to increased tax rates was not as high as the increase in prices (WHO, 2014b). Although this outcome, which is also valid for Turkey, is positive in terms of the financial purpose of the special consumption tax (SCT) in Turkey, the tax-related intervention has not reached its stated goal of protecting public health and reducing demand, due to smuggling as a result of higher taxes and prices. To achieve its stated goals, non-tax and non-price interventions are called for.

In addition to the health effects of alcohol and tobacco products, the focus on their social and economic effects has become increasingly prevalent, because alcohol and tobacco products are related to financial inequalities and poverty (Khan et al. 2002; Liu et al. 2006; Casswell and Thamarangsi 2009). Studies have shown an inverse relationship between expenditures on alcohol and tobacco products and on essential need products such as food, education, and health (John 2008, Pu et al. 2008).

There exists scant empirical literature on the sociodemographic and economic determinants of joint tobacco and alcohol consumption in Turkey. Although a few studies focus on single tobacco or alcohol products in Turkey (Tansel 1993; Bilgic et al. 2010, 2013; Yürekli et al. 2010), studies dealing with both alcohol and tobacco products

simultaneously are rare. Exceptions include (Bilgic and Yen 2015); the rest of the studies considered either alcohol or tobacco as a single product and ignored the relationship between the two. However, it is well-known that the consumption of alcohol and tobacco are interrelated. Ignoring such a relationship leads to biased and inefficient results and, consequently, false policy implications. In this study, by using a richer data set and by accommodating the relationship between the discrete and level outcomes of the two products, we obtained unbiased, more efficient parameters, and reliable policy analysis. Also, understanding the effects of the sociodemographic and economic factors of household and household members on both spending levels and probabilities of consumption of both products allows for more comprehensive policy deliberation.

This study investigated the spending decision and levels of expenditure in household consumption of alcohol and tobacco products by using an error-dependent (multivariate) sample selection system, estimated with the most current (2015) household expenditure data[1] collected by the Turkish Statistical Institute (TSI). This study aimed at creating more effective and concrete policies on alcohol and tobacco consumption using the information on the directions and magnitudes of the marginal effects of sociodemographic and economic variables. In addition to price-oriented policies in limiting the demand for alcohol and tobacco products, the formation of additional policies that are unique to families' sociodemographic and economic profiles allows the government to better reach their targeted goals of curtailing consumption. Findings also have important implications for other countries that share similar sociodemographic and economic factors.

Method

Our empirical specification was motivated by the discrete random utility theory (Pudney 1989). A household maximizes the random utility function subject to a fixed budget:

$$\max_{q,c} \left\{ U(Dq,\ c;\ h) | p'q + c = m \right\} \tag{1}$$

where $q = [q_1,\ q_2]'$ is a vector containing quantities of alcohol (q_1) and tobacco (q_2) with prices $p = [p_1, p_2]'$, c is a composite commodity for other goods with price normalized at unity, h is a vector of socio-demographic variables, m is budget, and $D = diag(d_1,\ d_2)$ is a diagonal matrix with each binary indicator d_i indicating potential consumption of q_i. Assume the utility function $U(Dq,\ c;\ h)$ is strictly quasi-concave and increasing with respect to c and positive elements of Dq. Then, solving Eq. (1) yields the notional demand q^* for alcohol and tobacco—a vector of optimal quantities demanded without non-negativity constraints, as a function of prices, income, as well as socio-demographic variables. Use of socio-demographic variables has a long history in demand analysis with cross-sectional data (Prais and Houthakker 1955).

The above-constrained utility maximum framework motivates two alternative specifications for the demand functions. First, assume all individuals are potential consumers of q_i in which case $d_i = 1$ for all i and censoring of each q_i corresponds to a corner solution governed by a Tobit mechanism. Second, when an individual can otherwise be a potential non-consumer, either $d_i = 1$ and utility maximum occurs in the interior of the choice set (*viz.*, $q_i > 0$), or $d_i = 0$ and $q_i = 0$ since price $p_i > 0$ by assumption. In this latter case, censoring in each q_i is governed by a sample selection mechanism. Since we only observe expenditure and not quantities, our dependent variables are expenditures. Express the notional demands as a system of equations for latent expenditures (y_i^*)

$$y_i^* = x'\beta_i + v_i, \quad i = 1, 2 \tag{2}$$

where x is the vector of explanatory variables, β_i are parameter vectors, and v_i are random disturbances which reflect the unobservable (discussed below).

Earlier empirical investigations of tobacco and alcohol consumption or demand have been based on aggregate time series data and often utilized the rational addictive behavior model (Chaloupka and Warner 2000; Yürekli and Zhang 2000; Gruber and Köszegi 2001; Gruber et al. 2003; Pierani and Tiezzi 2009). In contrast, studies of tobacco and alcohol consumption using survey data and limited dependent variable models have been prominent in the last two decades (Su and Yen 2000; Farrelly et al. 2001; Yen 2005a; Aristei and Pieroni 2008). The use of household data in this study allows evaluation of the effects of economic and sociodemographic characteristics of households given a sufficient number of degrees of freedom to estimate a large number of parameters within a system of expenditure equations. However, the preponderance of zero expenditures on both tobacco and alcohol products makes the choice of the appropriate econometric techniques crucial for the consistency of the empirical estimates (Yen 2005a, b). Estimation procedures not accounting for censoring of the dependent variables produce biased and inconsistent parameter estimates (Amemiya 1984; Maddala 1983). Further, the failure to estimate the model in the system framework compromises statistical efficiency. Statistical consistency and efficiency gain are therefore one of the advantages of a system-wide estimation procedure in which interactions of common unobservable

[1] Due to military coup in the second half of 2016 in the country, we did not want to use 2016 data due to fear, panic, and anxiety in people in food consumption. Since 2017 data have not yet been made public, we decided to use the latest 2015 data.

household characteristics among the equations are accommodated. These unobservable variables play a major role in determining the correlation between alcohol and tobacco consumption after accounting for observable household factors including social, economic, and demographic variables.

One system estimation procedure is the Tobit system. However, the Tobit model is undesirable in dealing with zero observations because the same parameters and variables determining the probability of zero and positive outcomes also determine the level; thus "any variable which increases the probability of a non-zero value must also increase the mean of the positive values" (Lin and Schmidt 1984). To obtain consistent parameter estimates and achieve efficiency gains, we estimated a two-good, four equation sample selection system introduced by Yen (2005a). Consider a two-good system where each outcome variable y_i is governed by a binary selection rule (consuming or not consuming):

$$\begin{array}{ll} \log y_i = y_i^* & \text{if } z'\alpha_i + u_i > 0 \\ y_i = 0 & \text{if } z'\alpha_i + u_i \leqslant 0, \quad i = 1, 2 \end{array} \tag{3}$$

where the latent equation for y_i^* is given in Eq. (2), x and z are vectors explanatory variables, β_i and α_i are conformable parameter vectors, and $u_i$and v_i are random errors. The error terms $[u', v']' = [u_1, u_2, v_1, v_2]'$ are distributed as four-dimensional normal with zero means, variances $[1,\ 1,\ \sigma_1^2,\ \sigma_2^2]'$, probability density function (pdf) $f(u_1,\ u_2,\ v_1,\ v_2)$, and correlation matrix $R = [\rho_{ij}^{uv}]$ such that correlation matrix ρ_{ij}^{uv} is the correlation between u_i and v_i (Kotz et al. 2000). Denote $w_1 = (\log y_1 - x'\beta_1)/\sigma_1, w_2 = (\log y_2 - x'\beta_2)/\sigma_2$, where each dependent variable y_i is log-transformed, which ameliorates both non-normality and heteroscedasticity in the dependent variables (Yen and Rosinski 2008).

To construct the likelihood function for all observations, consider first the case where both goods are censored at zero. The likelihood contribution is identical to that of a two-zero outcome in the bivariate probit model:

$$\begin{aligned} L &= \int_{-\infty}^{-z'\alpha_1} \int_{-\infty}^{-z'\alpha_2} f(u_1,\ u_2) du_2 du_1 \\ &= \Phi_2(-z'\alpha_1, -z'\alpha_2,\ \rho_{12}^{uu}), \end{aligned} \tag{4}$$

where Φ_2 is the bivariate normal cumulative distribution function (cdf) with correlation ρ_{12}^{uu}.

Consider next a mixed regime in which the first good (alcohol expenditure) is zero and the second (tobacco expenditure) is positive. The likelihood contribution is

$$\begin{aligned} L &= y_2^{-1} \int_{-\infty}^{-z'\alpha_1} \int_{-z'\alpha_2}^{\infty} \int_{-\infty}^{\infty} f(u_1, u_2, v_1, v_2) dv_1 du_2 du_1 \\ &= y_2^{-1} g(v_2) \int_{-\infty}^{-z'\alpha_1} \int_{-z'\alpha_2}^{\infty} h(u_1, u_2 | v_2) du_2 du_1 \end{aligned} \tag{5}$$

where marginal pdf $g(v_2)$ is one-dimensioned normal, conditional pdf $h(u_1, u_2|v_2)$ is bivariate normal (Kotz et al. 2000), and y_2^{-1} is the Jacobian of the transformation from v_2 to y_2. For the other mixed case with $(y_1 > 0,\ y_2 = 0)$, the sample likelihood contribution can be constructed by reciprocity.

For the case in which the outcomes of both dependent variables are positive, the likelihood contribution is

$$L = y_1^{-1} y_2^{-1} g(v_1, v_2) \int_{-z'\alpha_1}^{\infty} \int_{-z'\alpha_2}^{\infty} h(u_1, u_2 | v_1, v_2) du_2 du_1 \tag{6}$$

where marginal density $g(v_1, v_2)$ and conditional density $h(u_1, u_2|v_1, v_2)$ are both bivariate normal (Kotz et al. 2000), and $y_1^{-1} y_2^{-1}$ is the Jacobian of the transformation from $[v_1, v_2]'$to $[y_1, y_2]'$. The sample likelihood function is the product of the individual likelihood contributions defined above over the sample, depending on the outcomes of $[y_1, y_2]'$. The parameters $[\alpha_1, \alpha_2, \beta_1, \beta_2, \sigma_1, \sigma_2, \rho_{ij}^{uv}]$ were estimated by maximizing the sample log-likelihood function. The sample selection system contains two nested specifications: (1) restricting all but $\rho_{11}^{uv} = \rho_{11}^{vu} \neq 0$ and $\rho_{22}^{uv} = \rho_{22}^{vu} \neq 0$ to zero, *viz.*, $\rho_{21}^{uu}(= \rho_{12}^{uu}) = \rho_{12}^{vu}(= \rho_{21}^{uv}) = \rho_{22}^{vu}(= \rho_{22}^{uv}) = \rho_{21}^{vv}(= \rho_{12}^{vv}) = 0$ (four restrictions) reduces the system to a pairwise bivariate sample selection model Heckman (1979); (2) restricting all six unique error correlations to zero, *viz*, $\rho_{ij}^{uv} = 0$ for $u \neq v,\ i \neq j$ reduces the model to an independent system. The pairwise selection system can be estimated as the bivariate sample selection model Heckman (1979) for tobacco and alcohol separately. The independent system can be estimated as a further-restricted case of the pairwise system, that is, by estimating for each of the two products the probit model based on the binary outcomes of y_i for the whole sample, and OLS based for $\log(y_i)$ based on the truncated sample of positive observations. Tests of the two restrictive models against the sample selection system can be accomplished by conventional means, using the Wald test, likelihood-ratio (LR) test, or Lagrange multiplier (LM) test (Engle 1984).

Upon estimation, marginal effects on probabilities, conditional levels, and unconditional levels can be calculated. For $i = 1, 2$, the probability of a positive observation is

$$\Pr(y_i > 0) = \Pr(u > -z'\alpha_i) = \Phi(z'\alpha_i) \tag{7}$$

where $\Phi(\bullet)$ is cdf of the unit normal. The conditional mean of the dependent variable y_i is (Yen and Rosinski 2008)

$$E(y_i | u_i > -z'\alpha_i) = \exp(x'\beta_i + \sigma_i^2/2)\Phi(z'\alpha_i + \rho_{ii}^{uv})/\Phi(z'\alpha_i) \tag{8}$$

and the unconditional mean of y_i is

$$E(y_i) = P(y_i > 0)E(y_i | y > 0) = \exp(x'\beta_i + \sigma_i^2/2)\Phi(z'\alpha_i + \rho_{ii}^{uv}) \tag{9}$$

where ρ_{ii}^{uv} is error correlation between each set of selection and level equations. Differentiating (differencing) the above Eqs. (7)–(9) gives the marginal (or discrete) effects of explanatory variables. We calculated marginal effects at the

sample means of explanatory variables. For statistical inference, standard errors were calculated by the delta method (Rao et al. 1973).

Data

Data used in this study were collected from the household budget survey carried out by the Turkish Statistical Institute (TSI) in the period of 1 January 2015–31 December 2015 with 11,491 households surveyed. TSI regularly collects data each month by conducting surveys with approximately a thousand families that are similar to those in the previous month in terms of sociodemographic and economic characteristics. This study used data on 11,048 families after deleting outliers and observations with missing information. Alcohol expenditure was constructed by aggregating 10 items and tobacco expenditure by 3 items.

Results

Descriptive Statistics

Table 1 shows the descriptive statistics of the explanatory variables, which included socioeconomic characteristics of the households (movables and immovables owned, ownership of a passenger car, characteristics of the house, whether they shop with credit cards, the number of member, type of family, etc.) and heads of households (sex, age, marital status, education, income, etc.).

Mean monthly expenditure was 3.8 Turkish Lira (TL) for alcohol and 92.6 TL for tobacco (Table 1) per month. Among the consuming households, the means were 75 TL and 183 TL, respectively. In a study conducted in Australia, the monthly household expenditure was $129.2 (about 484.5 TL[2]) on alcohol and $50 (187.5 TL) on tobacco (Jiang et al. 2015). About 5% of the households spent on alcohol and half on tobacco products. The mean household size was 3.5 persons, 86% of the household heads were male, and 92% were of the age 30 or older. Mean years of education for a household head were 7.4, while 67% of the household heads were employed and 32% were retired. About 63% of the households owned a house, 30% of the households received a form of assistance, half resided in an apartment, 48.5% had a credit card(s), and 44.5% had a passenger car(s). See Table 1 for statistics of the remaining variables.

[2] At the beginning of the study, February 2018, 1 USD equaled 3.75 TL.

Results of the Sample Selection System

Maximum-likelihood estimates for the sample selection system are presented in Table 2. We first tested the two nested specifications against the full model. Using the Wald test, the hypothesis of no correlations between the error terms for tobacco and alcohol was rejected (Wald = 80.180, df = 4, $p < .000$), as was the hypothesis of zero correlations among all error terms (Wald = 161.608, df = 6, $p < .000$). Thus, both the pairwise selection system and the independent system were rejected, favoring the sample selection system. Likelihood-ratio tests confirmed the results of these tests.

The marginal effects of the independent variables on alcohol expenditure are given in Table 3. Among the 40 explanatory variables, 16 were found statistically significant on the probability, 3 on the conditional levels, and 13 on the unconditional levels of alcohol expenditures, at a significance level of 10% or lower (Table 3).

Focusing on explanatory variables with significant effects on alcohol expenditure, households headed by a male were 2.75 percentage points more likely to spend on alcohol than those headed by a female. These male-headed households spent 33.2 TL more per month conditional on spending and 3 TL more overall. A study conducted in Malaysia found that Chinese families headed by a male were 10.9 percentage point more likely to spend on alcohol than those headed by a female (Tan et al. 2016). Diaz et al. (2015) reported that 53% of adults living in Texas consumed alcohol, and 43% of male and 38% of female university students consumed alcohol excessively. Gender in underdeveloped and developing countries, as in the case of Turkey, had an effect on alcohol consumption (Giang et al. 2013). It may be stated that, in recent years, alcohol consumption has had a tendency to increase also among women as a result of socioeconomic development (Wilsnack et al. 2000; Simons-Morton et al. 2009). Our result suggests that men were more likely to consume alcohol than women.

Families with a married head were 4.61 percentage points more likely to spend on alcohol than families without. These households spent 7 TL less per month conditional on spending, and 3.9 TL less overall. A study in rural India found that single individuals consumed more alcohol while married individuals consumed less (Jumrani and Birthal 2017). In Vietnam, Giang et al. (2013) found alcohol expenditures lower among married households than single households. In this context, public health campaigns targeted toward single households about the harmful health effect of alcohol are likely to augur well.

Financial assistance from the state increases the probability of consuming alcohol by 1.23 percentage points but has no effect on the levels of spending. Households that had a combi boiler (stove) spent 0.99 TL (1.47 TL) less on alcohol unconditionally than families without such facilities; the

Table 1 Variable definitions and sample means

Variable	Definition	Mean (std. dev.)
Dependent variables		
Alcohol	Alcohol (TL per month)	3.824 (22.308)
	Among the consuming (TL per month)	75.433 (66.508)
	% Consuming	5.07
Tobacco	Tobacco (TL per month)	92.620 (124.406)
	Among the consuming (TL per month)	183.184 (118.407)
	% Consuming	50.56
Continuous explanatory variables		
Children 0–5	Number of kids aged 0–5	0.317 (0.637)
Children 6–14	Number of kids aged	0.568 (0.915)
Children 15–18	Number of kids aged 15–18	0.211 (0.476)
Adult 19+	Number of adults aged over 18 years	2.450 (1.066)
House size	House size	3.546 (1.884)
Education	Education in years	7.395 (4.823)
Expenditure	Family total expenses per month (TL/1000)	2.742 (2.025)
House feature index	Index created by house characteristics (bathroom, sauna, jacuzzi, toilet, kitchen, trash shredder, heater, floor heating, piped water system, natural gas, hot water, cable TV, elevator, garage, generator, security system, balcony, garden and children's playground)	7.260 (2.242)
Number of properties	Number of properties owned (number of self-contained houses, number of apartments, number of summer houses, shop, etc.)	1.024 (1.154)
Binary explanatory variables: household head and household characteristics		
Male	Gender is male	0.860
Age < 30	Reference	0.077
Age 30–50	$30 < \text{Age} \leq 50$	0.457
Age > 50	Age > 50	0.466
No school diploma	Reference	0.129
Primary school	Primary school education	0.443
Secondary school	Secondary school education	0.123
High school	High school education	0.162
College school	College school	0.143
Compulsory insurance	Has compulsory health insurance	0.840
Married	Married	0.834
Employed	Employed	0.667
Manager	Manager	0.046
Retired	Retired	0.318
Entrepreneurial income	Families with entrepreneurial income	0.336
State cash aids	Receives cash income from government	0.304
State in-kind aids	Receives in-kind type help income from the state	0.107
Alimony aids	Receives alimony, scholarship, cash income help from private persons and intuitions	0.132
Private in-kind aids	Receives in-kind type income help from private persons and intuitions	0.098
Foreign income	Has abroad retired, scholarship, or in-kind aid	0.023
Apartment	Resides in an apartment	0.495
Renter	Resides in a rental house	0.228
Homeowner	Resides in own house	0.634
Combi	Resides in a house warmed up with a combi boiler	0.319
Stove	Resides in a house warmed up with a stove	0.549
Internet	Has home internet access	0.346
Family with one child	A family with only one child	0.195
Family with two children	A family with only two children	0.196

Table 1 (continued)

Variable	Definition	Mean (std. dev.)
Family with > 2 children	Family with more than two children	0.140
Credit card	Family with a credit card	0.485
Vehicle	Family with a vehicle	0.445
Income ≤ 2000 TL	Monthly income ≤ 2000 TL	0.382
Income 2000–5000 TL	Monthly income 2000–5000 TL	0.490
Income > 5000 TL	Reference	0.128
Sample size		11,048

Standard deviations are not reported for binary variables

spendings were 11.56 TL and 27.46 TL less, respectively, among the consuming. Belongings in a household were a proxy for income, and we saw that alcohol expenditure decreased as the house was better equipped. Thus, campaigns to curtail alcohol consumption can reach their goals better by targeting more modern neighborhoods. On the other hand, internet service subscription increased rates of alcohol consumption by 2.6 percentage points. Households with internet subscriptions spent 7.87 TL more on alcohol conditional on consumption, and 2.3 TL more overall. The internet can have various features, notable socialization. Thus, anti-alcohol campaigns on the internet can play a role in discouraging alcohol consumption.

Among the families with two or more children, alcohol expenditures decreased as the number of children increased. Families with two children were 1.37 percentage points less likely to make expenditures on alcohol in comparison to those with no children. The estimate for families with three children was 1.91 percentage points lower. Increased family size led to increases in household essential consumption expenditures, and as a result of this, families cut down on consumption of luxury goods such as alcoholic beverages. Subramanian and Kumar (2017) reported similar findings on the roles of children in alcohol consumption.

Ownership of credit cards and cars contributed to 1.80 and 1.18 percentage points a higher likelihood to spend on alcohol products. Mixed results were found in the role of education in alcohol expenditure. Compared with households whose heads had no education, families with a primary-school educated head were 2.17 percentage points more likely to consume alcohol. The effects were 3.51 percentage points higher for high school and 3.31 percentage points for college. Overall, spending on alcohol was 3 TL higher among households with a high school educated head. Bilgic and Yen (2015) found that increased education levels reduced alcohol consumption in Turkey, and Yen (2005b) found education decreased alcohol consumption among both men and women in the United States. A study in Texas found that high school students consumed alcohol more than they used tobacco products and marijuana, and 81% of university students consumed alcohol for the rest of their lives (Diaz et al. 2015). We found alcohol consumption decreased with the level of education, but the effect was not significant. The variable which had the most significant effect on alcohol consumption was the total expenditure variable. Considering that households who participated in a survey were typically more likely to understate their income and report their expenditures more accurately, it was understood that this variable represented household income better. As income increased by 1 TL, alcohol expenditures increased by 0.001 percentage point and 0.0007 TL in the unconditional mean.

According to the results of marginal effects of tobacco products shown in Table 4, among the 40 exploratory variables used, 18 were statistically significant on the probability of tobacco consumption and 19 on the conditional and unconditional levels of expenditure, at the 10% significance level or lower.

Households headed by a male were 8.94 percentage points more likely to consume tobacco products, compared to households headed by a female. On levels, these households spent 34 TL more per month conditional on spending and 31 TL more overall. A study conducted in the same country found men 8.4 percentage points more likely to smoke than women and, considering the entire population, men spent 13 TL more (Ali and Bilgic 2016). In this context, it appeared that a rather male-focused approach in campaigns for the reduction of demand for tobacco products will be successful. For example, it was believed that public service announcements that prioritized an emotional theme like "a child without a father" or "do not let my father die" could be a more successful campaign in curbing tobacco products.

Age of the household head had a negative effect. Families headed by a member age over 50 were 4.23 percentage points less likely to consume tobacco products than their younger counterparts (age 30). Our results were similar to findings for Papua New Guinea that older age groups smoked less in comparison to the younger group age 18–30 (Hou et al. 2015). In India, Jumrani and Birthal (2017) found a negative relationship between the age of the household

Table 2 Maximum-likelihood estimates of sample-selection system of alcohol and tobacco expenditures

Variable	Selection				Level			
	Alcohol		Tobacco		Alcohol		Tobacco	
	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value
Constant	−2.108***	−8.787	−0.495***	−4.396	157.876**	2.992	165.640***	9.321
Male	0.368***	3.688	0.242***	4.443	25.464	1.487	26.104***	3.460
Age 30–50	0.106	1.132	0.083	1.609	−4.518	−0.375	−4.960	−0.782
Age > 50	−0.036	−0.328	−0.114†	−1.951	1.041	0.071	−2.395	−0.331
Married	−0.412***	−4.626	−0.208***	−4.070	1.481	0.109	−21.412**	−3.160
Employed	0.081	1.130	0.161***	4.426	−8.641	−0.997	−7.107	−1.532
Manager	0.085	0.924	0.028	0.460	13.429	1.325	12.706†	1.783
Compulsory insurance	−0.086	−0.857	−0.263***	−6.171	−5.126	−0.371	20.095***	3.648
Retired	0.054	0.682	0.000	−0.006	7.227	0.689	5.953	1.244
Entrepreneurial income	0.026	0.448	−0.032	−1.023	2.599	0.360	21.094***	5.593
State cash aids	−0.144†	−1.901	−0.127***	−3.867	4.083	0.413	0.559	0.129
State in-kind aids	−0.183	−1.315	0.115*	2.452	−12.093	−0.386	−15.469*	−2.570
Alimony aids	0.088	1.224	0.062	1.549	−6.743	−0.602	−6.149	−1.156
Private in-kind aids	−0.125	−1.279	0.032	0.682	−0.173	−0.011	−11.496†	−1.880
Foreign income	−0.092	−0.459	−0.017	−0.195	15.047	0.379	−3.258	−0.295
Apartment	−0.001	−0.020	−0.050	−1.400	8.190	0.856	1.093	0.239
Renter	−0.083	−1.057	0.102*	2.333	5.108	0.509	6.600	1.225
Homeowner	−0.123	−1.601	−0.148***	−3.689	−0.134	−0.015	−4.972	−0.972
Combi	−0.070	−1.089	−0.039	−0.962	−9.102	−1.159	9.954†	1.953
Stove	−0.014	−0.162	−0.016	−0.342	−27.165*	−2.372	12.523*	2.051
Internet	0.282***	5.055	0.015	0.464	1.994	0.213	7.903*	2.022
Family with one child	0.029	0.435	0.158***	4.417	−15.869†	−1.789	−2.130	−0.451
Family with two children	−0.161*	−1.977	0.048	1.254	14.581	1.232	−6.640	−1.398
Family with > 2 children	−0.242†	−1.894	−0.032	−0.680	8.474	0.416	1.100	0.203
House feature index	0.008	0.499	−0.017†	−1.905	−1.881	−0.985	1.996†	1.732
Credit card	0.206***	3.348	0.197***	6.477	−9.924	−1.042	3.907	0.950
Number of autos	0.131*	2.496	−0.019	−0.671	−5.869	−0.808	−4.624	−1.324
Primary school	0.228†	1.739	0.203***	4.462				
Secondary school	0.282†	1.863	0.213***	3.768				
High school	0.334*	2.312	0.092	1.618				
College school	0.317*	2.138	−0.267***	−4.298				
Number of properties	−0.024	−1.006	−0.048***	−5.741				
Children 0–5	−0.092†	−1.757	0.003	0.126				
Children 6–14	−0.129**	−2.820	0.001	0.073				
Children 15–18	−0.151*	−2.320	0.017	0.594				
Adult 19 +	−0.065†	−1.946	0.209***	15.713				
Total expenditures	0.089***	7.566	0.063***	8.762				
Education					−0.841	−0.842	−2.187***	−4.416
House size					−3.269	−0.665	0.978	0.813
Income ≤ 2000 TL					−5.312	−0.498	31.253***	7.259
Income 2000–5000 TL					10.597	0.730	51.549***	8.149
Sigma (σ_i)					66.726***	10.901	120.725***	39.179
Selection: tobacco (ρ_{21})	0.239***	7.619						
Level: alcohol (ρ_{31}, ρ_{32})	−0.376	−1.316	0.010	0.124				
Level: tobacco (ρ_{41}, ρ_{42}, ρ_{43})	0.080**	2.744	−0.455***	−4.977	−0.025	−0.458		
Log likelihood	−4654.850							

†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$

Table 3 Marginal effects of exogenous variables on alcohol products

Variable	Probability (×100)		Conditional level		Unconditional level	
	Estimate	t-value	Estimate	t-value	Estimate	t-value
Male	2.747***	4.525	33.214*	2.048	3.039***	4.925
Age 30–50	0.963	1.124	−2.314	0.192	0.585	0.639
Age > 50	−0.327	0.329	0.287	0.020	−0.223	0.213
Married	−4.605***	3.825	−7.014	0.608	−3.915**	2.812
Employed	0.714	1.159	−6.958	0.831	0.191	0.310
Manager	0.815	0.877	15.200	1.511	1.463	1.410
Compulsory insurance	−0.816	0.816	−6.904	0.505	−0.990	0.890
Retired	0.496	0.673	8.352	0.808	0.796	1.013
Entrepreneurial income	0.234	0.444	3.134	0.441	0.332	0.608
State cash aids	−1.232*	2.018	1.074	0.105	−0.850	1.244
State in-kind aids	−1.471	1.495	−15.926	0.516	−1.661	1.287
Alimony aids	0.834	1.169	−4.919	0.442	0.325	0.389
Private in-kind aids	−1.051	1.384	−2.790	0.180	−0.881	1.013
Foreign income	−0.779	0.491	13.133	0.334	−0.002	0.001
Apartment	−0.012	0.020	8.162	0.851	0.404	0.579
Renter	−0.732	1.087	3.374	0.340	−0.372	0.512
Homeowner	−1.139	1.570	−2.698	0.309	−0.971	1.334
Combi	−0.630	1.098	−10.564	1.365	−0.988†	1.720
Stove	−0.127	0.163	−27.458*	2.408	−1.472†	1.868
Internet	2.609***	4.910	7.863	0.974	2.284***	3.868
Family with one child	0.264	0.431	−15.270†	1.728	−0.599	0.925
Family with two children	−1.368*	2.108	11.219	0.954	−0.515	0.664
Family with > 2 children	−1.909*	2.209	3.383	0.165	−1.272	1.213
House feature index	0.070	0.499	−1.720	0.918	−0.036	0.255
Credit card	1.803***	3.453	−5.625	0.657	1.063†	1.913
Number of autos	1.182*	2.506	−3.136	0.444	0.705	1.379
Primary school	2.167†	1.653	4.742	1.028	1.856	1.594
Secondary school	2.979	1.614	5.816	1.058	2.588	1.541
High school	3.515*	2.001	6.903	1.115	3.051†	1.879
College school	3.306†	1.860	6.554	1.096	2.839†	1.772
Number of properties	−0.216	1.004	−0.496	0.804	−0.182	1.002
Children 0–5	−0.832†	1.758	−1.914	1.045	−0.702†	1.718
Children 6–14	−1.166**	2.809	−2.681	1.162	−0.983**	2.649
Children 15–18	−1.366*	2.317	−3.140	1.153	−1.152*	2.258
Adult 19 +	−0.588†	1.943	−1.351	1.079	−0.495†	1.896
Total expenditures	0.805***	7.727	1.851	1.298	0.679***	6.236
Education			−0.840	0.839	−0.043	0.840
House size			−3.269	0.665	−0.165	0.665
Income ≤ 2000 TL			−5.312	0.498	−0.269	0.498
Income 2001–5000 TL			10.597	0.730	0.536	0.729

$^{\dagger}p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

head and expenditures on tobacco. Thus, lower expenditure in older households may be the result of the emergence of tobacco-related illnesses in the family. Therefore, in curbing the demand for tobacco products, having elderly people share their personal experience in public announcements can be useful.

Marital status of the household head played a role. Families with a married household head were 7.53 percentage points less likely to consume tobacco products, spent 28 TL less conditional on consumption and 29 TL less overall. Jumrani and Birthal (2017) also found married households spent less on tobacco expenditures than single or divorced households. The increase in responsibility levels of married

Table 4 Marginal effects of exogenous variables on tobacco products

Variable	Probability (×100)		Conditional level		Unconditional level	
	Estimate	t-value	Estimate	t-value	Estimate	t-value
Male	8.941***	4.463	34.143***	4.875	30.702***	7.213
Age 30–50	3.069	1.602	−2.287	0.372	4.227	0.907
Age > 50	−4.231†	1.939	−6.081	0.860	−10.470*	1.967
Married	−7.531***	4.162	−27.933***	4.303	−28.691***	5.847
Employed	5.962***	4.405	−1.874	0.427	9.566**	3.005
Manager	1.017	0.460	13.593*	1.973	8.761	1.597
Compulsory insurance	−9.618***	6.264	11.902*	2.277	−10.018*	2.546
Retired	–0.009	0.006	5.945	1.280	2.982	0.863
Entrepreneurial income	−1.167	1.024	20.069***	5.507	7.997**	2.895
State cash aids	−4.665***	3.866	−3.554	0.855	−9.912***	3.353
State in-kind aids	4.199*	2.459	−11.844*	2.021	0.986	0.229
Alimony aids	2.276	1.551	−4.170	0.806	1.815	0.486
Private in-kind aids	1.155	0.682	−10.488†	1.765	−3.362	0.807
Foreign income	−0.605	0.195	−3.789	0.353	−2.949	0.390
Apartment	−1.840	1.399	−0.518	0.116	−3.487	1.065
Renter	3.749*	2.328	9.843†	1.889	11.733**	2.900
Homeowner	−5.470***	3.681	−9.706*	2.002	−14.625***	3.929
Combi	−1.440	0.962	8.689†	1.751	1.812	0.490
Stove	−0.599	0.342	11.999*	2.015	5.006	1.153
Internet	0.531	0.464	8.367*	2.215	5.164†	1.842
Family with one child	5.812***	4.436	2.878	0.648	11.718***	3.521
Family with two children	1.762	1.253	−5.106	1.113	0.461	0.136
Family with > 2 children	−1.164	0.680	0.076	0.014	−2.004	0.490
House feature index	−0.613†	1.905	1.458	1.296	−0.340	0.417
Credit card	7.270***	6.479	10.240**	2.772	17.933***	6.676
Number of autos	−0.698	0.671	−5.236	1.544	−3.861	1.537
Primary school	7.424***	4.502	6.488***	3.488	16.326***	4.491
Secondary school	7.788***	3.806	6.648**	3.203	17.353***	3.754
High school	3.362	1.620	2.913	1.593	7.420	1.616
College school	−9.766***	4.351	−8.855**	3.187	−21.059***	4.369
Number of properties	−1.776***	5.741	−1.556***	4.130	−3.899***	5.802
Children 0–5	0.101	0.126	0.089	0.126	0.222	0.126
Children 6–14	0.045	0.073	0.040	0.073	0.100	0.073
Children 15–18	0.605	0.594	0.530	0.587	1.327	0.593
Adult 19+	7.687***	16.239	6.733***	4.937	16.872***	14.567
Total expenditures	2.311***	8.827	2.024***	4.531	5.072***	8.626
Education			−2.187***	4.437	−1.103***	4.432
House size			0.978	0.812	0.493	0.813
Income ≤ 2000 TL			31.252***	7.259	15.757***	7.247
Income 2001–5000 TL			51.549***	8.149	25.990***	8.131

†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$

households and helping each other in the case of stress and a negative situation may lead to such an outcome. Therefore, it is useful to target this audience in campaigns against tobacco products.

While households with an employed head of household and income from entrepreneurship increased tobacco expenditure, the effect was the opposite for households whose head had compulsory health insurance. When the head of the household was employed, the likelihood of tobacco consumption increased by 5.96 percentage points. The effect of this variable on unconditional expenditure was 9.57 TL higher. Having income from entrepreneurship caused an increase in expenditures by 20 TL among the consuming and by 8 TL overall. In a study in Nigeria and

Pakistan, working individuals were found to smoke more than the unemployed (Gilani and Leon 2013; Uguru et al. 2015). Families with compulsory health insurance were 9.62 percentage points less likely to consume tobacco products. The effects on levels were estimated to be 12 TL in conditional consumption and 10 TL overall.

While financial assistance by the state reduced tobacco consumption probability by 4.67 percentage points, in-kind assistance increased it at a similar rate (4.2 percentage points). While the unconditional tobacco expenditure levels of the families that received financial assistance from the state were 10 TL lower in the entire sample, this decrease was 12 TL among tobacco-consuming families who received in-kind assistance. Thus, families who received food and financial assistance from the state spent less on tobacco products in comparison to those without financial assistance. Therefore, it is possible to reach more effective outcomes when the detrimental effects of tobacco products on human health are expressed for these families through a different channel. Moreover, being a tenant increased tobacco expenditure, while being a homeowner decreased it. The likelihood of consuming tobacco was 3.75 percentage points higher among the renters. The conditional effect was 10 TL and the unconditional effect was 12 TL higher. As tenants usually encountered monthly expenditure limitations like rent, they may have tried to overcome their stress related to financial burdens by using tobacco products more. On the other hand, being a homeowner reduced the probability of making tobacco expenditures by 5.47 percentage points. The effects on levels were 10 TL less conditionally and 15 TL less unconditionally.

Regarding the items owned by the households, ownership of combi boilers, ovens, and internet connection only affected the level of tobacco expenditure. Three factors increased the conditional level of tobacco expenditure by 9 TL, 12 TL, and 8 TL, respectively. Furthermore, the likelihood of making tobacco expenditures was 5.81 percentage points higher among families with only one child. This factor had a reduced effect of 12 TL on the unconditional level. While couples living with a child were more likely to spend more on tobacco products in comparison to childless couples as a reference, they limited their unconditional expenditures in the entire population. This was the desired outcome that both the state and the NGO like the Green Crescent should include public service announcement that is targeted especially towards children for their goals of reducing the demand for tobacco products. On the other hand, we found that credit card ownership had a 7.25 percentage point higher likelihood to spend on tobacco products. This factor had an increasing effect by 10 TL on tobacco expenditures among tobacco-consuming families. In terms of the entire population, it corresponded to an additional expenditure of 18 TL. Such a result was expected as a credit card makes payment easier. The government may impose extra financial responsibility on consumers who purchased tobacco products with a credit card.

In comparison to a household whose head did not have a primary school education, households with a primary school educated head were 7.42 percentage points more likely to spend on tobacco products. The conditional and unconditional expenditure amounts of this factor were 7 TL and 16 TL lower, respectively. Similarly, the effect of secondary school was 7.79 percentage points higher, 7 TL higher in conditional level, and 17 TL higher overall. Households with a college-educated head were 9.77 percentage points less likely to consume tobacco products. The effects of the conditional and unconditional levels were 9 TL and 21 TL, respectively. Considering the results, there was an increase in the absolute magnitudes of the effects of higher education on the tobacco consumption probability and both levels of expenditure. Yen (2005b) reported that smoking levels decreased as education levels increased. Therefore, education can be an effective policy tool against smoking. Additionally, besides laws that restricted tobacco products, the detrimental effects of smoking on human health should be included in health education textbooks in all schools and more public service announcements should be provided through visual and printed information.

Having any property decreased the probability of tobacco expenditure by 1.78 percentage points. Such ownership reduced the level of conditional and unconditional tobacco spending by 2 TL and 4 TL, respectively. The effects of this variable which is perceived as a proxy for income were similar to those of the income variable that we provided below. Additionally, an increased number of adult (19 years or older) individuals in the household increased tobacco consumption likelihood by 7.69 percentage points. This effect was observed as 7 TL on the level of tobacco expenditure. When the entire population was considered, it was estimated that the effect reached 17 TL. Considering the prevalence of smoking among adult family members, this result was expected. Relevant public and NGOs should focus on policies that will dissuade the youths from tobacco products. Just like the fact that the interior spaces where youths were found in large numbers were protected by laws, the surroundings of such places may also be protected by no smoking laws.

It was observed that both the total consumption expenditure and tobacco expenditure increased as income levels increased. John et al. (2011) found that the share of tobacco expenditures in both rural and urban areas increased along with increased levels of income. Increased consumption expenditure led to 0.002 TL and 0.005 TL higher conditional and unconditional tobacco expenditures, respectively. Households with a monthly income of 2000 TL or lower made an extra 31 TL of monthly tobacco expenditure in comparison to those with a monthly income of 5001 TL

and higher, while this increase was 51 TL for those in the 2001–5000 TL income group. For the entire population, these values were calculated respectively as 5 TL, 16 TL, and 26 TL. Fu and Florkowski (2016) reported a different finding. They reported a positive relationship between income levels and tobacco expenditures.

Conclusion

This study utilized microdata from a household expenditure survey to determine the roles of household socio-demographic and economic characteristics in the expenditures on alcohol and tobacco products, using the error-dependent sample selection system which accommodates zero observations in expenditures.

There are two different effects of tobacco spending on the household budget. The first one is known as "blending" meaning tobacco expenditure reduces the shares of other needs such as food, education, rent, and health in the household budget (San and Chaloupka 2016). The blending effect of alcohol and tobacco products also affects other members of the household who do not use these products directly. The second effect of alcohol and tobacco products on the household budget is the indirect effect caused by increased health-related expenditures.

Important steps have been taken in Turkey to reduce alcohol and tobacco consumption. Taxation can be one of the most cost-effective means of discouraging tobacco use. The Turkish government has increased tobacco taxes, with the share of taxes in retail prices increasing by 83% in 2017. As a result of higher taxes, tax revenue from tobacco products has doubled. The rate of consumption of tobacco products has not decreased but increased by 10% between the years 2013 and 2016. Considering the population, it is clear that the ratio of the smoking population in Turkey has experienced a decrease, albeit slightly (Cetinkaya and Marquez 2017). While tobacco use has decreased in high-income countries in the last two decades, it has increased in developing countries. With large multinational tobacco corporations successfully entering the emerging markets of tobacco products, tobacco consumption has increased.

According to the model results, similar socioeconomic characteristics play a role in the expenditure decisions of the household for both alcohol and tobacco. However, it is seen that fewer variables affect the levels of alcohol expenditure in comparison to tobacco expenditure. Despite this, the socioeconomic characteristics in question affect conditional and unconditional expenditure levels more in terms of alcohol spending. In this context, it may be argued that the sample selection bias is more significant and noticeable for alcohol expenditure. In summary, the factors that affect alcohol and tobacco consumption decisions are different and need to be analyzed in combination. In order to reduce tobacco and alcohol consumption in Turkey, consumers who are younger than 50 years of age, a household with a male head of the household, single households, and households headed by low levels of education should be taken into account and policies should be developed accordingly. There is a great advantage of the implementation of policies that are unique to the variables explained in detail in the findings and discussion section above by bringing them to the public's attention as a package.

The limitation of this study is that alcohol products are collected in a group and tobacco products are collected in a separate group. Perhaps in the future, these groups can be divided into sub-groups, and even though there is a risk of convergence in the parameters, these sub-groups may be modeled to provide more information and pervasive policy formation for products in question.

Compliance with Ethical Standards

Conflict of interest On behalf of all my coauthors I as the corresponding author declare that he has no conflict of interest.

Human and Animal Rights This article does not contain any studies with human participants or animals performed by any of the authors.

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