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Determinants of alcohol purchase and expenditure among Vietnamese households: Evidence from a Heckman selection model

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Abstract

Aims: This study examines the determinants of household alcohol purchase decisions and expenditure intensity in Vietnam, addressing the potential sample selection bias arising from the high proportion of non-purchasing households.

Methods: The analysis uses cross-sectional data from the 2020 Vietnam Household Living Standards Survey (VHLSS) with a sample of 9,389 households. A Heckman two-step selection model is employed to jointly estimate the probability of purchasing alcohol and the level of expenditure conditional on purchase.

Results: The Wald test of independent equations confirmed significant sample selection bias ($p = 0.035$), validating the use of the Heckman selection framework. Male-headed households were 7.6 percentage points (pp) more likely to purchase alcohol and spent an additional 325.3 thousand Vietnamese Dong (VND) annually (conditional on purchase) than female-headed households. Income demonstrated the strongest gradient: the richest quintile was 13.3 pp more likely to purchase alcohol and spent 2,608,000 VND more annually among purchasers compared to the poorest group. Geographically, households in the Mekong River Delta were 16.8 pp less likely to purchase alcohol than those in the Red River Delta, yet purchasers in this region recorded the highest spending intensity nationwide (+1,649,9000 VND), indicating a pattern of high-intensity consumption events.

Conclusion: Household alcohol expenditure in Vietnam is shaped by marked demographic, income, and regional disparities. We propose a multi-layered policy framework that combines stronger excise taxation to reduce affordability with interventions targeting gender norms. Region-specific strategies remain essential, including cooperative-based formalization support in the Northern mountainous areas and stricter supply-side controls in high-intensity Southern markets.

Introduction

Alcohol has long held a distinctive role in the cultural and social fabric of many societies around the world, particularly in Asian countries such as Vietnam. In both traditional and contemporary settings, alcohol is commonly present during festivals, weddings, ancestral rituals, and even professional engagements, serving as a medium for expressing hospitality, reinforcing social ties, or asserting personal status (Adams et al., 2022). However, behind its symbolic value and social functions lie a range of adverse consequences that cannot be overlooked, including significant risks to public health, social safety, and economic well-being.

According to the World Health Organization (WHO), alcohol consumption is one of the leading global risk factors for death and disease, contributing to more than 2.6 million deaths annually and being associated with over 200 health conditions, including cancer, cardiovascular diseases, and traffic accidents (WHO, 2024). Importantly, the burden of alcohol-related harm is disproportionately borne by lower-income populations. In 2019, alcohol-attributable mortality was significantly higher in low-income countries than in high-income countries (37.1 vs. 26.3 deaths per 100,000 population), despite substantially lower per capita alcohol consumption in low-income settings (WHO, 2024). At the regional level, alcohol consumption patterns and their health consequences exhibit substantial heterogeneity. In the Asia–Pacific region, Vietnam represents a particularly relevant case. The alcohol-attributable mortality in Vietnam reached

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54.4 deaths per 100,000 population, exceeding levels reported in Thailand (42.9), the Philippines (36.0), Malaysia (10.8), and Indonesia (10.3). The burden is highly gender-skewed, with male mortality rates (102.2 per 100,000) nearly seven times higher than female rates (14.8 per 100,000). Moreover, unlike several neighboring countries where alcohol-attributable mortality has stabilized or declined, Vietnam experienced a continued increase (+6.5 per 100,000), underscoring the growing public health relevance of alcohol consumption in the country (WHO, 2024).

In Vietnam, rapid economic renovation and rising living standards have been accompanied by a substantial expansion of alcohol consumption. According to WHO estimates, total per capita alcohol consumption among adults aged 15 years and older increased from approximately 4.7 liters of pure alcohol in 2010 to 8.3 liters in 2016, and rose further to 9.3 liters in 2019, placing Vietnam among the higher-consuming countries in the Western Pacific region (WHO, 2018, 2024). During the same period, the domestic alcohol market expanded rapidly, with alcohol production increasing by nearly 50% within one decade, reflecting strong supply-side growth (WHO, 2018). Consistent with these market trends, WHO data indicate a pronounced increase in alcohol consumption intensity among both men and women in Vietnam. Between 2010 and 2016, per capita alcohol consumption among male adults rose sharply from approximately 8.2 liters to 14.5 liters of pure alcohol, while female consumption increased from 1.3 liters to 2.5 liters. This upward trend continued into 2019, with male per capita consumption reaching 15.3 liters and female consumption rising to 3.8 liters, highlighting a sustained expansion of alcohol use across genders over the past decade (WHO, 2018, 2024). Taken together, these indicators provide robust empirical support for the observed growth of alcohol consumption in Vietnam alongside socioeconomic development and suggest broader social normalization of alcohol use in daily life.

The widespread practice of home-brewed alcohol production and the excessive levels of alcohol consumption in certain areas have raised serious concerns about public order, social safety, and traffic-related risks (Luu & Thieng, 2018). In middle-income countries such as Vietnam, the socioeconomic impacts of alcohol consumption are particularly severe, as it contributes to rising poverty and healthcare burden (Hanh et al., 2019; Phan, 2024). Moreover, drinking intensity varies by income level, with lower-income households exhibiting higher vulnerability to harmful drinking patterns. Compared with households earning less than 5 million Vietnamese Dong (VND) per month, those in higher-income groups show a significantly lower likelihood of light drinking (aOR = 0.75; 95% CI[0.57, 0.98]; Kumar et al., 2023).

These figures become more informative when interpreted alongside regional survey evidence. Among the six socio-economic regions in Vietnam, alcohol use prevalence is highest in the Central Highlands (73.4%), followed by the Red River Delta (65%) and the Northern Midlands and Mountainous Areas (61%), while the Mekong River Delta exhibits the lowest prevalence nationwide (52%; Luu & Thieng, 2018), indicating substantial regional heterogeneity in drinking participation. Importantly, the Central Highlands and the Northern Midlands and Mountainous Areas are commonly characterized by relatively lower average incomes, higher poverty incidence, and more limited access to healthcare services (Feng et al., 2024; Tuyen, 2023). In this context, high alcohol consumption rates in these regions may raise concerns about potential vulnerability to alcohol-related health and economic consequences, particularly in settings characterized by heavy episodic drinking and limited social protection.

Beyond its health burden, alcohol consumption also directly affects household expenditure patterns. When income is limited, increased spending on alcohol often comes at the expense of essential needs such as food, education, and healthcare, particularly among low- and middle-income households (Jolex & Kaluwa, 2022; Pu et al., 2008). In Vietnam, alcohol expenditure is not merely spending on a consumer good; it also reflects demographic, socioeconomic, cultural, and regional differences across household groups. However, domestic quantitative research on household alcohol expenditure behaviour remains limited with most existing studies focusing on drinking prevalence or consumption frequency (Anh et al., 2025; Giang et al., 2013; Kumar et al., 2023) rather than jointly examining participation and expenditure intensity. In contrast, international evidence indicates that alcohol expenditure decisions are shaped by a complex set of factors. Empirical studies from Malaysia (Tan et al., 2009), Turkey (Aksoy et al., 2019), East Asian countries (Belay et al., 2023), and the Republic of Palau (Sata et al., 2021) highlight the roles of individual characteristics (gender, age, education), household attributes (household size, dependency structure), and contextual factors (income level, urban-rural residence, and geographic location) in influencing alcohol spending behaviour. In addition, a recent systematic review synthesizing evidence across multiple countries confirms the consistent role of demographic and sociocultural determinants in shaping alcohol consumption patterns (Khamis et al., 2022). To address this empirical gap, this study aims to examine the determinants of both alcohol purchase participation and expenditure intensity among Vietnamese households. This objective is particularly critical in the current context, where rapid growth in alcohol consumption has been accompanied by increasing health and socioeconomic burdens.

The analysis utilizes data from the 2020 Vietnam Household Living Standards Survey (VHLSS), a large-scale, nationally representative household survey that provides detailed information on household alcohol expenditure and socioeconomic characteristics. A key empirical challenge in this setting is the substantial proportion of households reporting zero alcohol expenditure. Estimating expenditure models using only positive spenders may lead to sample selection bias, as households that choose to purchase alcohol may systematically differ from non-purchasing households. Therefore, this study applied the two-step Heckman selection model, which explicitly accounts for the two-stage nature of alcohol-related behavior, namely the decision to purchase and the conditional level of expenditure, allowing for consistent estimation of both processes.

By adopting this framework, the study makes three contributions. First, using nationally representative VHLSS 2020 data, it provides updated evidence on household-level determinants of alcohol purchasing and spending in Vietnam and documents substantial demographic and spatial heterogeneity. Second, it explicitly separates the extensive and intensive margins of alcohol-related behavior and reports marginal effects for participation, conditional spending, and population-wide (unconditional) spending, thereby offering a more complete characterization of alcohol expenditure patterns than single-equation approaches. Third, it methodologically tests and corrects for selection dependence between purchase and expenditure decisions within a Heckman framework, and complements the main estimates with a Two-Part Model sensitivity check. This generates policy-relevant evidence on which groups and regions exhibit "high-intensity" spending conditional on participation – an important basis for targeted and context-sensitive alcohol control measures.

Methods

Data

To investigate the determinants of alcohol consumption decisions and household alcohol expenditure, this study employs cross-sectional data from the 2020 Vietnam Household Living Standards Survey (VHLSS). The survey was conducted by the General Statistics Office (GSO) under the Ministry of Planning and Investment, in cooperation with the World Bank (GSO, 2021). The VHLSS is the official national household survey system in Vietnam and is widely used by government agencies and academic researchers for policy analysis and socioeconomic studies. It follows internationally standardized survey protocols and benefits from technical and methodological support from the World Bank, ensuring high data quality, consistency, and comparability across survey waves (GSO, 2021).

The VHLSS adopts a multi-stage stratified sampling design based on the national population census framework, with sampling weights provided to ensure representativeness at both national and regional levels (GSO, 2021). The 2020 wave covers 9,389 households, encompassing a total of 34,691 individuals. Within each survey year, the VHLSS is implemented across multiple survey rounds, with sampled households assigned to one specific survey period and interviewed once at the time of data collection. Expenditure information, including alcohol-related spending, was collected using standardized recall periods. In particular, frequently purchased consumption items are typically reported based on a 30-day recall period, while less frequent or high-value expenditures are recorded using a 12-month recall period, in accordance with standard household survey practice (GSO, 2021). In addition to expenditure information, the dataset provides comprehensive household-level demographic and socioeconomic characteristics, including age structure, education, employment status, income, ethnicity, and geographic location.

Ethical Approval and Informed Consent

The data are secondary and anonymous; therefore there was no need for ethical approval.

Theoretical Framework and Model Selection

In studies of consumption behavior for goods such as alcohol, restricting analysis solely to positive spenders is a common practice that may inadvertently introduce sample selection bias (Aksoy et al., 2019; Chonviharnpan & Lewis, 2015; Tan et al., 2009; Yajamín-Villamarín, 2025). Although a large proportion of Vietnamese households report purchasing alcohol (approximately 88% of the sample), the remaining non-consumption observations are unlikely to represent purely random zeros. In the Vietnamese context, abstinence is often associated with systematic unobserved factors such as adherence to cultural norms, strong health consciousness, or religious beliefs (Casswell, 2022). If these unobserved traits that reduce the likelihood of drinking also affect the level of expenditure conditional on consumption, the error terms of the participation and expenditure equations become correlated (Madden, 2006). Ignoring this correlation by estimating expenditure equations only for purchasing households would therefore lead to inconsistent parameter estimates (Heckman, 1979; Yajamín-Villamarín, 2025).

To address this issue, the study employs the Heckman selection model (Heckman, 1979). Conceptually, this framework corrects for sample selection bias by explicitly modeling the unobserved motivation to purchase alcohol that jointly affects participation and expenditure decisions. The framework specifies two equations: a selection equation (participation) and an outcome equation (expenditure). The bias correction is achieved by accounting for the correlation between the error terms of these two equations (which is equivalent to controlling for the Inverse Mills Ratio in the traditional two-step interpretation). By incorporating this selection mechanism, the model allows for consistent and unbiased estimation of the underlying behavioral relationships (Wooldridge, 2002).

Furthermore, this study adopts the Heckman framework over alternative approaches such as the Two-Part Model (TPM) based on theoretical considerations regarding decision dependence. While the TPM assumes independence between participation and expenditure decisions (Madden, 2006), the Heckman model allows these two stages to be correlated. Given the social and habit-forming nature of alcohol consumption in Vietnam, assuming independence may be overly restrictive. The Heckman framework therefore provides an appropriate empirical strategy to formally test and account for this interdependence (Yajamín-Villamarín, 2025).

Methodologically, the Heckman selection model is specified as a two-equation system comprising a selection (participation) equation and an outcome (intensity) equation. Let d_i denote the latent alcohol purchase decision, and define the observed participation indicator as $D_i = 1$ ($d_i > 0$), where $D_i = 1$ if the household reports positive alcohol

expenditure and $D_i = 0$ otherwise. The selection equation is given by:

$$d_i = Z_i\gamma + \mu_{2i}, \text{ with } D_i = 1 \text{ if } d_i > 0 \quad (1)$$

Conditional on participation $D_i = 1$, the outcome equation models the intensity of alcohol expenditure:

$$y_i = X_i\beta + \mu_{1i}, \text{ observed only if } D_i = 1 \quad (2)$$

The error terms are assumed to be jointly normally distributed:

$$\mu_{1i} \sim N(0, \sigma^2), \mu_{2i} \sim N(0,1), Corr(\mu_{1i}, \mu_{2i}) = \rho.$$

where y_i denotes annual household alcohol expenditure (measured in thousand VND per year); X_i is the vector of observable covariates determining expenditure intensity; β is the associated parameter vector; and μ_{1i} is an idiosyncratic error term with mean zero and variance σ^2. Z_i denotes the vector of observable variables influencing the household's alcohol purchase participation, which may include covariates overlapping with X_i, and γ is the corresponding parameter vector. The parameter ρ captures the correlation between unobserved determinants of participation and expenditure intensity. A statistically significant ρ indicates the presence of sample selection bias, implying that participation and expenditure decisions are interdependent. In such cases, the Heckman selection model yields consistent and asymptotically efficient estimates and is therefore preferred to conventional OLS or alternative two-part specifications (Greene, 2007; Yen & Rosinski, 2008).

In this study, the outcome equation is specified as:

$$y_i = X_{1i}\beta_1 + C_i\beta_2 + \mu_{1i}, \quad (3)$$

where X_{1i} and C_i include the following covariates:

Demographic Characteristics: age of household head (years); sex of household head (1 = male; 0 = female); marital status of household head (1 = married; 0 = single); ethnicity of household head (1 = Kinh; 0 = ethnic minorities); household size (persons); number of children aged 0–5; and number of elderly members aged 65 or older.

Socioeconomic Characteristics: education of household head (years of schooling); annual household income classified into five income quintiles (Quintile 1 = poorest to Quintile 5 = richest); and employment status of household head (1 = employed; 0 = unemployed).

Geographic Characteristics: place of residence (1 = urban; 0 = rural); and a set of regional dummy variables corresponding to the six official socioeconomic regions of Vietnam: Red River Delta (reference category), Northern Midlands and Mountains, North and South Central Coast, Central Highlands, South East, and Mekong River Delta.

Accordingly, the selection equation is specified as:

$$d_i = Z_{1i}\gamma_1 + C_i\gamma_2 + \mu_{2i}, \text{ and } D_i = 1 \text{ if } d_i > 0, \quad (4)$$

where Z_i (comprising Z_{1i} and C_i) denotes the set of covariates influencing alcohol purchase participation. Overall, empirical rejection of the null hypothesis $\rho = 0$ provides support for jointly modelling participation and expenditure intensity within the Heckman selection framework.

In this study, the model is estimated using the Full Information Maximum Likelihood (FIML) method, which jointly estimates the selection and outcome equations within a single likelihood framework. Compared with the traditional two-step Heckman procedure, FIML avoids the generated regressor problem associated with the estimated Inverse Mills Ratio and yields more efficient and asymptotically consistent parameter estimates, particularly when the correlation between equations is non-negligible or when multicollinearity is present (Greene, 2007). A Wald chi-squared test of the null hypothesis ($P = 0$) is then used to examine whether the participation and expenditure decisions are statistically independent. Rejection of this hypothesis indicates the presence of sample selection bias and validates the use of the Heckman specification.

Variables

The selection of variables in this study is grounded in both theoretical considerations and a review of previous empirical research on alcohol consumption behavior (Belay et al., 2023; Khamis et al., 2022; Sornpaisarn et al., 2013; Yen & Jensen, 1996). The included variables are intended to comprehensively capture the socioeconomic and demographic characteristics of households, which are hypothesized to influence both the decision to consume alcohol and the level of alcohol expenditure.

Individual and household-level characteristics are represented by variables such as household size, average age of members, number of young children, and number of elderly persons. Prior studies suggest that household size may affect the probability of alcohol consumption in varying directions depending on context (Belay et al., 2023; Khamis et al., 2022; Rashied, 2023). Additionally, the age of the household head is assumed to exhibit a non-linear relationship, typically an inverted U-shape, with alcohol consumption peaking during middle age (Yen & Jensen, 1996).

Gender of the household head is also a critical determinant, as numerous studies have found that male-headed households are more likely to consume alcohol and tend to spend more on alcoholic beverages compared to female-headed households (Belay et al., 2023; Gius, 2005). Educational attainment of the household head is included in the model to account for the role of education in shaping consumption behavior. While higher education levels have been associated with more moderate and controlled alcohol use, the magnitude and direction of this effect may vary depending on the type of alcoholic beverages consumed (Belay et al., 2023; Khamis et al., 2022).

Household income plays a critical role in determining both access to and the level of alcohol expenditure, as higher-income households generally have greater capacity to spend on non-essential goods such as alcoholic beverages (Chonviharnpan & Lewis, 2015). The occupation of the household head serves as a proxy for employment status and income stability, making it an important control variable in studies of alcohol consumption. Households headed by self-employed or unemployed individuals may exhibit different consumption patterns compared to those with salaried or wage-earning heads (Chonviharnpan & Lewis, 2015; Rashied, 2023).

Place of residence and geographic region are also included to account for spatial heterogeneity in alcohol consumption behavior. Prior studies have indicated that urban households are more likely to consume alcohol due to higher living standards and better product availability (Chonviharnpan & Lewis, 2015; Rashied, 2023). Additionally, the ethnicity of the household head is considered to reflect the influence of cultural and religious factors. Ethnic minority groups may have distinct drinking patterns compared to the ethnic majority population (Gius, 2005; Yen, 2005).

Table 1 presents descriptive statistics of the sample (n = 9,389). Regarding the dependent variables, the average annual household expenditure on alcohol is approximately 3,171,400 VND. In terms of participation, 88% of households reported positive alcohol expenditure, indicating a high prevalence of consumption among the surveyed population.

Regarding demographic characteristics, the mean age of the household head is approximately 51.0 years. The majority of households are headed by males (73.84%), and 79.81% of household heads are married. In terms of ethnicity, 82.99% of household heads belong to the Kinh majority, while 17.01% belong to ethnic minorities. The average household size is 3.7 members. The average number of children aged 0–5 years per household is 0.44, and the average number of elderly members aged 65 years or older is 0.32.

In terms of socioeconomic characteristics, the average educational attainment of household heads is approximately 6.1 years of schooling. The average annual household income is 178,114,500 VND, with the sample distributed evenly across five income quintiles (approximately 20% each). Regarding employment status, 67.27% of household heads are employed.

Regarding geographic characteristics, 32.81% of households reside in urban areas, while 67.19% live in rural areas. The distribution of households across the six geographical regions is as follows: North and South Central Coast (22.02%), Red River Delta (21.15%), Mekong River Delta (20.24%), Northern Midlands and Mountains (17.70%), Southeast (11.95%), and Central Highlands (6.93%).

Table 1

Summary Statistics of Variables

Variable	Percentage	Mean (SD)
Dependent variables		
Annual alcohol expenditure (thousand VND)		3,171.40 (5,524.03)
Alcohol purchase participation		
Household with alcohol expenditure		
Yes	88.00	
No	12.00	
Independent variables		
Demographic characteristics		
Age of household head (years)		50.97 (14.04)
Sex of household head		
Male	73.84	
Female	26.16	
Marital status of household head		
Single	20.19	
Married	79.81	
Ethnicity of household head		
Kinh	82.99	
Ethnic minorities	17.01	
Household Size (persons)		3.70 (1.61)
Number of children (aged 0-5)		0.44 (0.69)
Number of elderly (65 years old or older)		0.32 (0.61)
Socioeconomic characteristics		
Education of household head (years of schooling)		6.06 (4.93)
Annual household income (thousand VND)		178,114.53 (160,422.91)
Quintile 1 (poorest)	19.98	
Quintile 2	19.99	
Quintile 3	20.00	
Quintile 4	20.00	
Quintile 5 (richest)	20.02	
Employment of household head		
Employed	67.27	
Unemployed	32.73	
Geographic characteristics		
Place of residence		
Rural area	67.19	
Urban area	32.82	
Geographical region		
Red River Delta	21.15	
Northern Midlands & Mountains	17.702	
North & South Central Coast	22.015	
Central Highlands	6.933	
South East	11.950	
Mekong River Delta	20.248	
Number of observations	**9,389**	

Results

Table 2 reports marginal effects from the Heckman selection model across three outcome dimensions. Column 1 (Probability) captures the extensive margin by showing how explanatory variables affect the probability that a household reports positive alcohol expenditure. Column 2 (Conditional level) reflects the intensive margin by reporting effects on alcohol expenditure levels among drinking households only, while Column 3 (Unconditional level) summarizes the overall effects across the full sample, combining both participation and expenditure intensity. The results indicate that both demographic and socioeconomic characteristics significantly shape Vietnamese households' alcohol purchasing and expenditure behavior across these dimensions. In particular, gender, marital status, household income, household size, and regional location are consistently associated with higher participation probabilities as well as higher conditional and unconditional expenditure levels. In contrast, age, educational attainment, and occupation of the household head do not show statistically significant marginal effects across any of the three outcome measures.

Table 2

Marginal Effects on Alcohol Purchase and Expenditure (Heckman Selection Model)

Variable	Probability (dy/dx ×100)	Conditional level	Unconditional level
Age of household head	0.125*** (0.027)	−2.331 (4.696)	−3.186 (6.401)
Sex of household head (reference: Female)	7.647*** (0.694)	325.296** (152.296)	444.589** (204.670)
Marital status of household head (reference: Single)	6.296*** (0.777)	260.859 (154.332)	356.522 (213.721)
Ethnicity of household head (reference: Ethnic minorities)	1.248 (1.005)	−293.185** (122.740)	−400.703** (167.277)
Household size	1.840*** (0.308)	124.095*** (36.892)	169.603*** (50.424)
Number of children (0–5)	−0.482 (0.629)	−160.807** (75.534)	−219.778** (102.933)
Number of elderly (65+)	−3.387*** (0.604)	−175.244 (94.831)	−239.510 (130.558)
Education of household head	0.002 (0.067)	−1.189 (10.694)	−1.626 (14.625)
Household income (reference: Quintile 1 [poorest])			
Quintile 2	6.405*** (1.174)	326.096*** (89.097)	488.779*** (133.172)
Quintile 3	9.537*** (1.237)	767.214*** (113.265)	1116.725*** (163.566)
Quintile 4	10.049*** (1.337)	1307.781*** (140.195)	1844.389*** (191.401)
Quintile 5 (richest)	13.266*** (1.354)	2608.029*** (176.642)	3460.101*** (237.280)
Employment of household head (reference: Unemployed)	2.767*** (0.627)	61.459 (97.636)	83.997 (133.038)
Place of residence (reference: Urban area)	−3.229*** (0.674)	0.041 (103.488)	0.057 (141.439)
Geographical region (reference: Red River Delta)			
Northern Midlands & Mountains	2.075** (0.800)	45.379 (99.780)	66.782 (146.903)
North & South Central Coast	0.233 (0.757)	709.581*** (106.046)	1002.190*** (148.865)
Central Highlands	−1.858 (1.215)	803.615*** (168.321)	1129.040*** (230.206)
South East	−15.853*** (1.347)	1029.106*** (216.462)	1428.405*** (299.317)
Mekong River Delta	−16.781*** (1.101)	1649.884*** (180.586)	2221.924*** (232.994)
Observations	**9,389**		

Note: Wald test of independent equations: (rho = 0): $chi^2(1) = 4.45$. Prob > $chi^2 = 0.0350$. Standard errors are reported in parentheses.

Regarding demographic characteristics, the age of the household head shows a statistically significant but small positive effect on the probability of purchasing alcohol (β = 0.125 percentage points [pp]). However, age does not significantly influence the level of expenditure. In contrast, the gender of the household head exerts a substantial influence. Male-headed households are 7.65 pp more likely to purchase alcohol than female-headed households. In addition, male-headed households exhibit significantly higher spending intensity. Conditional expenditure among purchasers increases by 3,253,000 VND, and population-level (unconditional) expenditure is higher by 4,446,000 VND.

Marital status and ethnicity also play notable roles. Households headed by married individuals are 6.30 pp more likely to purchase alcohol than their single counterparts, although the difference in spending levels is not statistically significant. Regarding ethnicity, while Kinh households do not differ significantly from ethnic minorities in participation probability, they engage in substantially lower

spending levels. Specifically, conditional expenditure for Kinh households is 293,200 VND lower, and unconditional expenditure is 400,700 VND lower compared to ethnic minority households.

Household composition variables display heterogeneous effects. Household size has a consistently positive and significant impact across all three measures. Each additional member increases the purchase probability by 1.84 pp and raises conditional and unconditional expenditure by 124,100 VND and 169,600 VND, respectively. Conversely, the presence of children (aged 0–5 years) does not affect the likelihood of purchase but significantly reduces conditional expenditure by 160,800 VND. Similarly, the presence of elderly members (aged 65+ years) significantly reduces the probability of purchasing alcohol by 3.39 pp, although its effect on expenditure levels is not statistically significant.

Economic factors, particularly household income, demonstrate the strongest gradient. Relative to the poorest quintile (Quintile 1), all higher income groups show significantly higher probabilities of purchase and expenditure levels, with the magnitude increasing progressively. For the richest group (Quintile 5), the probability of purchasing alcohol is 13.27 pp higher, and conditional expenditure is 2,608,000 VND higher than the reference group. This monotonic increase across income quintiles is clearly presented in Figure 1, where the effect sizes extend progressively for higher income groups. Employment status also matters; households with an employed head are 2.77 pp more likely to purchase alcohol, though employment does not significantly affect the amount spent.

Finally, geographic factors show substantial variation. Urban residence is associated with a 3.23 pp decrease in the probability of purchasing alcohol compared to rural areas. Regionally, the results reveal a divergence between participation and expenditure behaviors compared to the Red River Delta (reference group). Households in the Northern Midlands and Mountains are 2.08 pp more likely to purchase alcohol, yet their expenditure levels do not differ significantly from the reference group. In contrast, households in the South East and Mekong River Delta are significantly less likely to purchase alcohol, with probabilities lower by 15.85 and 16.78 pp, respectively. However, regarding expenditure, households in the North and South Central Coast, Central Highlands, South East, and Mekong River Delta all exhibit substantially higher spending levels compared to the reference group. Notably, despite the lower likelihood of participation, the Mekong River Delta records the highest spending intensity, with conditional and unconditional levels exceeding the Red River Delta by approximately 1,649,900 VND and 2,221,900 VND, respectively. As shown in Figure 1, this contrast is pronounced. While the coefficients for the southern regions in Panel A are negative, the corresponding expenditure bars in Panels B and C shift sharply to the positive side.

Robustness Checks and Sensitivity Analysis

The reliability and validity of the empirical findings were assessed through a series of diagnostic tests and sensitivity analyses, covering pre-estimation, estimation, and post-estimation stages. Regarding pre-estimation diagnostics, potential multicollinearity among explanatory variables was examined using the Variance Inflation Factor (VIF). With VIF values ranging from 1.06 to 2.81 and an average of 1.67 (Appendix Table A1), the results fall well below the conventional threshold of 10, confirming that multicollinearity is not a concern for model stability (Greene, 2007).

To validate the model specification, the necessity of the sample selection correction was evaluated using the Wald test of independent equations (reported in Table 2). The rejection of the null hypothesis of independence between the participation and expenditure equations ($\rho = 0$) with statistical significance ($\chi^2(1) = 4.45$, $p = 0.035$) indicates statistically significant dependence between the two decisions. This result confirms the presence of sample selection bias and provides empirical support for the use of the Heckman model to obtain consistent estimates (Heckman, 1979). Furthermore, robust standard errors were applied in all estimations to account for potential heteroskedasticity.

Although the Wald test statistically supports the Heckman specification, a sensitivity analysis was performed by estimating a TPM to assess the stability of the estimates and quantify the extent of the selection bias (Table 3). A comparison of the two specifications reveals that the direction and statistical significance of key covariates—such as household income, gender, and regional indicators—remain consistent across both models, indicating that the identification of the core drivers of alcohol expenditure is robust to model choice. However, a notable difference is observed in the magnitude of the effects. The conditional marginal effects in the TPM are consistently larger than those in the Heckman model; for instance, the marginal effect for the highest income quintile is 3,484 in the TPM versus 2,608 in the Heckman specification. This pattern suggests that imposing the independence assumption ($\rho = 0$) may lead to upward-biased estimates, thereby reinforcing the relevance of explicitly correcting for selection dependence.

Overall, the sensitivity analysis supports the robustness of the core findings while indicating that the Heckman framework provides more conservative and reliable estimates for this dataset.

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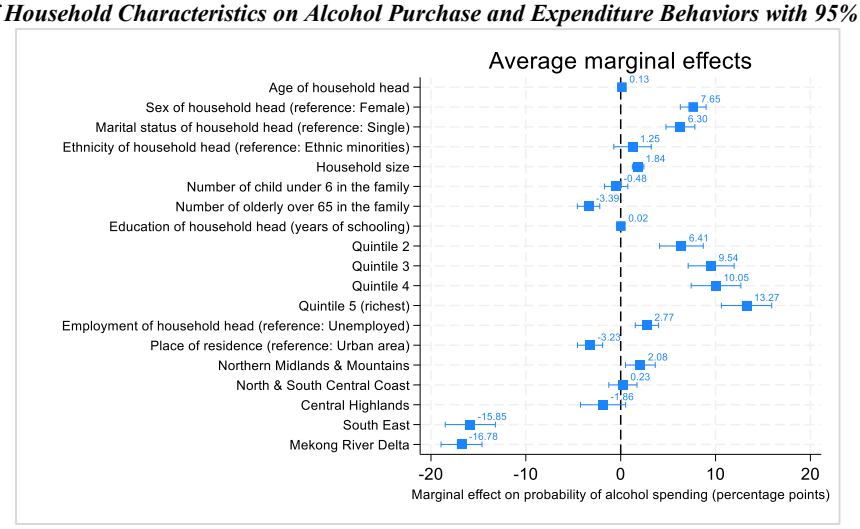
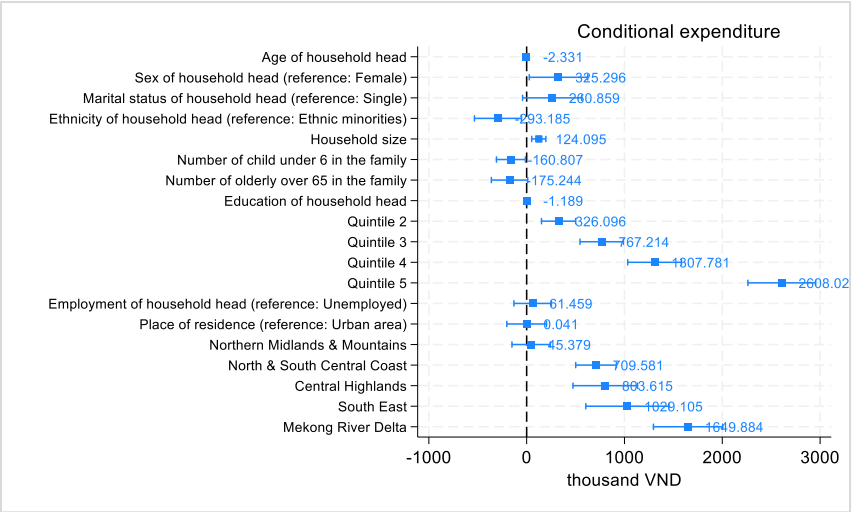
Figure 1

Marginal Effects of Household Characteristics on Alcohol Purchase and Expenditure Behaviors with 95% CI

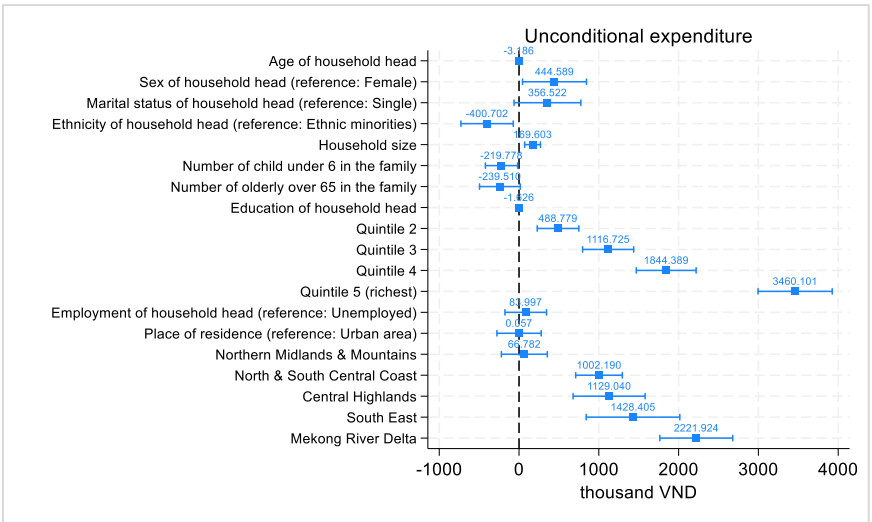
(A)



(B)



(C)



Note: Panel (A) presents the marginal effects on the probability of purchase; Panel (B) shows the effects on conditional expenditure (among purchasers); and Panel (C) displays the effects on unconditional expenditure (population-wide). Horizontal bars indicate 95% confidence intervals; estimates crossing the zero line are not statistically significant.

Table 3

Marginal Effects of Household Characteristics on Alcohol Purchase Probability and Conditional Expenditure (Two-Part Model)

Variable	Probability (dy/dx ×100)	Conditional level
Age of household head	0.13*** (0.03)	−2.97 (6.39)
Sex of household head (reference: Female)	7.88*** (0.67)	460.65** (207.13)
Marital status of household head (reference: Single)	5.85*** (0.75)	375.10* (211.61)
Ethnicity of household head (reference: Ethnic minorities)	0.91 (1.02)	−399.74 ** (167.44)
Household size	1.97*** (0.32)	172.96*** (50.55)
Number of children (0–5)	−0.38 (0.67)	−220.96** (103.10)
Number of elderly (65+)	−3.37*** (0.62)	−245.69* (130.06)
Education of household head	0.02 (0.07)	−1.53 (14.65)
Household income (reference: Quintile 1 [poorest])		
Quintile 2	6.08*** (1.18)	500.44*** (133.09)
Quintile 3	9.09*** (1.25)	1134.20*** (164.17)
Quintile 4	9.91*** 1.35)	1863.19*** (191.74)
Quintile 5 (richest)	13.07*** (1.37)	3484.75*** (238.05)
Employment of household head (reference: Unemployed)	2.81*** (0.63)	88.70 (133.38)
Place of residence (reference: Urban area)	−3.07*** (0.68)	-5.76 (141.90)
Geographical region (reference: Red River Delta)		
Northern Midlands & Mountains	1.93** (0.82)	73.05 (147.11)
North & South Central Coast	0.17 (0.77)	1003.91*** (149.05)
Central Highlands	−1.64 (1.22)	1126.58*** (230.38)
South East	−15.75*** (1.36)	1400.93*** (300.64)
Mekong River Delta	−16.28*** (1.11)	2192.71*** (229.50)
Observations	**9,389**	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are reported in parentheses.

Discussion

This study provides new empirical evidence on the socioeconomic and geographic determinants of household alcohol consumption behavior in Vietnam, highlighting substantial heterogeneity in both participation and expenditure intensity.

The empirical results highlight the profound influence of gender norms on alcohol consumption in Vietnam. Our finding that male-headed households are significantly more likely to drink and spend more confirms established cultural patterns (Brokowski, 2016; Kumar et al., 2023; Nguyen & Trevisan, 2020; Um et al., 2025). This is consistent with studies in similar contexts; for instance, Tan et al. (2009) found that in Malaysia, Chinese male-headed households were 14.7 pp more likely to consume alcohol than female-headed ones. Similarly, Aksoy et al. (2019) reported higher alcohol consumption probabilities for men in Turkey. Recent evidence in Vietnam further indicates that men are more likely to cluster into higher-risk lifestyle profiles that include alcohol use, reflecting persistent gender-based disparities in health-related behavior (Le et al., 2024). In Vietnam, drinking is often viewed as a masculine social activity essential for networking and business, which explains the substantial gender gap (An et al., 2022; Gillen, 2016).

Ethnic differences further highlight cultural heterogeneity in consumption behavior. While Kinh households do not differ significantly from ethnic minority households in participation probability, they exhibit significantly lower expenditure levels. This pattern may reflect the persistence of alcohol-related cultural practices among certain ethnic minority groups, particularly in mountainous and remote areas, where locally produced alcohol plays an important role in daily social interactions and community rituals (Po et al., 2020; Tran et al., 2020).

Household composition also plays an important role. The positive association between household size and alcohol expenditure suggests that larger households may face more frequent social occasions, including family celebrations and traditional events, where alcohol consumption is customary. This result aligns with findings by Bianchi et al. (2023), who similarly reported a positive correlation between household size and alcohol consumption. However, this finding contrasts with evidence from Malaysia, where larger households tend to reduce alcohol spending (Tan et al., 2009), underscoring the context-specific nature of household consumption dynamics. In contrast, the presence of elderly household members significantly reduces the likelihood of alcohol purchase. This result is consistent with prior evidence that older household members may exert moderating influence through health concerns and social authority within the family structure (Aksoy et al., 2019; Rashied, 2023).

Income emerges as the strongest economic determinant of alcohol expenditure. The monotonic increase in both participation probability and expenditure levels across income quintiles confirms that alcohol behaves as a normal consumer good in Vietnam. As household income rises, alcohol consumption becomes more frequent and more intensive. This pattern aligns with standard demand theory and previous empirical evidence from developing and

middle-income countries (Ahlner et al., 2022; Aksoy et al., 2019). The magnitude of the income effect suggests that economic growth, if not accompanied by effective regulatory and public health interventions, may contribute to rising alcohol-related health and social burdens.

Urban-rural differences reveal additional behavioral contrasts. Urban households are less likely to purchase alcohol compared to rural households. This may reflect the continued prevalence of informal and home-based alcohol consumption practices in rural communities, where alcohol is often integrated into daily meals and social gatherings. In urban areas, alcohol consumption may occur less frequently but in more formal or commercial settings (Luu et al., 2014). A striking pattern emerges in the southern regions (South East and Mekong River Delta): while fewer households report purchasing alcohol compared to the Red River Delta, those that do spend substantially more. This suggests a pattern of "high-intensity" consumption events rather than frequent low-value purchases. This finding aligns with previous literature documenting significant geographical disparities in alcohol consumption patterns (Cheah & Rasiah, 2017; Rashied, 2023; Yajamín-Villamarín, 2025). The exceptionally high spending in the Mekong River Delta may reflect culturally embedded patterns of alcohol consumption in this region. The contrast with the Red River Delta suggests that a uniform national policy might be less effective than targeted interventions that address specific regional drinking cultures, particularly in the southern regions where spending intensity is highest (Luu et al., 2014).

Based on the empirical findings, this study proposes a multi-layered policy framework. First, structural interventions should replace generic awareness campaigns for male-headed households. Policy should focus on strict enforcement of zero-tolerance drink-driving laws as immediate deterrents. Furthermore, workplace interventions are needed to decouple drinking from professional success, fostering social norms where refusing alcohol is normalized. Second, a hybrid approach combining national baselines with regionally tailored solutions is essential. For the Northern Midlands and Mountains, to address unrecorded (home-brewed) alcohol without harming livelihoods, we recommend a "formalization support" strategy. Local governments should encourage transitioning household producers into managed cooperatives, enabling quality monitoring and gradual formalization. For the Mekong River Delta and South East, supply-side restrictions are critical to address high-intensity commercial spending. Authorities should regulate outlet density and enforce advertising restrictions to prevent aggressive targeting of these populations. Third, policies should leverage community-based social sanctioning. Capitalizing on the protective role of the elderly, local authorities should revitalize village codes and empower elders to regulate consumption during cultural events. This utilizes indigenous cultural hierarchies to check excessive drinking more effectively than passive education. Fourth, strengthening national excise taxation remains the foundational strategy. The robust link between income and expenditure suggests affordability is a key driver. Thus, higher excise taxes are necessary to counterbalance income growth.

Study Limitations

This study has several limitations. First, using cross-sectional VHLSS 2020 data restricts inference to associations rather than causal effects, and unobserved factors may still confound estimates. Second, alcohol outcomes are based on self-reported household expenditures, which may suffer from recall and social desirability bias and cannot distinguish quantity from price or quality; the data also provide limited granularity on beverage types and unrecorded (home-brewed) alcohol. Third, the analysis is conducted at the household level and relies on household-head characteristics, so it cannot capture within-household heterogeneity in drinking behavior.

Conclusion

The findings reveal that alcohol purchase and expenditure behaviors are simultaneously influenced by demographic factors, socioeconomic characteristics, and spatial variables. Notably, households headed by males, with larger family sizes, and higher income levels are significantly more likely to purchase alcohol and to spend more on it compared to their counterparts. Conversely, the presence of elderly members appears to play a mitigating role primarily by reducing the likelihood of purchase, without a statistically significant effect on expenditure levels. Regarding marital status and employment, while married and employed individuals are more likely to purchase alcohol, their spending levels do not differ significantly from single or unemployed individuals.

In terms of geography, a distinct divergence is observed. Households in the Mekong River Delta and South East are significantly less likely to purchase alcohol compared to the Red River Delta, yet those who do purchase spend substantially higher amounts. This highlights a pattern of high-intensity consumption in the southern regions despite lower participation rates. Urban-rural differences reveal rural households are more likely to purchase alcohol compared to urban households.

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