# Impact of Social Effects on Alcohol Consumption: The Case of Cambodian Household

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**ABSTRACT**

This paper examines the impact of social effects on alcohol consumption behavior in Cambodia. It also provides a thorough study of the relationships between household's alcohol consumption behavior, social effects, and demographic factors. Using socio-economic surveys of 19,774 Cambodian households conducted in 2014, 2015, 2016, traditional Ordinary least square (OLS), Instrumental variable (IV), and 2SLS quantile regressions are employed for the analysis. From the OLS and IV regression, the estimates show that social effects are a strong predictor of alcohol consumption. Other demographics variables such as marital status, percentage of male, age, work status, and social gatherings expenditure play a significant role in predicting the household alcohol expenditure. From the 2SLS quantile regressions targeting the non-zero household expense on alcohol consumption, I find that the higher household head's education the higher proportion of alcohol expenditure. Social effects and other demographics variables are all associated with household alcohol consumption. I expect the results to be an indicator for the researchers and government practitioners to put more effort in lowering the impact of social effects on the alcohol consumption through policy restrictions and enforcement against binge alcohol practice in Cambodia.

Keywords: Alcohol consumption; Social effects; Demographic factors.

## 1. INTRODUCTION

Excessive alcohol consumption of the household within the country or region especially young members of the household who are vulnerable to poverty and many other detrimental effects remains a great concern to government and public health officials; Economic literature gives less attention to this issue (William et al., 2001; Kremer et al., 2008; Niankara 2009). More studies about the demand for alcohol consumption for instance, the demographics of household's alcohol consumption along with behavioral driving force particularly social effects is in the need to examine economically. Understanding the impulse behind alcohol consumption could help develop policy recommendations that can impact positively on the household's alcohol consumption behavior. This paper uses econometric tools and examines empirical literature investigating the impact of social effects on alcohol consumption in relation to households in Cambodia analyzing related demographic variables determining the alcohol consumption behavior of the households.

Alcohol has been known to be a hazardous substance which associates with negative effects of both health and economic to alcohol consumers. In the past decades, the concern over the matter of alcohol abuse has been intensified in a sense of mitigating the

consequences of unhealthy alcohol drinking behavior that could potentially lead to large scale social problems.

Policies against alcohol abuse such as legal drinking minimum ages, restrictions on alcohol distribution and advertising, the excise tax on alcohol have been initiated especially in developing countries that are more exposed to the harmful drinking habit, though the effectiveness of implementation has been encouraged to be facilitated further, Holmes and Anderson (2017).

Cambodia, a low-income country, is ranked as one of the highest and most prolific drinkers among other ASEAN nations considering the fact that the consumption per capita of pure alcohol estimated to be 6.7 liters, WHO (2016). Amongst 15-19-year-olds, 42 percent of males and 27 percent of females were drinkers (Mom and Khuon 2009).

The nature of alcohol distribution and consumption in Cambodia are shaped by political, economic, cultural, media, and social (Asia Foundation 2016). This unhealthy trend of alcohol consumption within the society has driven researchers to question the root cause and the intensity of this particular phenomenon that could seriously be harmful to the youngsters who are the prevalence of heavy drinking practice.

Guilfoil (1962) explained how the determinant of consumption operates within a country by emphasizing on the real income which significantly impacts on consumption behavior. Simultaneously, other states include price, tax, and other consumer preferences also affect the consumption behavior of a commodity.

Among the classical economic mechanisms mentioned, “social effects” play a vital role in not only promoting but also pressuring people into alcohol drinking habits. Manski (1993b) investigated the identification of endogenous “social effects” and addressed empirically that people of the same group tend to behave similarly due to having similar individual characteristics or face similar institutional environments.

In Cambodia, the consumption within the household is expected to correlate with consumption in the community because alcohol beverage is usually consumed in the group as a sense of socializing (Rithy and Sok 2019). The demographics and consumer behavior toward alcohol products in Cambodia that have been studied in the past decades indicated mostly through descriptive statistics investigating the drinking behavior and harmful effects of the substance (Banta et al., 2012; Asia Foundation 2016).

Rarely have the study been addressing the influence of social interactions that could impact the decision of the member of the households to consume alcoholic beverages. This paper aims to investigate the determinant of alcohol consumption in Cambodia modified with demographics factors emphasizing the impact of community influence on the drinking behavior of the household members.

## 2. RELEVANT LITERATURE REVIEW

### 2.1 Motives behind alcohol consumption

To unfold the psychology behind the consumption of alcohol, researchers have been conducting series of studies unlocking the root cause of alcohol drinking practice taking an

insight into people's behavior and motives testing the relationship between the types of motive and the consumption of alcohol to identify which motives are strongly related (Berger and Leigh, 1988; Kenkel and Riba, 1994; Zarkin et al, 1998).

More empirical studies also pointed out that alcohol beverage can be an addictive substance which is detrimental to consumers considering the danger of consuming an excessive amount of alcohol (Becker et al., 1988, Bentzen et al., 1999; Pieranti et al., 2007).

Henry et al., (2012) examined how TV advertisements influence alcohol drinking addiction using quantile regression addressing the correlation between past and current consumption of alcohol, rational addiction model (Becker et al., 1988). They found that heavy drinkers are more responsive to advertising and become more addicted.

What can be considered as a more significant driving force to consume alcohol considering the fact that consequences to the consumer are pointed out to be more serious empirically?

Bronfenbrenner (1979) "Ecological system theory" explained that "social influence" plays an important role in encompassing the household members' behavior as well as their path of development resulted from the influences of their surroundings such as their parents, friends, work, school, and so on. It is applicable that "the socio-ecological theory" demonstrates the psychology behind household's alcohol consumption behavior which can be affected by their surroundings and social interactions.

Looking closer into the motives behind alcohol consumption, Abbey et al. (1993) examined the relationship between reasons for drinking alcohol and alcohol consumption pointed out two main reasons for the alcohol consumption: people drink alcohol to cope with stress; people drink alcohol because of social influences.

Kremer et al. (2008) and Ibrahim (2009) investigated the behavior of alcohol consumption among college students in the US in relation to peer influence also indicated that social interaction changes people's preferences with complex behavior such as binge drinking.

In many cases, the potential access to alcohol substance at an early attempt happens to be a gateway to excessive alcohol consumption. "Social effects" is one of the significant factors associated with the first attempt in alcohol consumption (Brown et al., 1986). Moreover, accessing alcohol substances at an early age could also drive people to become a chronic heavy drinking person in later adulthood (Soundararajan et al., 2017).

Is "social effects" the only significant drive that correlated with alcohol consumption behavior? Brain et al. (2010) further investigates the effects of advertising, social influences, and self-efficacy on adolescent tobacco use and alcohol consumption and suggested that "social effects" can be a stronger predictor of risk behavior than advertising and/or parental influence.

Positioning as a stronger predictor among other mechanisms drives the researcher to further explain how it positively benefits the subject matter as in developing a sense of belonging and networking. MacDonald and Shield (2001) suggested that alcohol plays a networking role if consumed during the time spent with colleagues from work by serving as a signal of the individual's commitment to the firm.

Not only social effects that drive people to consume alcohol, but also other modified demographic variables also play a vital role in associate with alcohol consumption behavior

(Changpetch et al., 2016). Using logistic regression to analyze panel dataset from Thai households in 2009, they discovered that the region where the household is located, urban/rural location of the household, household income, tobacco household expenditure, gambling household expenditure, education, religion, marital status, gender, age, and work status of the household head are all associated with the alcohol consumption of households.

Even after accounting for individual traits such as characteristics, obesity, and smoking status, Srinivasa et al. (2017) examined data from Scotland stretching from 1995-2012 explained that disadvantaged social groups have greater alcohol-attributable harms compared with individuals from advantaged areas for given levels of alcohol consumption.

With the concerns over the growth in alcohol consumption particularly countries that are vulnerable to poverty, the socioeconomic factors can be a major driving force to alcohol consumption across the country (Donald et al., 1995; Cheah 2015; WHO 2018). Jayathilaka (2016) also indicated a significant relationship between alcohol and poverty in Sri Lanka through household surveys in major provinces. In the sample studied, he found that a high proportion of poor households' expenditures spent on alcoholic beverages.

## 2.2 Demand and social effects

The most fundamental law of economics with regards to consumption behavior links to the price of the product to the demand. Increasing the monetary price of alcohol through tax is expected to lower alcohol consumption.

Gray et al. (2015) proposed an alcohol demand theory fundamentally explains how much alcohol is desired under the conditions of prices that change over time taking into account the trait-based theory which includes ages, gender, education, income, ethnicity, and so on.

Apart from the correlation between price and consumption, many papers also pointed out other irregular behavioral determinants of alcohol demand which significantly improved the traditional neoclassical economic model (Zech, 1975; Brown et al, 1986; Mischel, Shoda, and Peake, 1988; Becker and Murphy, 1988).

Seeking to analyze the potential irrational behavior in the determinant of demand, Gaertner (1974), Pollak (1976), Alessie and Kapteyn (1991) investigated consumer demand models in the case of fixed price in a variety of commodities though alcohol is not included, individual demand increases with the mean demand of a reference group. This proves that there exists irregular behavior of the consumer when it comes to consumer decision making within the reference groups.

The average consumption of alcohol in a larger group depicts individually-measured outcome variables, Jamison et al., (2008). Within their selected sample at London University, students were influenced by the size of the drinking group, price, and alcohol availability. Male students are prone to consume alcohol more than females. Even accounted for a clinical experiment-based study, the estimates were proved to be valid and highly applicable for the investigation of social effects identification.

## 2.3 Social effects and demographics estimation

Social effects (social interactions) which are a branch of social science have been interested among researchers for a long time (Ioannides 2008). It is pointed out that the key

factor influencing the decision in consuming alcoholic beverages is driven by the social interactions of the reference groups (Abbey et al., 1993; MacDonald and Shield, 2001).

One of the issues is to separate the impact of social effects on the subject's behavior (endogenous social effects) from the impact of social characteristics (contextual effects) and/or correlated unobserved factors (correlated effects) on the subject's behavior (Manski, 1993; Brock et al., 2001).

The average school graduation rate, the average number of books of student's peers, or the average group's alcohol consumption are commonly taken as the reference group to uncover the social effects on individual's outcomes as in graduation status, earnings, or individually-measured of alcohol consumption (Acemoglu et al., 2000; Angrist and Lang, 2004; Jamison et al., 2008).

Though it seems to be in the right direction in estimating the social effects based on the reference group, the presence of random effects in the error term raises issues for statistical inference anyhow this is not IV (Instrumental variable) estimation issue *per se* (Joshua et al., 2008: 146). Instrumental variables (IVs) can help to address the issues concerning identifying the endogenous social effects (or peer effects) (Manski, 1993; Yan et al., 2009; O'Malley et al., 2014).

If the estimation is carried out through OLS (Ordinary Least Square), all of the identification challenges could generate endogeneity in the parameter associated with social effects, which leads to identification problems and biased estimates (Manski 1993).

The estimates of social effects based on the reference group on the subject's outcomes require valid instrumental variables (Joshua et al., 2008: 146). The previous study also pointed out that if the correlation between the IV and the endogenous variable is weak, it can lead to large bias and inconsistent estimates (Hahn and Hausman, 2003; Stock et al., 2002; Joshua et al., 2008: 144).

Fletcher et al., (2012) used alcohol availability in classmates' homes and classmates' parents' alcohol abuse as instruments based on US data and found a significant impact of peer effects (or social interactions) in problem alcohol drinking of the targeted students of different grades in the US.

Carlos (2017) used Colombian data to estimate peer effects (or social interactions) for alcohol consumption among high school students by the instrument the peer behavior in which subjects are exposed to household members of individual's peers who consume alcohol. They discovered that instrumenting classroom consumption with that of the household yields an increase of 10 percent in the proportion of classroom users of alcohol.

One thing all these studies have in common is that they used "school and grade fixed effects, or a set of reference group characteristics" to identify common separately from endogenous peer effects (or social effects), and instrumental variables to address the self-selection problem finding evidence of the significant impact of social interactions (Fletcher et al., 2012; Carlos, 2017).

Most other well-known studies of alcohol consumption behavior conducted based on cross-sectional data of a nation to examine the impact of alcohol consumption on the socioeconomic status with demographics analysis also addressed that IVs produced better estimates though the difficulty is to find valid instruments that are powerful predictors of alcohol consumption but are unrelated with the dependent variable (Berger and Leigh, 1988;

Kenkel and Riba, 1994; Zarkin et al., 1998; MacDonald and Shields, 2001; Antai et al., 2014).

Other previous studies of demographics and socioeconomic status with alcohol consumption behavior that uses cross-sectional data of a nation employ traditional OLS approach paring with binary logit and probit regressions (Jayathilaka, 2016; Changpetch, et al. 2016; Srinivasa et al., 2017). This indicates that in the case of cross-sectional data at the national level, OLS estimates can be significant when it comes to household's demographics analyses in association with the household's alcohol consumption behavior.

The socioeconomic status is typically measured as the net total income of the targeted subject studied (Kenkel and Riba, 1994; MacDonald and Shields, 2001). Other explanatory variables (or demographics) are the proxy of other household characteristics such as household head's education, religion, marital status, gender, age, and household head's working status (Changpetch et al., 2016).

Alcohol consumption measures include a yes/no binary indicator of the decision in consuming alcohol, multiple binary indicators of levels of consumption, consumption frequency over a specific period (Jayathilaka 2016; Changpetch et al., 2016; Srinivasa et al., 2017).

Aside from the social effects and demographics studies, external factors that are in place to promote the alcohol product, for instance, TV advertisings, Social media, and other promotional activities have been found to have an impact on the alcohol consumption (Brain et al., 2010; Kinard et al., 2010; Saffer et al., 2012; Wahyono et. al, 2017; Stautz et al., 2017). This paper, however, focuses narrowly on the determinants of alcohol consumption estimating social effects, endogenous social interactions, between household alcohol consumption and average household alcohol consumption of the reference groups in a nation.

## 3. THEORETICAL FRAMEWORK

### 3.1 Social effects

Many studies in social science conducted have concerns over the social effects. The studies emphasized on the causal effect of group characteristics on individual outcomes addressing the detrimental outcomes due to social influence (Brown et al. 1986; Wilks et al. 1989; Acemoglu et al. 2000; Ammermueller et al. 2009).

"Alcohol price" is not included as it is unobservable in this study (see 6.3 Variable specification issue), thus the classical economic demand function is inappropriate to follow in this paper. Many previous papers on alcohol consumption behavior drop the alcohol pricing variable (MacDonald et al., 2001; Erdal, 2004; Jayathilaka, 2007; Changpetch et al., 2016).

This paper mainly adopts the identification of endogenous social effects as in linear model from Manski (1993). It aims to test the hypothesis of correlated effects wherein individuals/households of the same group behave similarly due to having similar individual characteristics or face similar institutional environments.

### 3.2 Model specification

Using the same annotation adopting the social effects model of Manski (1993), the model specify through characterizing parameters $(C\ x\ z\ u)$. $C$ as the scalar outcome (e.g. household expense on alcohol consumption), $x$ attributes of individual's reference group (e.g. subject's community, village, or ethnic group), and $(z, u)$ attributes directly affect $C$ (e.g. socioeconomic status, income and education). $(C, x, z)$ are observable variables where $u$ is not.

Assume that:

$$C = \propto +\beta E(C|x) + E(z|x)'\gamma + z'\eta + u,\ E(u|x,z) = x'\delta\ , \quad (1)$$

where $(\propto, \beta, \gamma, \delta, \eta)$ are parameter vectors. Then, the mean regression of $C$ on $(x, z)$ can be expressed as :

$$E(C|x,z) = \propto +\beta E(C|x) + E(z|x)'\gamma + x'\delta + z'\eta \quad (2)$$

From (1) and (2), it is inferred that if parameter $\beta \neq 0$, an endogenous effect exists in the linear regression. It shows that the outcome of variable $C$ is modified by $E(C|x,z)$ which is the mean of variable $C$ among the persons in the reference group that is defined by the attributes of the individual's reference group x. In addition, if parameter $\gamma \neq 0$, exogenous effect occurs in the model. It indicates that variable $C$ varies with $E(z|x)'$ which is the mean of the exogenous variable $z$ (attributes directly affect $C$ ) among persons in the reference group.

In the case that parameter $\delta \neq 0$, there exists correlated effects in the model. It indicates that the persons in the reference group $x$ behave similarly due to similar unobserved individual characteristics $u$ or similar institutional environments. Parameter $\eta$ expresses the direct effect of the exogenous variable $z$ on the outcome of variable $C$.

$E(C|x)$ is linear only under the conditions that $[z]$ is a function of $[x]$, $E(z|x)$ does not vary with $[x]$, $E(z|x)$ is linear function of $[x]$, and $[x]$ is a linear function of $[z]$ (Manski 1993).

### 3.3 Sample inference

To analyze the impact of social effects, attributes directly affect the outcome variable $[z]$ and attributes of the individual's reference group $[x]$ must be dependently consistent with the observed behavior (Manski 1993). Since the specification of reference group is rarely offered and mostly unobservable, the practice of analysis can be conducted through assuming that individuals or households are influenced by $E(C|x)$ and $E(z|x)$, for some specific $x$, attributes of individual's reference group, Hardle (1990).

In a larger sample group social effects with randomly chosen individuals, Manski (1993) suggested using spatial correlation model interpreted as a two-stage method for the estimation of the pure endogenous-effects model.

Adapted from equation (1), assuming that $E(C|x)$ is linear using the same annotation, the spatial correlation model can be written as:

$$C_i = \beta W_{iN} Y + z_i'\eta + u_i,\ i = 1, \dots, N, \quad (3)$$

where $Y = (C, i = 1, \dots, N)$ is the N * 1 vector of sample realizations of $C$ and $W_{iN}$ is a specified 1*N weighting vector; the components of $W_{iN}$ are non-negative and sum to one.

In the first stage, one can estimates $(\beta, \eta)$ using sample data on $(C, x)$ estimating $E(C|x)$ non parametrically, and in the second stage, one can estimates $(\beta, \eta)$ by finding the least-squares fit of $[C]$ to parametric estimates of $[1, E_N(C|x_i), z]$ where $E_N(C|x_i)$ is the first stage estimate of $E(C|x)$.

Many non-parametric estimates of $E(C|x)$ are in the form of weighted averages of the form $E_N(C|x_i) = W_{iN}Y$, Hardle (1990). Estimates of $(\beta, \eta)$ as in spatial correlation (e.g. school, region, or community/village) can be the estimation of pure endogenous-effect models.

## 4. DATA

The study is conducted through a secondary data set of a household survey in Cambodia from the Cambodia Socioeconomic Survey (CSES) conducted by the National Institute of Statistics (NIS) of the Ministry of Planning. As planned by NIS, the survey is conducted every five years with big sample size, starting with the first "big sample" survey in 2004, followed by the second 2009, and the third 2014. The "smaller sample" surveys are conducted annually between the period of every five years "big sample" survey.

The "big sample" survey in 2014 followed by the "smaller sample" survey in 2015 and 2016 are selected for investigation in this study. In the survey, households were asked to answer questions such as living conditions, housing conditions, education, labor involvements, crop production and other agricultural activities, other household economic activities, household liabilities, durable goods, income from other sources. The household questionnaire was responded by the head of the household, spouse of the head of the household, or another adult household member. The date of the answers from the selected sample is recorded in the data as the exact date and time that the survey was taken.

Table 4.1 describes the selected observations from CSES data which compose of "number of households, number of primary selected units (villages), and number of cities/provinces" in Cambodia.

**Table 4.1:** Descriptive and Statistical data analysis

| **Name** | **2014** | **2015** | **2016** |
|---|---|---|---|
| Households | 12096 | 3840 | 3840 |
| PSU (Villages) | 720 | 320 | 384 |
| Cities/Provinces | 24 | 24 | 24 |

Source: CSES 2014, 2015, 2016

The survey includes basic background information of the household members including household income and household consumption information on 18 different major food items and 10 other non-food items.

In addition to CSES conducted by NIS, the first Cambodia Economic Census 2011 and Public Education statistics 2016 are included. The data are accounted for the "Alcohol retail outlets" and "The number of schools" throughout the country. These additional data are used as instrumental variables for the analysis (see more on 6.1 Endogeneity problem).

## 5. METHOD

The paper aims to estimate the social effects on alcohol consumption of selected households in Cambodia. The method of this paper follows the approach of Manski (1993) which investigates behavior in a population of whether the average behavior in some group influences the behavior of the individuals that comprise the group. It examines the impact of social effects on household's alcohol consumption behavior. Using the CSES data sample in 2014, 2015, and 2016, the average consumption of alcoholic beverages by the village is used to measure the social effects.

Estimates of social effects as in the spatial correlation approach can be of the pure endogenous-effect model, Manski (1993). This paper employs econometric tools include the traditional Ordinary least square (OLS) and Single equation instrumental variable (IV) with "average household expenditure per capita on alcohol consumption by the village" acted as endogenous social effects variable instrumented by "Number of Schools" and "Retail alcohol outlets" (see more on 6.1 Endogeneity problem).

Through Cambodia socio-economic survey (CSES) households conducted in the sample, of the 19,774 households, 6,636 or 33.5 percent of the households consumed alcohol. Since the proportion of household alcohol expenditure is right skewed (see Figure 5.5), it is essential to examine the characteristics of the 33.5 percent households that consumed alcohol through median and other quantile estimates apart from the mean (OLS and IV estimates). The 2SLS quantile regressions is employed in addition to OLS and IV.

The 2SLS quantile estimates could also pave the way to understand more in depths on the significant difference between alcohol drinkers and non-alcohol drinkers. Alcohol substance has been proved to be different from other substance, for instance, it can be addictive and detrimental to alcohol drinkers (Becker et al., 1988, Bentzen et al., 1999; Pieranti et al., 2007)

In this paper, the 6,636 households are investigated through 2SLS quantile regressions at the $10^{th}$, 25th, 50th, $75^{th}$, and $90^{th}$ quantiles with bootstrap standard errors (See more on 6.2 bootstrapping quantile regression). The quantile estimates aim to address the significance of social effects and the characteristics of non-zero household expenditure per capita on alcohol consumption.

Adapted from equation (3) of Manski (1993), the model is in a reduced form. It categorizes variables $(C_i, W_{iN}Y, z, u)$. In the model, $C$ denotes the scalar outcome or dependent variable, $W_{iN}Y$ where $Y = (C, i = 1, \dots, N)$ is the weighted averages of sample realizations of $C$ (Hardle 1990) which denotes the social effects variable, and $z, u$ denotes the attributes directly affect $C$ while $u$ is unobservable. $z$ acts as the demographic variables in the study.

## 5.1 Dependent variable

According to the CSES data, the household's alcohol consumption per head variable measures the frequency of consumption in the number of days eaten or drinks in the past 7 days which transcribed into the past thirty days that alcohol was consumed per day, drinks per month (Household expense on alcohol consumption per month).

The dependent variable $C$ is the household expense on alcohol consumption in the past thirty days which divided by the total number of adults (more than 18 years old) in the household to proxy the alcohol consumption of adult household members individually.

## 5.2 Social effects variable

The weighted average of household expenditure per capita on alcohol consumption by the village is used to measure the social effects variable, the main explanatory variable. The number of adult household members (more than 18 years old) will be treated as the weight to the average alcohol consumption of the households by the village. (see more on Table 5.3 Variable definition) It appropriately serves as a measure of social effects variable as it is the proxy of the average behavior in some group (number of households per capita by village) that influences the behavior of the individuals (households per capita adult) that comprise the group.

From equation (3) and (4), Manski (1993) pointed out that $E(C|x)$ is linear only if $[z]$ is a function of $[x]$, $E(z|x)$ does not vary with $[x]$, $E(z|x)$ is linear function of $[x]$, and $[x]$ is a linear function of $[z]$. This essentially indicates that variable $(x, z)$ have to be functionally consistent with the observed behavior of the household. Conceptually, people of the reference group must have consistent attributes ($z$ is the attributes directly affect $C$; $x$ is the attributes of individuals' reference group, for instance, respondent's community, village or ethnic group, social gatherings, .etc.).

In the study, respondents are expected to spatially exposed to the surrounding environment of their community/village since the selected households are grouped by village based on CSES data. According to the "ecological system theory", social interactions play a significant role in shaping members of the household to behave in accordance with their environments (Bronfenbrenner 1979).

In Cambodia, forming and attending social gatherings usually associate with alcohol drinking practice (Rithy et al., 2019). Ideally, members of the family or household heads who participate in the labor force or social gatherings will tend to be exposed to alcohol drinking habits more than the ones who are not in the labor or social interactions. This can also foster the habit of consuming alcohol beverages which address the significance of the social effects variable.

In the analysis, modified social interaction variables are added. These include labor participation, gambling, special occasions (expense on forming parties, gatherings events, etc.), miscellaneous expenditure (expense on attending parties, weddings, gatherings, etc.) and donations (charity involvements, a donation to monks, community, NGOs, etc.). These modified social gathering variables act as a proxy of how social the person is within the community and how it affects the scaler outcome of an individual's alcohol consumption behavior. It also identifies the attributes of the reference group whether it is consistent among the sample.

## 5.3 Demographic variables

To identify the traits and psychology behind the demand of alcohol beverages among households and to determine the respondents' characteristics representing the targeted population for generalization purposes, it is necessary to include demographics variables to the regression analysis.

Independent variables from CSES measure economic, demographics, and other factors associated with the alcohol consumption behavior of the households. Variables

included are household income, household head's education, household head's age. Other variables included are the gender of the household head, percentage of adult males in the household, urban/rural area, and household head's marital status.

## 5.4 Instrumental variables

"Alcohol Retail outlets" and "Number of Schools" are used as the instrumental variables for the main explanatory variable "Average household expenditure per capita on alcohol consumption by the village". (see more on 6.1 Endogeneity problem)

## 5.5 Statistical method

Adapting from Manski (1993) approach to identify the social effects model from equation (3), household's alcohol consumption per capita can be explained through the following single linear equation:

$$(4) \quad C_i = \propto + \beta_1 C_{psu_i} + \beta_2 HHH_{Age_i} + \beta_3 HHH_{Female_i} + \beta_4 HHH_{Married_i} + \beta_5 \%male_i + \beta_6 HHH_{Edu_i} + \beta_7 HH_{Income_i} + \beta_8 HHH_{occ_i} + \beta_9 Urban_i + \beta_{10} Labor_{part_i} + \beta_{11} Social\_exp_i + \beta_{12} Outlets_i + \sum_{j=0}^{12} r_{1+j} Month_{1+j} + \sum_{j=1}^{2} r_j Year_{2014+j} + u_i,$$

where subscript $i$ represents each household. Parameters to be estimated are $\propto$ & $\beta_k$ . $C_i$ denotes household per head expense per capita on alcohol consumption. $W_{iN}Y$ from equation (3) that represents the social effects parameter is now denoted as $C_{psu_i}$ based on CSES data depicting the average expense per capita of household's alcohol consumption by the village. $z_i, u_i$ denotes the attributes directly affect $C_i$ as a proxy of the demographic variables in the equation featuring factors associated with the household's alcohol consumption behavior where $u_i$ is unobservable. $Month_{1+j}$ where j $\in$ 0,1,..,12 are "$Month_{1+j}$ dummy variable" and $Year_{2014+j}$ where j $\in$ 1,2 are "$Year_{2014+j}$ dummy variable".

**Table 5.3:** Summary of variable definition

| Variables | Definition |
|---|---|
| **Dependent variable** | |
| Consumption ($C_i$) | Household expense on alcohol consumption per capita (In thousand riels per month) |
| **Demographic variables** | |
| HHH_Age | =1 if head of household's age less than 25.<br>=1 if head of household's age 25 to 35.<br>=1 if head of household's age 35 plus. |
| HHH_Female | =1 if household head is female. |
| HHH_Married | =1 if household head is married. |
| %male | Percentage of male adults to total household members |
| Urban | =1 if household is located in urban; 0 if household is located in rural |
| HH_Income | Summation of all net incomes from forest hunting, farm, livestock, fish and non-agricultural revenue, income from other source, and salary of household members per capita. |
| HHH_Edu | Household head's educational attainment |
| No diploma | =1 if head of household has not completed any grade |
| Primary school completed | =1 if head of household completed grade 6-8 in school |

| | |
|---|---|
| Lower secondary school completed | =1 if head of household completed grade 9-11 |
| High school completed | =1 if head of household completed grade 12-15 in school |
| Higher degree completed | =1 if head of household completed more than 16 years in school |
| HHH_occ | Household head's current occupation: |
| Employee | =1 if household head is employee |
| Employer | =1 if household head is employer |
| Own account worker | =1 if household head is own account worker |
| Unpaid family worker | =1 if household head is unpaid family worker |
| Other | =1 if household head's current occupation is in other status (unemployed permanent/impermanent, other conditions etc.) |
| **Social effects variable** | |
| Consumption by psu ($C\_psu_i$) | Average household expenditure on alcohol per capita by the village (PSU represent village based on CSES data), counting all the households except household $i$. (In thousand riels per month)<br><br>= [(Average household expenditure on alcohol by the village * Number of adults by the village) – (Average household expenditure on alcohol * Number of adults in the household)] / (Number of adults by the village – Number of adults in the household) |
| Labor_part | =1 if household head participate in labor |
| Social_exp | Social gatherings expenditure per capita (In thousand riels per month) |
| Donations | Household expenditure on donations to monks, community, NGOs etc. |
| Gambling | Household expenditure on lottery, sports, animal betting: casino gambling, card games, football, boxing, cockfighting etc. |
| Special Occasions | Cost of organizing special occasions such as funeral rituals, weddings, parties, gatherings |
| Miscellaneous expenditure | Cost of attending funeral rituals, weddings, parties, and community gatherings. |
| **Instrumental variables** | |
| Outlets | Number of alcohol retail outlets in Cambodia include the cities and provinces (Cambodia economic census 2011) |
| Schools | Number of the schools in Cambodia include the cities and provinces (Ministry of Education 2016) |
| **Unobserved variable** | |
| $u_i$ | Unobserved attributes directly affect household's alcohol consumption |

**Table 5.4:** Summary of variable statistics (Pooled 2014, 2015, and 2016)

| Variables | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| **Dependent variable (In thousand riels)** | | | | |
| Consumption ($C_i$) | 2.1 | 6.628 | 0 | 150 |
| **Social effects variable (In thousand riels)** | | | | |
| Consumption by PSU ($C\_psu_i$) | 189.35 | 266.61 | -3.04 | 4759.56 |
| **Demographic variable** | | | | |
| Percentage of adult male | 28.975 | 1.237 | 0 | 50 |
| HHH Female (=1, 0 otherwise) | 0.23 | 0.42 | 0 | 1 |
| HHH Married (=1, 0 otherwise) | 0.77 | 0.42 | 0 | 1 |
| HHH Age less than 25 | 0.026 | 0.159 | 0 | 1 |
| HHH Age 25 to 35 | 0.197 | 0.398 | 0 | 1 |
| HHH Age 35 plus | 0.805 | 0.395 | 0 | 1 |
| HHH labor participation | 0.875 | 0.329 | 0 | 1 |
| Urban (=1, 0 otherwise) | 0.346 | 0.475 | 0 | 1 |
| Alcohol retail outlets | 3217.078 | 2535.598 | 104 | 7950 |

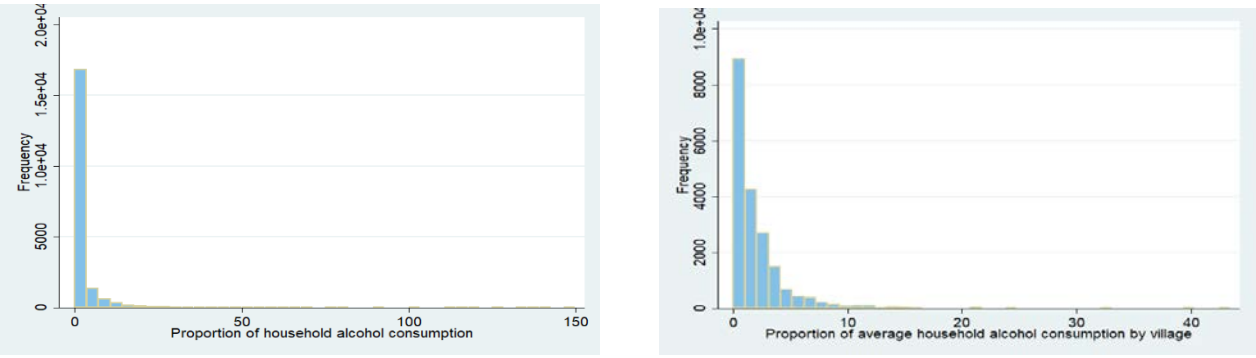
| | | | | |
|---|---|---|---|---|
| Number of Schools by provinces | 636.34 | 259.17 | 84 | 1083 |
| Household total net income per capita (In thousand riels) | 22073.76 | 357523 | -1022480 | 4.39e+07 |
| **Household head's education** | | | | |
| No diploma | 0.395 | 0.489 | 0 | 1 |
| Primary school | 0.236 | 0.425 | 0 | 1 |
| Lower secondary school | 0.109 | 0.311 | 0 | 1 |
| High school | 0.067 | 0.250 | 0 | 1 |
| Higher degree | 0.033 | 0.180 | 0 | 1 |
| **Household head's current occupation** | | | | |
| Employee | 0.326 | 0.469 | 0 | 1 |
| Own-account worker | 0.536 | 0.498 | 0 | 1 |
| Unpaid family worker | 0.109 | 0.312 | 0 | 1 |
| Others | 0.283 | 0.450 | 0 | 1 |
| **Social gatherings expenditure per capita (In thousand riels)** | | | | |
| Gambling | 7.763 | 79.027 | 0 | 4000 |
| Special occasions | 158.16 | 579.722 | 0 | 20000 |
| Miscellaneous expense | 419.022 | 526.909 | 0 | 22000 |
| Donations | 33.205 | 71.213 | 0 | 2666.667 |
| No. of Observations: 19774 | | | | |

Note: Summary stats for non-zero household alcohol expenditure per capita are in the appendix A. (Source: Author's composition from CSES 2014, 2015, 2016)

In the model, $C_i$ and $C\_psu_i$ represent the scaler outcome and the social effects variable accounted for the expenditure on alcohol beverages per capita by household and by the village with the mean of 21000 Riels or around 5.12 USD monthly. From equation (4), the main interest is to estimate the main explanatory variable $C\_psu$ specifying the impact of social effects by the village on alcohol consumption behavior by households.

The histograms in Figure 5.5 describe the distributions of the proportions of household expenditure on alcohol consumption per capita, and average household expenditure on alcohol consumption per capita by village, respectively. Both distributions are right-skewed with the value of covariance 0.275, which indicates that the relationship between the outcome variable $C_i$ and the social effects variable $C\_psu_i$ is positive.

**Figure 5.5:** Distributions of the proportions of household alcohol consumption per capita, and average household alcohol consumption per capita by village




Source: Author's composition

Social interaction variables that cover labor participation, current occupation of household head, and social gatherings expenditure are the proxy of the attribute of the

reference groups by the village. Of the 19774 observations, 86.62 percent of the household head participate in the labor force: 28.3 percent employee, 3.9 percent employer, 37.4 percent own account worker, 1.9 percent unpaid family worker, 28.4 percent other working status.

Other demographic variables include "the percentage of the adult male, female household head, household head's age and marital status of household head, household's income, alcohol retail outlets, and urban" are expected to play a significant role in determining household expenses on alcoholic beverages.

Within the three-year sample of CSES, 39.5 percent of the Household head has not completed any qualification, 27.6 percent completed primary school, 24.36 percent completed high school and only 2.27 percent obtained higher degree.

Education that is associated with the demand for alcohol equation could instinctively be the knowledge of health with regards to alcohol consumption. Though in this paper, it is proxy for rational behavior since people could restrain themselves from the external force "social effects" have been shown to attain higher levels of education (Mischel et al., 1988).

Mischel et al., (1988) addressed that the education variable is a proxy of the ability to restrain from the illogical decision that is related to several individual factors that include genetics and experience. Estimated results for education are compared to what would be expected if education is proxy for the ability to restrain from social influence or other external forces that promote alcohol drinking habits.

Month and year dummies are employed controlling the exogenous increase in the dependent variable which is not explained by other variables, e.g. in price and availability of alcoholic beverages, in health promotion policies where estimates are presented periodically.

A limitation of CSES data is the lack of information on price, alcohol restriction policies, and other external forces which can be included as additional controls for the household's alcohol consumption behavior.

## 6. OTHER ESTIMATION ISSUES

### 6.1 Endogeneity Problem

Estimates of social effects as in the spatial correlation approach can be of pure endogenous-effect (Manski 1993). The two-way relationship between the dependent variable and main explanatory variable, "Household expenditure per capita on alcohol consumption" and "Average household expenditure per capita on alcohol consumption by the village" can both be endogenously defined which causes a simultaneity issue that leads to biased estimate.

Econometric specification formulated through average alcohol consumption per capita by the village as a function of consumption per capita at the household level $C_i$ $(C_{psu_i})$ would not be correct. Equation (3) and equation (4) shows that changes in average alcohol consumption per capita by the village are explained by the changes in household alcohol consumption per capita though it would also be correlated with the error term which is the unobserved attributes directly affect the dependent variable. This leads to a violation of the OLS assumption turning the estimation to be inconsistent.

Method of two stages least square (IV) is employed as a remedy to the endogeneity issue. The valid instrumental variable is variable that correlate with the average household

expenditure on alcohol by the village and has no impact on the household expense on alcohol per head.

In this paper, the use of instrumental variables estimation (IV) allows more accurate to assess the impact of social effects on household's alcohol consumption behavior. The practical challenge with IV estimation is to find the valid instrument or set of instruments that are significant determinants of the endogenous variable though are also orthogonal to the residuals of equation (4). "Alcohol Retail outlets" and "Number of Schools" are used as the instrumental variables for the main explanatory variable "Average household expenditure per capita on alcohol consumption by the village". These two variables are highly correlated with average household expenditure per capita on alcohol consumption by the village and uncorrelated with the dependent variable, household expense per capita on alcohol consumption.

## 6.2 Bootstrapping quantile regression

When data are non-normal or contain outliers, OLS may not be effective. From Figure 5.5, the distributions of the proportions of household alcohol consumption per capita are right-skewed and outliers are presented. Moreover, the specification tests address that the regression analysis contains heteroscedasticity and endogeneity issues (see Table 7.1). This violates the OLS assumptions that can lead to inconsistent estimates.

Bootstrapping quantile regression can be used to construct more standard errors, confidence intervals, and tests of hypotheses concerning quantile regression models (Koenker et al., 1994). If outliers and violations of the OLS assumption are in evidence, the bootstrapping quantile regression analysis is preferred in the analysis (Nikitina et al., 2019).

In this paper, to address the endogeneity issue, 2SLS quantile regression analysis targeting non-zero household alcohol expenditure per capita is employed with bootstrapped standard errors replicating 1000 times to get robust estimates. The first stage of the 2SLS regresses equation (4) with instrument variables "Number of alcohol retail outlets" and "Number of Schools". The predicted values of the endogenous social effects variable are then used in the second stage as predictors of the dependent variable along with exogenous variables.

## 6.3 Variables specification issue

Estimation of alcohol consumption behavior could be a challenge due to the limitation of the study scope and the unavailability of data. Many significant exogenous variables are unable to observe. These may include the advertisements, the practice of alcohol distributions, and the other community-level characteristics.

Social influences (or social effects) were proved to be a stronger predictor concerning the determinants of alcohol consumption behavior compared to advertising and parental effects (Abbey et al., 1993; MacDonald et al., 2001; Brain et al., 2010). The study of endogenous social effects (or social influence) identification can undoubtedly be a significant predictor of alcohol consumption behavior.

The price of alcohol is a vital factor determining the expense of alcohol consumption. Alcohol pricing throughout the regions is noticeably dispersed. The price set on alcohol at the food and beverage outlets is different depending on location, distance, and outlet scale.

The distribution of alcohol beverages can also be complex as the number of unregistered outlets is high in Cambodia leaving the issue to estimate the alcohol pricing variable.

Alcohol pricing can be endogenous because prices may be correlated with other village or community-level characteristics which also affect drinking behavior (Lance et al., 2004). Guoqiang et al., (2011) examined whether the price is sensitive to alcohol consumption in developing countries. To control the confounding unobserved community-level characteristics, they used dummy variables for each region and year, and robust standard errors to allow for clustering at the community level.

In this paper, as a remedy to the unobserved community-level characteristics issue, the alcohol price variable is not included in the regressions. Seasonal dummy variables (month and year dummies), white robust standard errors (OLS and IV estimates), and bootstrap robust standard errors (2SLS quantile estimates) are employed.

## 7. RESULTS AND CONCLUSION

### 7.1 Estimation through OLS and IV regression

In this section, OLS "Ordinary least Square" regression is employed paired with IV "Single equation instrumental variable" regression to determine the household alcohol consumption behavior with the emphasis on the impact of social effects.

Single equation instrumental variable (IV) regression is employed following Manski (1993) approach where the social effects variable "Average household expenditure per capita on alcohol consumption by village" is treated as a pure endogenous-effect variable. The instrumental variable (IV) approach is recognized to produce larger estimates than the ordinary least squares (OLS) although, in the case of weak identification, coefficients are often estimated with little precision (Joshua et al., 2008: 144). For IV estimates in Table 7.1, "Alcohol retail outlets" and "Number of schools" are used as instrumental variables (see 6.1 Endogeneity problem).

The results of the regression indicate that there are indeed social effects in place behind alcohol consumption behavior. Estimates of OLS and IV present almost identical results though IV regression produces larger estimates concerning the main explanatory variable.

Key explanatory variables include household head's gender, age, occupations, marital status, urban, income, and social gatherings expenditure play a significant role in predicting the outcome of household expenditure per capita on alcohol consumption.

The estimates from separate year regressions indicate that the behavior of the observations toward the findings is consistent with the pooled three years' analysis, in this paper, the analysis is based on the pooled three years' data from 2014, 2015, and 2016.

Because the expected value of the dependent variable is latent (i.e., not observed), a special procedure is needed to obtain standardized coefficients (Long, 1997, pp. 207-208). On account of the limited dependent variable (see Figure 5.5), sensitivity analysis (Truncated and Tobit regression) is also performed and moved to Appendix B.

The estimates of truncated regression (Appendix B) indicate that social effects and other explanatory variables include household's age, education, gender, occupation, marital

status, urban, and social gatherings significantly associated with alcohol consumption expenditure. Compare to OLS and IV estimates, truncated regression indicates a significant correlation between household heads' education and alcohol consumption. The higher the household heads' education the higher the alcohol consumption expenditure.

**Table 7.1:** Determinants of alcohol consumption and social effects (OLS and IV with robust std. err)

| Dependent Variable = Household alcohol expenditure per capita (weight: adult members) | | | | |
|---|---|---|---|---|
| Explanatory Variables | (OLS) | | (IV) | |
| | Coefficient | Standard error | Coefficient | Standard error |
| HH average alcohol consumption per capita by PSU (village level) | 0.006*** | (0.0005) | 0.0208*** | (0.003) |
| **Household head's age (Baseline category: HHH age less than 25)** | | | | |
| HHH age 25 to 35 (=1, 0 otherwise) | 0.576* | (0.290) | 0.319 | (0.366) |
| HHH age 35 plus (=1, 0 otherwise) | -0.463 | (0.276) | -0.820* | (0.348) |
| Percentage of adult male | 0.041*** | (0.004) | 0.034*** | (0.005) |
| HHH Female (=1, 0 otherwise) | 0.04 | (0.214) | -0.109 | (0.248) |
| HHH Married (=1, 0 otherwise) | 0.414* | (0.210) | 0.169 | (0.244) |
| HHH labor participation (=1, 0 otherwise) | 0.233 | (0.168) | 0.317 | (0.211) |
| Urban (=1, 0 otherwise) | 0.227* | (0.128) | 0.456** | (0.151) |
| **Household head's education (Baseline category: not completing any qualification)** | | | | |
| Primary school completed (=1, 0 otherwise) | 0.206 | (0.129) | 0.045 | (0.150) |
| Lower secondary school completed (=1, 0 otherwise) | 0.183 | (0.215) | -0.101 | (0.239) |
| High school completed (=1, 0 otherwise) | 0.187 | (0.173) | 0.022 | (0.203) |
| Higher degree completed (=1, 0 otherwise) | -0.146 | (0.392) | -0.637 | (0.488) |
| **Household head's current occupation (Baseline category: Employee)** | | | | |
| Employer (=1, 0 otherwise) | 0.513* | (0.393) | 0.673* | (0.434) |
| Own account worker (=1, 0 otherwise) | -0.200 | (0.127) | -0.057 | (0.150) |
| Unpaid family worker (=1, 0 otherwise) | -0.452 | (0.355) | -0.176 | (0.415) |
| Others (=1, 0 otherwise) | -0.346* | (0.145) | -0.295 | (0.181) |
| **Household net total income per capita** | 0.000000162 | (7.11e-08) | 3.61e-08 | (7.85e-08) |
| **Household social gathering expenditures per capita** | | | | |
| HH Gambling expenditure per capita | 0.00415** | (0.0015) | 0.00366*** | (0.00139) |
| HH Special occasions expenditure per capita | 0.0000571 | (0.00008) | 0.000047 | (0.00008) |
| HH Miscellaneous expenditure per capita | 0.00157*** | (0.00003) | 0.00135*** | (0.0002) |
| HH Donation expenditure per capita | 0.00339*** | (0.0012) | 0.00175* | (0.0012) |
| **Month dummy variables (Baseline category: July)** | | | | |
| Jan | 0.008 | (0.341) | -0.383 | (0.231) |
| Feb | 0.896*** | (0.319) | 0.176 | (0.303) |
| Mar | 0.0749 | (0.166) | -0.430 | (0.248) |
| April | 2.072*** | (0.177) | -0.860 | (0.749) |
| May | -0.0931 | (0.214) | -0.057 | (0.199) |

| | | | | |
|---|---|---|---|---|
| Aug | -0.207 | (0.184) | -0.570* | (0.238) |
| Sep | -0.305 | (0.307) | -0.380 | (0.242) |
| Oct | 0.0742 | (0.165) | -0.0506 | (0.216) |
| Nov | -0.139 | (0.171) | -0.417 | (0.221) |
| Dec | -0.0271 | (0.161) | -0.090 | (0.194) |
| **Year dummy variables (Baseline category: 2015)** | | | | |
| 2016 | 0.451** | (0.137) | 0.372* | (0.171) |
| _cons | -1.349** | (0.497) | -3.041*** | (0.675) |
| Specification tests (p-values) | | | | |
| Breusch-Pagan | 0.00 | _ | _ | _ |
| Sargan | _ | _ | 0.21 | _ |
| Wu-Hausman | _ | _ | 0.00 | _ |
| *N* | 19756 | | 19756 | |

*Notes: Standard errors in parentheses*
** p < 0.05, ** p < 0.01, *** p < 0.001*
The Breusch-Pagan test tests the null hypothesis of no heteroscedasticity, i.e. the error terms are not normally and independently distributed with a constant variance. The heteroscedasticity robust standard error of the regression is performed. The Sargan test tests the null hypothesis of valid instruments. The Wu-Hausman test tests the null hypothesis of consistent OLS estimates counterpart.

From table 7.1, OLS and IV regressions are performed based on the pooled three-year sample 2014, 2015, and 2016. Both regressions produce almost identical results concerning the demographic variables however compare to OLS, IV estimates indicate higher magnitude value on social effects variable which strongly predicts the household's alcohol consumption behavior. The Wu-Hausman test and the estimated results suggest that IV estimates are more preferred in the analysis.

The results suggest that average household consumption per capita by the village strongly predicts the household alcohol consumption per capita. This implies that social effects play an important role in determining the alcohol consumption. Holding everything else constant, OLS estimates indicate that a 1000 riels increase in the household expenditure per capita on alcohol consumption by the village would increase the household expenditure per capita on alcohol consumption by 6 riels while IV estimates would increase household expenditure per capita on alcohol consumption by 20 riels.

It is common to get the larger impact of social effects when using IV approach compare to OLS (Joshua et al., 2008: 144). Previous studies on social effects and peer influence that employed IV found larger estimates compare to OLS (Ammermueller et al., 2006, Carlos 2017, Scholder et al., 2019) while some other studies found lower estimates (Acemoglu et al., 2000; Angrist et al., 2004; Fletcher et al., 2012). One thing all these studies have in common is that they used "A set of reference group characteristics (instrumental variables)" to identify common separately from endogenous peer influence (or social effects) although the simultaneity issues and the measurement errors were addressed differently. IV estimates can be larger than OLS estimates since IV estimates the local average treatment effect while OLS estimates the average treatment effect; Therefore, due to the heterogeneity of the sample, IV produce higher estimates (Card 1999, 2001).

Social gathering variables that associate with the social effects parameter through acting as attributes and identities of individuals and groups within the sample include donations, miscellaneous expense, and gambling expenditure are all significantly correlated with the household expenditure per capita on alcohol consumption. Holding other factors constant, IV regression produces identical estimates compare to OLS estimates, the alcohol

expenditure per capita would increase by 4 riels if expenditure per capita on "gambling" increases by 1000 riels, 1 riel if expenditure per capita on "miscellaneous expense" increases by 1000 riels, and 3 riels if expenditure per capita on "donation" increases by 1000 riels.

The results can further imply that the more social interactions of the members in the households, the more likely that they spend on alcoholic beverages however the magnitudes of the social gathering expenditure estimates are small. This may be because the coefficients may still cover from the endogeneity problem.

The "percentage of adult male" significantly predicts higher consumption of alcoholic beverages. 1000 riels increase in the expenditure per capita on alcohol consumption of "percentage of male" would increase the household expenditure per capita on alcohol consumption by 40 riels holding everything else constant. The gender of household head does not have a statistically significant impact on alcohol expenditure.

Of the 19,756 observations, 77.03 percent of household heads are married while 22.97 percent are single household heads (only one household head who are either single, widow, or distance from their spouse). Holding everything else constant, OLS estimates indicate that a 1000 riels increase in the expenditure per capita on alcohol consumption of married household heads would increase the household expenditure per capita on alcohol consumption by 414 riels. This signifies that married household head tends to spend more on alcoholic beverages than the single ones.

Almost identical to IV, OLS estimates indicate that household heads age between 25 to 35 is the strongest predictors of other age brackets. Holding other factors constant, the household expenditure per capita on alcohol beverages would be 570 riels more compare to household heads who are less than 25 years of age. Household expenditure per capita on alcohol consumption of other age groups does not appear to be statistically different from that of the baseline group "Household heads less than 25 years old". This indicates that the most intense working-age adult household heads between 25 to 35 in which about 97.73 percent participate in labor are likely to consume more alcoholic beverages than other age brackets (84.03 percent, age more than 35, and 95 percent, age less than 25 participate in labor).

The results from OLS and IV regressions indicate that household head's "educational attainment" and "labor participation" do not have any partial impact on alcohol consumption.

In the three-year sample, when categorizing variable employee as the baseline estimate, the household heads whose current occupation is employer turns out to be significantly higher in value compared to the household heads who are the "Employee". Holding other factors constant, the household expenditure per capita on alcohol beverages would be 530 riels more compare to household heads who are "Employee".

Other variables include "Own-account worker", "Unpaid family worker", and "Other unspecified working status" do not appear to be statistically different from that of the baseline group household heads who are "Employee". Since these household heads are likely to be less exposed to social effects compare to household heads who are "employee" and "employer", it signifies that the involvement with the social interaction of the household heads at the workplace as employee and employer predicts higher household expenditure on alcoholic beverages. The participation of the labor force in line with social influence promotes alcohol drinking habits (Abbey et al. 1993; MacDonald et al., 2001).

Household expenditure on alcoholic beverages is expected to be significantly higher in the urban area (Changpetch et al. 2016). Holding everything else constant, IV estimates, indicate that household expenditure per capita on alcohol beverages would increase by 450 riels per month if the household expenditure per capita on alcohol consumption increases by 1000 riels per month in the urban area.

Both OLS and IV estimates display no partial effects between the household total net income and the expense of alcohol beverages per capita. The results indicate that the earnings from household per capita have no effect on the spending on alcoholic beverages. This also explains how alcoholic beverages can be detrimental economically. The lower-income households that have excessive spending of alcohol beverages can face more consequences compare to higher-income households considering the higher rate of vulnerability to poverty and the harmful effects of alcohol consumption. Alcohol can be addictive and harmful (Becker et al.1988, Stautz et al., 2017).

## 7.2 Estimation through 2SLS quantile regression

In this section, 2SLS quantile regression is performed using only non-zero expense per capita of household's alcohol consumption. The first stage of the 2SLS regresses equation (4) with instrument variables "Number of alcohol retail outlets" and "Number of Schools". The predicted values of the endogenous social effects variable are then used in the second stage as predictors of the dependent variable along with exogenous variables. The quantiles are simply percentiles. The 2SLS quantile regression results are presented in Table 7.2 with $10^{th}$, $25^{th}$, $50^{th}$, $75^{th}$, and $90^{th}$ quantiles with bootstrapped standard error estimates. Bootstrapped standard error is preferred in the quantile analysis (Nikitina et al., 2019) (see more on 6.2). This method aims to investigate more in depths on the determinants of household alcohol consumption behavior and the identification of social effects targeting only the household that consumed alcoholic beverages. It could also examine what predicts the different aspects of quantile estimates as the proportions of household expenditure on alcohol consumption are right-skewed and contain outliers (see Figure 5.5).

"Social influence" is one of the significant factors associated with the first attempt in alcohol consumption (Brown et al., 1986). Soundararajan et al. (2017) also pointed out that accessing alcohol substance at an early attempt happens to be a gateway to excessive alcohol consumption. In this case, addressing the determinants of alcohol consumption targeting only alcohol drinkers can help to understand more about the behavior of household members that habitually spend on alcoholic beverages.

Similar to OLS and IV estimates, the 2SLS quantile estimates depict that the average household expenditure per capita on alcohol consumption by the village significantly impact on the household expenditure per capita on alcohol consumption.

The 2SLS quantile estimates consistently address that the persons within the reference group who have already tasted alcohol substance are similarly influenced by the social effects due to similar unobserved individual characteristics or similar institutional environments.

Demographic variables include household head' gender, age, labor involvements, education, urban, income, and social gatherings expenditure continue to play a significant role in predicting the outcome of household alcohol expense per capita.

**Table 7.2:** Determinants of alcohol consumption and social effects in 2SLS quantiles of non-zero household alcohol expense per capita with bootstrap std.err

| Dependent Variable = Household alcohol expenditure per capita (weight: adult members)<br>Explanatory Variables | 10 | 25 | 50 | 75 | 90 |
|---|---|---|---|---|---|
| HH average alcohol consumption per capita at PSU (village level) | 0.004* | 0.009** | 0.022*** | 0.037** | -0.003 |
| | (0.002) | (0.003) | (0.006) | (0.012) | (0.017) |
| **Household head's age (Baseline category: HHH age less than 25)** | | | | | |
| HHH age 25 to 35 (=1, 0 otherwise) | 0.059 | -0.135 | 0.139 | 0.354 | 2.425 |
| | (0.119) | (0.163) | (0.239) | (0.777) | (1.468) |
| HHH age 35 plus (=1, 0 otherwise) | -0.295* | -0.672*** | -0.731* | -1.497 | -0.689 |
| | (0.113) | (0.157) | (0.218) | (0.716) | (1.409) |
| Percentage of adult male | 0.008* | 0.009 | 0.020* | 0.047* | 0.063 |
| | (0.002) | (0.003) | (0.006) | (0.012) | (0.023) |
| HHH Female (=1, 0 otherwise) | 0.017 | 0.089 | 0.364 | 0.280 | 0.771 |
| | (0.080) | (0.142) | (0.205) | (0.465) | (1.133) |
| HHH Married (=1, 0 otherwise) | -0.101 | -0.130 | -0.076 | -0.247 | 0.466 |
| | (0.075) | (0.131) | (0.177) | (0.436) | (1.076) |
| HHH labor participation (=1, 0 otherwise) | -0.091 | -0.066 | -0.439 | -0.457 | -2.405 |
| | (0.082) | (0.119) | (0.201) | (0.416) | (1.019) |
| Urban (=1, 0 otherwise) | 0.309*** | 0.653*** | 1.159** | 2.396*** | 3.187*** |
| | (0.050) | (0.080) | (0.146) | (0.376) | (0.590) |
| **Household head's education (Baseline category: Not completing any qualification)** | | | | | |
| Primary school completed (=1, 0 otherwise) | 0.091 | 0.181 | 0.296 | 0.394 | 0.739 |
| | (0.042) | (0.060) | (0.125) | (0.234) | (0.652) |
| Lower secondary school completed (=1, 0 otherwise) | 0.071 | 0.401** | 0.830** | 1.715** | 2.892** |
| | (0..110) | (0.139) | (0.290) | (0.436) | (1.142) |
| High school completed (=1, 0 otherwise) | -0.056 | 0.088 | 0.398 | 0.596 | 1.372 |
| | (0.058) | (0.091) | (0.165) | (0.328) | (0.699) |
| Higher degree completed (=1, 0 otherwise) | 0.693*** | 0.582* | 2.142*** | 7.704*** | 7.542*** |
| | (0.220) | (0.414) | (1.188) | (1.918) | (3.231) |
| **Household head's current occupation (Baseline category: Employee)** | | | | | |
| Employer (=1, 0 otherwise) | 0.492*** | 0.509** | 0.498 | 1.329 | 0.359 |
| | (0.145) | (0.137) | (0.457) | (0.982) | (1.226) |
| Own account worker (=1, 0 otherwise) | -0.101 | -0.056 | -0.300 | -0.619 | -0.071 |
| | (0.047) | (0.044) | (0.122) | (0.253) | (0.559) |
| Unpaid family worker (=1, 0 otherwise) | 1.180*** | 1.706*** | 1.599** | 3.182** | 2.251 |
| | (0.395) | (0.411) | (1.482) | (1.399) | (2.033) |
| Others (=1, 0 otherwise) | -0.264** | -0.289* | -0.954*** | -1.561** | -3.171 |
| | (0.064) | (0.068) | (0.171) | (0.351) | (0.648) |
| **Household net total income per capita** | 6.69e-08 | 0.00000027* | 0.0000002* | 9.51e-08 | -8.42e-08 |
| | (1.82e-08) | (0.0000001) | (3.03e-08) | (8.19e-08) | (0.000001) |
| **Household social gathering expenditures per capita** | | | | | |
| HH Gambling expenditure per capita | 0.001*** | 0.004*** | 0.007*** | 0.012*** | 0.013*** |
| | (0.001) | (0.001) | (0.003) | (0.003) | (0.003) |
| HH Special occasions expenditure per capita | 0.00003 | 0.0001 | 0.0002* | 0.001*** | 0.001*** |
| | (0.00004) | (0.00008) | (0.0001) | (0.0003) | (0.0008) |
| HH Miscellaneous expenditure per capita | 0.0006*** | 0.0011*** | 0.002*** | 0.006*** | 0.002*** |

| | | | | | |
|---|---|---|---|---|---|
| | (0.00009) | (0.0001) | (0.0002) | (0.0006) | (0.0009) |
| HH Donation expenditure per capita | 0.001*** | 0.0028*** | 0.006*** | 0.011*** | 0.02*** |
| | (0.0006) | (0.0008) | (0.001) | (0.003) | (0.010) |
| **Month dummy variables (Baseline category: July)** | | | | | |
| Jan | -0.184 | -0.119 | -0.005 | 0.453 | 1.953 |
| | (0.081) | (0.116) | (0.191) | (0.410) | (1.064) |
| Feb | 0.086 | 0.272 | 0.862** | 2.330** | 3.517** |
| | (0.073) | (0.124) | (0.250) | (0.445) | (0.986) |
| Mar | -0.114 | -0.039 | 0.319 | 1.412* | 1.350 |
| | (0.080) | (0.121) | (0.243) | (0.406) | (0.842) |
| April | 0.299** | 0.640** | 1.785*** | 7.761*** | 16.15*** |
| | (0.100) | (0.165) | (0.353) | (1.150) | (3.312) |
| May | -0.078 | -0.232 | -0.018 | 0.089 | -0.447 |
| | (0.070) | (0.117) | (0.218) | (0.360) | (0.821) |
| Aug | -0.192 | -0.233 | -0.484 | -0.208 | -0.440 |
| | (0.068) | (0.115) | (0.191) | (0.429) | (0.862) |
| Sep | -0.258* | -0.446* | -0.554 | -0.663 | -1.846 |
| | (0.080) | (0.108) | (0.193) | (0.338) | (0.831) |
| Oct | 0.0008 | -0.021 | -0.058 | 0.090 | -0.203 |
| | (0.0872) | (0.110) | (0.326) | (0.351) | (0.740) |
| Nov | -0.003 | -0.157 | -0.320 | -0.128 | -0.946 |
| | (0.074) | (0.106) | (0.179) | (0.420) | (0.778) |
| Dec | -0.007 | 0.0348 | 0.229 | -0.012 | -0.989 |
| | (0.080) | (0.112) | (0.187) | (0.337) | (0.736) |
| **Year dummy variables (Baseline category: 2015)** | | | | | |
| 2016 | -0.091 | -0.119 | -0.015 | 0.121 | 0.736 |
| | (0.060) | (0.093) | (0.155) | (0.334) | (0.595) |
| _cons | -0.012 | -0.528 | -2.788* | -5.706 | 6.084 |
| | (0.548) | (0.855) | (1.542) | (3.053) | (4.951) |
| *N* | 6636 | 6636 | 6636 | 6636 | 6636 |

Notes: Summary stats are in the appendix A. Standard errors in parentheses.
Robust bootstrap standard errors are included based on 1000 repetitions.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results of 2SLS quantile regression targeting non-zero household alcohol expenditure per capita suggest that the main explanatory variable "social effects" plays a vital role in predicting alcohol consumption behavior although, at the highest quantile estimates, it has no partial impact on alcohol consumption. The "social effects" shows a general pattern of increase from 10th quantile to 75th quantile and is insignificant at the 90th quantile. That is, the impact of the social effects declines as the proportion of the alcohol consumption is at the highest quantile.

Holding everything else constant, at the 10th quantile, a 1000 riels increase in the household expenditure per capita on alcohol consumption by the village would increase the household expenditure per capita on alcohol consumption by 4 riels at the 10th quantile, 9 riels at the 25th quantile, 22 riels at the 50th quantile, and 37 riels at the 75th quantile.

The social gatherings expenditure which include gambling, miscellaneous expense, and donations are all positive and significant. The estimates show a general pattern of increase from the 10th quantile to the 90th quantile. At the median quantile, holding other factors constant, the alcohol expenditure per capita would increase by 7 riels if expenditure per capita on "Gambling" increases by 1000 riels, 2 riels if expenditure per capita on "Miscellaneous expense" increases by 1000 riels, and 6 riels if expenditure per capita on "Donation" increases by 1000 riels. These are quite identical to the OLS and IV estimates.

The 2SLS quantile estimates of "Percentage of adult male" are statistically significant with a general pattern of increase at the $10^{th}$, $50^{th}$, and $75^{th}$ quantile. The $75^{th}$ quantile strongly impact on alcohol consumption. Holding other factors constant, a 1000 riels increase in household's alcohol expenditure per capita of "Percentage of male" would increase the household's alcohol expenditure per capita by 47 riels. The quantile estimates consistently show that the gender of the household head does not have a statistically significant impact on alcohol expenditure.

Unlike OLS and IV estimates, 2SLS quantile estimates indicate that at the $50^{th}$ quantile, holding other factors constant, the alcohol expenditure per capita would be 731 riels less compare to household heads who are less than 25 years of age. The household expenditure per capita on alcohol consumption of the other age groups in other quantile estimates does not appear to be statistically different from that of the baseline group, household heads who are less than 25 years of age. Of the 6,636 observations, "Household heads' marital status" has no partial effects on alcohol consumption.

Of the 6,636 observations, Household heads who completed "Lower secondary school" and "Higher degree" of education are the strongest predictor of household expenditure per capita on alcohol consumption among other grades completed. The estimates show a general pattern of increase from $10^{th}$ quantile to the $90^{th}$ quantile. Holding other factors constant, the alcohol expenditure per capita of household heads who completed "Lower secondary school" would be 830 riels at the $50^{th}$ quantile, and 2892 riels at the $90^{th}$ quantile, and household heads who completed "Higher degree" would be 2142 riels at the $50^{th}$ quantile, and 7542 riels at the $90^{th}$ quantile more compare to household heads who have not completed any qualification. This signifies that the effect of higher education increases as the quantiles of alcohol consumption increase.

In the 2SLS quantile estimates, higher educational attainment of household head depicts higher expenses on alcoholic beverage per capita holding other factors constant. The likelihood of consuming alcoholic beverages can increase over time in the sense that the substance can be addictive disrupting the rational behavior, Becker et al, (1988). Moreover, the quantile estimates pattern of household head's education may also depict the influence of social effects disregarding ones' rational decision in alcohol consumption because within the observations, 98.69 percent of household heads who completed higher degree participate in the labor force and already adopt alcohol drinking practice. With the involvement of social activities, people with higher education may spend more on expensive alcoholic beverages, for instance, beer, wine, or other imported alcoholic drinks.

Household heads' current occupation of "Employer" and "Unpaid family worker" is the strongest predictor of household expenditure per capita on alcohol consumption among other occupations. The estimates show a statistically significant increasing pattern at the $10^{th}$ quantile to the $25^{th}$ quantile for "Employer", and at the $10^{th}$ to $75^{th}$ quantile for "Unpaid family worker". Holding other factors constant, at the median quantile, the alcohol expenditure per capita of household heads who are "Unpaid family worker" would be 1599 riels more compare to "Employee". At the $25^{th}$ quantile, the alcohol expenditure per capita of household heads who are "Employer" would be 509 riels more compare to "Employee".

From the results, household heads located in the urban area shows a general pattern of increase from $10^{th}$ quantile to $90^{th}$ quantile. Holding other factors constant, the alcohol expenditure per capita would increase by 1159 riels per month at the $50^{th}$ quantile, and 3187 riels per month at $90^{th}$ quantile if the expenditure per capita on alcohol consumption of the households located in the urban area increases by 1000 riels per month.

Household's net total income per capita has consistently no partial effects on alcohol consumption at every quantile estimates. This signifies that results are consistent with the assertion that the income of household per capita has no impact on household alcohol consumption behavior which is similar to the estimates of OLS and IV.

## 8. CONCLUSION

The economic model presented in this paper provides many solid findings on the impact of social effects on alcohol consumption behavior. Estimates of social effects using the instrumental variables method are substantive because the Sargan test shows that the IVs are valid. The estimates also produce better estimates compare to the traditional OLS estimates. In addition to OLS and IV estimates, the employment of 2SLS quantile estimates additionally help to address certain changes of household's alcohol consumption behavior concerning the non-zero household expenditure per capita on alcohol consumption.

The findings of the study indicate that household expenditure per capita on alcohol beverages and average household expenditure per capita on alcohol beverages by the village are significantly correlated. The magnitude of the social effects parameter found in IV estimates is higher compare to OLS estimates. Through OLS and IV estimates, variables that strongly predict the household expense on alcohol consumption per capita are the average alcohol expenditure per capita by the village together with other demographic factors and social gathering expenditure which includes donations, special occasions, and gambling expenditure.

The percentage of male, married household heads, household heads who are 25 to 35 years old, significantly predict higher consumption of alcoholic beverages.

The consumption of alcohol in the household is more responsive to household heads who are "Employer" as compared with other occupations.

The 2SLS quantile estimates consistently show a significant pattern of increase in the impact of social effects parameter on alcohol consumption behavior at $10^{th}$ to $75^{th}$ quantile estimates. The estimates show increasing absolute value from 0.002 at the $10^{th}$ quantile, 0.009 at the $25^{th}$ quantile, 0.022 at the $50^{th}$ quantile, and 0.037 at the $75^{th}$ quantile. The $90^{th}$ quantile estimates do not have a statistically significant impact on alcohol expenditure signifying that at the highest proportion of the alcohol consumption, "social effects" no longer impact on the decision to consume since the consumption of alcohol beverages are already at its peak.

The results from the estimates show that demographic factors include the percentage of the adult male, household head's age, urban, and social gatherings expenditure significantly associate with the outcome of alcohol consumption.

Contrast to OLS and IV estimates, the 2SLS quantile estimates find that the consumption of alcohol response significantly to higher education. At the 10th to 90th quantile estimates, household heads who completed "Lower secondary school" and "Higher degree" indicate an increasing pattern of higher magnitude value compare to household heads with no qualifications.

The overall analyses indicate that the social effects parameter includes the average household's alcohol consumption by village, social gatherings expenditure, and labor involvements significantly signal a strong correlation with the alcohol consumption behavior. Education does not associate in shaping household expenditure on alcoholic beverages. When accounted for only the alcohol drinkers, higher education turns out to be a stronger predictor of alcohol consumption. This indicates how detrimental alcohol substance can be regardless of the educational attainment if alcohol drinking is already adjusted to the daily expenditure of the household. Since the analysis is through alcohol expenditure, it can also signify that household heads with higher education tend to spend more on expensive alcohol beverages since almost all of higher education household heads who consume alcohol participate in labor, and may expose to social events that associate with drinking beer, wine, and other imported alcohol beverages.

Despite this thorough investigation, there are some limitations to this study. The emphasis of the impact of social effects across the nation on household's alcohol consumption behavior using CSES data contains limitations on data availability particularly on recognized exogenous variables such as price, alcohol restriction policies, advertisements, and distribution of alcoholic beverages. Advertising induced consumption for drinkers at most at risk from alcohol while the price is more responsive to moderate drinkers (Saffer et al., 2012). More importantly, the survey is based on the response of the household heads representing the households rather than the individual's response. This can cause measurement errors that needed to facilitate further in the future research study.

The outcome of the alcohol drinking practice expectancies can also be a possible mechanism that the social effects could impact the later use (Wood et al., 2001). Additional measures of the scaler outcome of social influence can benefit future research.

## 8.1 Discussion and recommendation

The results from the study highlight the importance of social interactions in Cambodian society which play a vital role in promoting the consumption of alcoholic beverages that potentially be harmful to society. The indication from the analysis shows that a large proportion of household members especially the working-age household members include younger adult head of the household are influenced by social effects and associate with alcohol drinking practice. The analysis also indicates that higher education could still be exposed to binge alcohol drinking practice when it is already adapted to the daily consumption.

I expect the results to be an indicator for the researchers and government practitioners to put more efforts in lowering the impact of social influence on the alcohol consumption through policy restrictions and enforcement against binge alcohol practice, for instance, enforce the minimum drinking age policy, make more efforts to publicize the dangers of alcohol consumption across the nation, especially in the villages and communities. The policy implementation should concentrate on the individuals that involve in the labor or social gatherings by conducting health promotion strategies and tailoring the programmes to reduce the practice of binge alcohol drinking through the key person within the villages and organization, for instance, village chiefs, health specialists, human resource department targeting specifically on both employee and employer particularly on social influence, health and socioeconomic consequences of alcohol drinking practice.

# APPENDICE

## APPENDIX A: Summary variable statistics of non-zero household alcohol expenditure per capita

| Variables | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| **Dependent variable (In thousand riels)** | | | | |
| Consumption ($C_{it}$) | 6.253 | 10.057 | 0.145 | 150 |
| **Social effects variable (In thousand riels)** | | | | |
| Consumption by psu ($C\_psu$) | 245.361 | 316.868 | -1.874 | 4759.56 |
| **Demographic variable** | | | | |
| Percentage of adult male | 32.016 | 6.764 | 0 | 50 |
| HHH Female (=1, 0 otherwise) | 0.115 | 0.319 | 0 | 1 |
| HHH Married (=1, 0 otherwise) | 0.884 | 0.319 | 0 | 1 |
| HHH Age less than 25 | 0.029 | 0.168 | 0 | 1 |
| HHH Age 25 to 35 | 0.246 | 0.431 | 0 | 1 |
| HHH Age 35 plus | 0.762 | 0.425 | 0 | 1 |
| HHH labor participation | 0.924 | 0.263 | 0 | 1 |
| Urban (=1, 0 otherwise) | 0.282 | 0.450 | 0 | 1 |
| Alcohol retail outlets | 2665.128 | 2189.895 | 104 | 7950 |
| Number of Schools by provinces | 636.34 | 259.17 | 84 | 1083 |
| Household total net income per capita (In thousand riels) | 28128.02 | 573572.9 | -162655 | 4.39e+07 |
| **Household head's education** | | | | |
| No diploma | 0.259 | 0.438 | 0 | 1 |
| Primary school | 0.247 | 0.431 | 0 | 1 |
| Lower secondary school | 0.108 | 0.311 | 0 | 1 |
| High school | 0.068 | 0.253 | 0 | 1 |
| Higher degree | 0.023 | 0.15 | 0 | 1 |
| **Household head's current occupation** | | | | |
| Employee | 0.348 | 0.476 | 0 | 1 |
| Own-account worker | 0.573 | 0.494 | 0 | 1 |
| Unpaid family worker | 0.058 | 0.235 | 0 | 1 |
| Others | 0.259 | 0.438 | 0 | 1 |
| **Social gatherings expenditure per capita (In thousand riels)** | | | | |
| Gambling | 11.379 | 90.569 | 0 | 3600 |
| Special occasions | 154.815 | 502.794 | 0 | 8000 |
| Miscellaneous expense | 447.243 | 516.984 | 0 | 10010 |
| Donations | 33.542 | 75.144 | 0 | 2666.667 |
| No. of Observations: 6636 | | | | |

## APPENDIX B: Determinants of alcohol consumption and social effects (OLS, Truncated, & Tobit), pooled 2014 2015, and 2016.

| Dependent Variable = Household alcohol expenditure per capita (weight: adult members) | | | | | | |
|---|---|---|---|---|---|---|
| Explanatory Variables | OLS | | Truncated Regression | | Tobit (Censored) | |
| | Coefficient | Standard error | Coefficient | Standard error | Coefficient | Standard error |
| HH average alcohol consumption per capita by PSU (village level) | 0.006*** | (0.0001) | 0.079*** | (0.010) | 0.01*** | (0.0003) |
| **Household head's age (Baseline category: HHH age less than 25)** | | | | | | |
| HHH age 25 to 35 (=1, 0 otherwise) | 0.576* | (0.290) | 40.83 | (23.63) | 1.764* | (0.696) |
| HHH age 35 plus (=1, 0 | -0.463 | (0.276) | -49.44* | (23.94) | -0.343 | (0.666) |

| | | | | | | |
|---|---|---|---|---|---|---|
| otherwise) | | | | | | |
| Percentage of adult male | 0.041*** | (0.005) | 3.146*** | (0.794) | 0.246*** | (0.014) |
| HHH Female (=1, 0 otherwise) | 0.04 | (0.192) | 34.91* | (17.61) | -0.729 | (0.483) |
| HHH Married (=1, 0 otherwise) | 0.414* | (0.183) | 22.45 | (16.87) | 2.815*** | (0.462) |
| HHH labor participation (=1, 0 otherwise) | 0.233 | (0.183) | -0.288 | (1.721) | 3.095*** | (0.488) |
| Urban (=1, 0 otherwise) | 0.227* | (0.111) | 50.13*** | (12.15) | 0.098 | (0.275) |
| Retail alcohol outlets | -0.0001*** | (0.00002) | 0.0019 | (0.0019) | -0.0006*** | (0.00005) |
| **Household head's education (Baseline category: not completing any qualification)** | | | | | | |
| Primary school completed (=1, 0 otherwise) | 0.206 | (0.128) | 66.97*** | (17.04) | -0.021 | (0.317) |
| Lower secondary school completed (=1, 0 otherwise) | 0.183 | (0.195) | 101.2*** | (23.70) | -0.357 | (0.484) |
| High school completed (=1, 0 otherwise) | 0.187 | (0.155) | 94.38*** | (22.05) | -0.285 | (0.383) |
| Higher degree completed (=1, 0 otherwise) | -0.146 | (0.317) | 158.7*** | (34.11) | -2.50** | (0.830) |
| **Household head's current occupation (Baseline category: Employee)** | | | | | | |
| Employer (=1, 0 otherwise) | 0.513* | (0.248) | 41.24* | (17.69) | 0.084 | (0.60) |
| Own account worker (=1, 0 otherwise) | -0.200 | (0.117) | -28.48** | (10.83) | -0.695* | (0.286) |
| Unpaid family worker (=1, 0 otherwise) | -0.452 | (0.335) | -23.69 | (30.33) | -3.11*** | (0.895) |
| Others (=1, 0 otherwise) | -0.346* | (0.151) | -105.3*** | (23.20) | -0.221 | (0.373) |
| **Household net total income per capita** | 0.0000002 | (0.0000001) | 0.000004 | (0.000003) | 0.0000003 | (0.0000002) |
| **Household social gathering expenditures per capita** | | | | | | |
| HH Gambling expenditure per capita | 0.00415*** | (0.0005) | 0.0854*** | (0.017) | 0.007*** | (0.001) |
| HH Special occasions expenditure per capita | 0.0000571 | (0.00007) | 0.0240*** | (0.0066) | 0.00008 | (0.0001) |
| HH Miscellaneous expenditure per capita | 0.00157*** | (0.00008) | 0.0341*** | (0.004) | 0.002*** | (0.0001) |
| HH Donation expenditure per capita | 0.00339*** | (0.0006) | 0.149*** | (0.031) | 0.005*** | (0.001) |
| **Month dummy variables (Baseline category: July)** | | | | | | |
| Jan | 0.008 | (0.213) | 1.874 | (22.83) | 0.520 | (0.534) |
| Feb | 0.896*** | (0.214) | 76.12** | (23.98) | 2.489*** | (0.526) |
| Mar | 0.0749 | (0.214) | 6.910 | (22.47) | 0.580 | (0.536) |
| April | 2.072*** | (0.216) | 153.7*** | (31.53) | 3.515*** | (0.526) |
| May | -0.0931 | (0.213) | -25.77 | (23.96) | -0.260 | (0.542) |
| Aug | -0.207 | (0.213) | -19.15 | (23.90) | -0.272 | (0.539) |
| Sep | -0.305 | (0.213) | -43.36 | (24.95) | -0.743 | (0.544) |
| Oct | 0.0742 | (0.213) | -15.18 | (23.33) | 0.492 | (0.537) |
| Nov | -0.139 | (0.213) | -44.78 | (24.95) | 0.088 | (0.536) |
| Dec | -0.0271 | (0.214) | 9.243 | (12.72) | 0.417 | (0.535) |
| **Year dummy variables (Baseline category: 2015)** | | | | | | |
| 2016 | 0.451** | (0.140) | 9.243 | (12.72) | 0.965** | (0.345) |
| _cons | -1.349** | (0.453) | -516.4*** | (99.03) | -20.4*** | (1.187) |
| Sigma _cons | | | 45.91*** | (4.068) | 12.16*** | (0.114) |
| *N* | 19756 | | 6636 | | 19756 | |

*Notes: Standard errors in parentheses. (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)*

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