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A Study on the Determinants of Drinking Demand and Expenditure of College Students

Seung-gil, Lee *

Associate Professor, Department of Tourism Management, Namseoul University, Korea
nadachasha@nsu.ac.kr

Abstract

The purpose of this study is to estimate the factors that affect college students' drinking needs and spending. An analysis model to estimate the determinants affecting drinking needs was applied with a truncated Poisson model and a truncated negative binomial model. Tests to select more appropriate models of the two types were made using the comparison of log-likelihood function and the over-dispersion test.

The analysis result was interpreted by applying the truncated negative binomial model as the truncated Poisson model showed over-dispersion. We also applied the Tobit model to analyze the determinants that affect college students' expenditure on drinking. According to the analysis, gender, grade, allowance and parental occupation were the factors influencing statistics, and gender, type of household income, and student religion were the factors influencing expenditure.

Keywords: Drinking, Determinants, Truncated negative binomial model, Truncated Poisson model, Over-dispersion, Tobit model

1. INTRODUCTION

The reason why the college students' drinking attitude has become a social issue is the repeated deaths of college freshmen due to drinking every year. According to a survey conducted by the Korea Centers for Disease Control and Prevention in 2018, 44.1 % of male students and 32.8 % of female students drank more than 10 cups a day. This is quite high compared to 21.9 % for average adult males and 6.2 % for average adult females [1]. These findings can be interpreted as college students' lack of control over drinking compared to other ages.

Korea's alcohol consumption per person aged 15 years or older stood at 9.1 liters as of 2015, the average level for OECD countries. However, the generous culture of drinking and the low level of awareness of the adverse function of drinking are major obstacles to the health promotion project to prevent serious drinking behavior. In particular, drinking in college periods is known to be a major factor in predicting alcohol utilization disorders in adulthood [2]. The study on drinking among college students is very important in that the relatively high drinking rate of college students, the amount, the problem, and the drinking behavior during college periods can lead to adult drinking behavior after graduation [2, 3].

Therefore, the purpose of this study is to estimate and the analysis motivations affecting college students'

drinking, the determinants affecting drinking demand through the truncated Poisson model and the estimate of the determinants affecting expenditure through the Tobit model. Through this analysis, the basic information on drinking among college students will be provided and the analysis results will be used as data to promote policies related to drinking.

2. LITERATURE REVIEW

The motivation of this study was started by what motives were based on college students' drinking. Also, we wanted to estimate what kind of influence this drinking motive has on drinking demand. In other words, we wanted to estimate whether freshman students drank more than higher-grade students, or whether boys drank more than girls.

The study of drinking factors can be largely classified as studies of demographic factors, personal factors, sociocultural factors, environmental factors and cognitive factors. Psychological and social factors that affect drinking problems include depression, anxiety, stress, and expectations of drinking result [4, 5]. If look at the concept of each factor specifically, first of all, there are 4 types of motivation for drinking, depending on the reason for drinking [6]. The enhancement motive is drinking to enhance positive emotions and the coping motive is drinking to escape from negative emotions. Also, the conformity motive is drinking to avoid social criticism and to get good feeling from others and the social motive is drinking to interact with others.

It is generally reported that men use alcohol because of their interpersonal relationships and women use alcohol to escape from tension, anxiety, frustration and trouble situations [7]. The college period is reported to be the period when alcohol consumption and alcohol use disorder rate are the highest in the entire life [8]. Problems that can result from college students' drinking also arise in a variety of categories, including the harmful affect to college students themselves, their neighbors, and society or organization [9]. According to the results of the study of [10], direct harmful effects from drinking was the most reply is the mental and physical discomfort including hangovers and blackouts (76.9%), followed by a decline in academic ability (55.8%), violence under the influence of alcohol (42.4%), and unintended accidental sexual intercourse (16.9%). Indirectly harmful effects included taking care to drunken friends (56.7%), unpleasant situations where dormitories are tainted with vomit (28.8%), and sleep or study obstruction caused by drunken friends (28.6%). In addition, according to the 2008 survey of [11], 47% of all college students whose surveyed said they had experienced financial difficulties from drinking expenses and 49% said they had experienced financial damage from drinking problems. Social harmful effects include suicide, death, assault, drunk driving, sexual harassment, gambling, interpersonal problems and various legal problems, which seriously affect not only oneself but also society and organization [12].

3. EXPERIMENTS

3.1 Study design

The survey for analysis was conducted with students from four-year universities located in Seoul and Chungcheongnam-do from June to August 2018. Distributed 400 and retrieved 357 questionnaires, and finally analyzed 322 of the answers, except for those with difficult for analysis because of the large missing value of the dependent items and those with extreme value, more than the average amount.

The dependent variables in the questionnaire consist of items for the number of drinking experiences over the past a month and the amount of expenditure on drinking. In addition, 20 new measurement items have been included, referring to prior studies, to measure motivation for drinking. The independent variables consisted of the gender, grade, religion, type of residence, and the characteristics of the household (the type of income

of the parent, the amount of monthly income, etc.). Frequency analysis and exploratory factor analysis were performed using the statistics program. The truncated Poisson model, the truncated negative binomial model and the Tobit model were analyzed to estimate the determinants of drinking and the expenditure determinants. The independent variables applied to the analytical model were treated as dummy variable with 1 and 0. For example, white collars and blue collars were classified as parents' jobs, while agriculture, fishing, forestry and retirement, joblessness and other occupations were treated as one variable.

3.1.1 Analytical model

Poisson distribution means the distribution of probability corresponding to the number of times an event occurs at random within a given time or space. The probability variable following the Poisson distribution is an econometric model that is commonly used to estimate the coefficient data, showing only an integral number (0, 1, 2, 3....), rather than a negative number (-) [13, 14]. The over-dispersion is easily observed in the coefficient data, such as Poisson distributions, which assume equal dispersion [15]. The over-dispersion means that the dispersion exceeds the average [16]. The over-dispersion is caused by differences not observed within the data [15,17,18], This over-dispersion reduces the efficiency of the measurement of the model and occurs the problems with the reliability of the statistics for the coefficients [19]. In addition, very low-parameter standard errors are generated, resulting in discrepancies of estimated quantity and conveniences [20]. As a result, applying the coefficient data containing the over-dispersion to the Poisson model is not correct method for estimation. If the truncated Poisson model (TP) shows over-dispersion, the problem of over-dispersion can be solved by selecting a density function that has a negative binomial with the over-dispersion parameter, in other words, truncated negative binomial model (TNB). Therefore, the analysis model to be estimated in this study is set up and analyzed with the TP model and the TNB, tested with a regression analysis for over-dispersion, and re-estimate the demand determinant using truncated negative binomial model when over-dispersion is accepted. An analysis model for estimating the determinant of drinking expenditure was applied with the Tobit model.

4. RESULTS

4.1 The demographic characteristics of samples

Tabel 1 shows the demographic characteristics of the sample.

Table 1. The demographic characteristics of samples (N=322)

Characteristics		Frequency (%)	Characteristics		Frequency (%)
Gender	Male	128(39.8)	Religion	Christianity	71(22.0)
	Female	194(60.2)		Catholic	31(9.6)
Job	Professional job	42(13.0)		Buddhism	22(6.8)
	Office job	68(21.1)		No religion	194(60.2)
	Technical job	43(13.4)		Other	4(1.2)
	Service job	25(7.8)	Monthly Income (million Won)	100 or lower	2(0.6)
	Public servant/Teacher	30(9.3)		100~200	18(5.6)
	Self-employment	85(26.4)		200~300	69(21.4)

	Agriculture, fishing, and forestry	6(1.9)		300~400	55(17.1)
	Retired or joblessness	6(1.9)		400~500	65(20.2)
	Others	17(5.3)		500~600	43(13.4)
Residence type	Self-contained	69(21.4)		600~700	26(8.1)
	Boarding house	36(11.2)		More than 700	44(13.7)
	With parents	213(66.1)	Grade	Freshman	59(18.3)
	Relatives house	1(0.3)		Sophomore	51(15.8)
	Others	3(0.9)		Junior	155(48.1)
Parents' income type	Single-income	120(37.3)		Senior	57(17.7)
	Dual-income	187(58.1)			
	Others	15(4.7)			

4.2 Investigative factors analysis of drinking motivation

Table 2 shows the results of factor analysis of drinking motive.

Table 2. Investigative factors analysis of drinking motivation

Domains	Items	Factor loading	Variance	Cronbach's α	Eigen value
F1a For pleasure	Because can enjoy the gathering.	.764	18.609	3.722	.758
	To be sociable person	.623			
	Because alcohol makes the fun gathering.	.657			
	Because like gathering and celebration.	.756			
	To celebrate special things with friends	.704			
Relaxing anxiety	To forget one's worries	.863	18.130	3.626	.908
	To relieve depression and tension	.895			
	To take off a bad feeling	.850			
	To gain more confidence	.681			
	To forget the troubles	.814			
Good feeling	Because like the feeling of drinking alcohol	.728	16.012	3.202	.902
	Because get excited when drink.	.748			
	To make feel better	.875			

	To give a pleasant feeling	.872			
	Because makes happy.	.782			
Recommendation from surrounding people and social intercourse	Friends recommended	.623	13.532	2.708	.837
	Because if don't drink, will make fun of other people.	.709			
	To adapt in the gathering	.815			
	To win favor	.806			
	To not alienate	.844			
Cumulative 66.293%, KMO=.852 Bartlett X^2= 3787.235(p>0.000)					

a: The average value of a 5-point scale (1: Not at all, 3: Medium, 5: Very yes)

For the 20 drinking motivation items, the factor analysis was conducted using the principal component analysis and the Varimax (see Table 2). After setting factor loading to 0.5, the analysis found that can be classified in four type the factors of drinking motivation. Reflecting the characteristics of the items measured, factors names were named as follows, 'For pleasure', 'Relaxing anxiety', 'Good feeling', and 'Recommendation from surrounding people and social intercourse'. The results of the analysis were reliable and valid as the persuasiveness of the overall dispersion was 66.293% and the coefficient of KMO is .852 and Bartlett test of sphericity showed a significant χ^2 value of 3787.235(p<0.001).

4.3 Results of analysis using TP model and TNB model

Table 3 shows the technical statistics of variables.

Table 3. Technical statistics of variables (N=322)

Variables	Variables Name	Variables Definition	Standard deviation
Dependent variables	Number of drinking	Number of drinking	4.114(3.046)
	Drinking expenditure	Drinking expenditure	63.682(49.240)
Independent variables	Gender	Male=1; others=0	0.397(0.490)
	Freshmen	Freshmen=1; others=0	0.158(0.365)
	Sophomore	Sophomore=1; others=0	0.481(0.500)
	Junior	Junior=1; others=0	0.177(0.382)
	allowance	Monthly allowance	290668(154397)
	Double-income	Double-income =1; others=0	0.580(0.494)
	With Family	With Family =1; others=0	0.661(0.473)
	White collar	White collar=1; others=0	0.434(0.496)
	Agriculture, etc.	Agriculture, etc.=1; others=0	0.071(0.257)
	Monthly income	2millions~3millions=1; others=0	0.214(0.410)

	3millions~4millions=1; others=0	0.170(0.376)
	4millions~5millions=1; others=0	0.201(0.402)
	More than 6millions =1; others=0	0.350(0.478)
Christianity	Christianity=1; others=0	0.220(0.415)
Catholic	Catholic=1; others=0	0.096(0.295)
Buddhism	Buddhism=1; others=0	0.068(0.252)

The technical statistics of the dependent and independent variables applied to the analysis model are shown in Table 3. As shown in the table, independent variables were treated as dummy variables with 1 and 0. For example, to identify the influence of both male and female students, male students were set to 1, and female students were set to zero to estimate the influence of independent variables on dependencies. For grade 2, 3 and 4 were set to 1, and freshmen were treated as dummy variables. In the case of parental occupation, white collar and other jobs were set to 1, and blue collar was treated as dummy variable.

Table 4 shows the results of analysis of determinants of drinking using the TP model and TNB model.

Table 4. Results of analysis using TP model and TNB model (N=322)

Variables/Models	TP	TNB
	Coeff(t-ratio)	Coeff(t-ratio)
Male	0.202(3.499)***	0.226(2.642)***
Freshmen	0.028(0.315)	0.022(0.164)
Sophomore	-0.216(-2.843)***	-0.217(-1.922)*
Junior	-0.368(-3.774)***	-0.366(-2.554)**
Allowance	4.206e-007(2.171)**	4.624e-007(1.697)*
Double-income	0.033(0.582)	0.032(0.379)
With Family	-0.087(-1.479)	-0.087(-0.989)
White collar	0.052(0.882)	0.046(0.526)
Agriculture / Retirement / Joblessness	0.271(2.640)***	0.272(1.734)*
2 ~3 millions	0.036(0.276)	0.059(0.312)
3 ~4 millions	-0.082(-0.598)	-0.109(-0.552)
4 ~5 millions	0.007(0.058)	-0.000(-0.005)
More than 6millions	0.284(2.221)**	0.289(1.550)
Christianity	0.068(0.985)	0.102(0.987)
Catholic	0.030(0.303)	0.058(0.395)
Buddhism	-0.200(-1.678)*	-0.190(-1.121)
One	1.241(8.596)***	1.210(5.644)***
Alpha	-	0.270(6.122)***

Log likelihood function	-810.4853	-760.7359
Chi squared	85.725 (P>0.000)	99.498(P>0.0000)

a. ( ) indicates t value

b. *, **, *** means significance at the 10%, 5% and 1% levels respectively

c. Number of samples without missing values for all variables included to estimate demand function

As shown in Table 4, the results of the analysis with the TP model and the TNB model show that there are slight differences in statistically significant variables and significance. Therefore, it is necessary to check the over-dispersion of the Poisson model as described in the study model.

Table 5 shows the test results of over-dispersion.

Table 5. Over-dispersion test

	t-value	p-value
$g(\lambda_i)=\lambda_i$	7.528	5.198e-013
$g(\lambda_i)=\lambda_i2$	7.529	5.295e-013

If TP model contains an over-dispersion, the appropriated alternative to the Poisson model is the TNB model. The log likelihood function, which is the basis for determining the suitability of the model, was shown to be more appropriate for TNB model (-760.7359) compared to the TP model (-810.4853). Another way to determine the suitability of the model is to look at the significance of the coefficients in the TNB model. the results in shown significant (p<0.001) t-value is 6.122, so, includes over-dispersion. As a third method, the over-dispersion test presented by [16] was carried out (see Table 5). In other words, $(Y_i-\lambda_i)2-\lambda_i$ is regression analyzed for $g(\lambda_i)$ to produce results. Regression analysis is generally performed after assuming two possibilities, $g(\lambda_i)=\lambda_i$ and $g(\lambda_i)=\lambda_i2$, and provides coefficients for each and t-values for significance tests. As the analysis results, when $g(\lambda_i)=\lambda_i$, the t value is 7.52851 for the coefficients of λ_i, so, the null hypothesis that equal to the average and dispersion is rejected, when $g(\lambda_i)=\lambda_i2$, the t value for the coefficients is 7.52923, the null hypothesis is also rejected. As a result, the Poisson model applied in this study has a problem with over-dispersion, so it is necessary to apply the TNB model and interpret the resulting independent variables for the demand model.

4. DISCUSSIONS

According to the analysis of the TNB model, male students have a positive influence on dependencies at a level of 1% more than female students. In other words, male students are more likely to drink than female students. Broken down by grade, Sophomore and Junior have negative influence at 10% and 5% significant respectively. The more allowance, the more positive the drinking demand (significant 10%). The study found that dual-income parents or those living with their parents had no influence to drinking. With related with parental occupational variables, have statistical significance at a level of 10% for families that the parents' jobs are agriculture, forestry and fisheries, or that have retired or joblessness. For income variables, it was analyzed that there was a positive influence on drinking behaviors at a significant level of 5% for households with more than 6 million won. The relationship between religion and alcoholism is not relevant, according to the analysis. For estimated the determinants associated with drinking expenditure of college students used Tobit model. The analysis found that male students spend more for drinking than female students (significant 1%). There was

no difference in the level of spending by grade and no difference was found with respect to the Drinking Expenditure, depending on the allowance amount. However, it was analyzed that dual-income families had positive influence on spending at a significant level of 5%, and that income also had no influence regardless of the amount of income. In the case of religion, the Christian student had a negative influence at a level of 10% significant.

Table 5. Drinking expenditure determinants (N=322)

Tobit model	Coef(t-value)
Male	21.590(3.818)***
Freshmen	6.625(0.705)
Sophomore	4.197(0.558)
Junior	4.665(0.496)
Allowance	1.74464e-005(0.946)
Double-income	1.110.(2.016)**
With family	-8.113.(-1.392)
White collar	-2.454.(-0.436)
Agriculture / Retirement / Joblessness	14.007(1.298)
2 ~3 millions	-9.61(-0.007)
3 ~4 millions	-8.181(-0.647)
4 ~5 millions	8.374(0.674)
More than 6millions	9.166(0.751)
Christianity	-1.213(-1.794)*
Catholic	-6.846(-0.710)
Buddhism	-5.292(-0.490)
One	44.094(3.221)***
Sigma	47.221(25.038)***
Log likelihood function	-3856.202

5. Conclusion

The purpose of this study is to estimate college students' drinking motives, drinking determinants and expenditure determinants. Drinking motivation was composed of 20 measurement items based on prior study and was classified into 4 types, including 'For pleasure', 'Relaxing anxiety', 'Good feeling' and 'Recommendation from surrounding people and social intercourse' through exploratory analysis of factors. To estimate the determinants of drinking demand, the TP model and the TNB model were analyzed, and the comparison test of the two models checked the over-dispersion through

the likelihood function value, the TNB model's alpha value, and regression analysis. Tests determined that TNB model was more appropriate than the truncated Poisson model.

Based on the analysis by applying a TNB model, the variables that influence drinking were analyzed as those that had a statistical effect on Gender, grade, allowance, and parents' occupational variables. Also, the Tobit model was applied to the analysis related to drinking expenditure. According to the Tobit model, the Gender, the type of household income, and the type of religion were variables that affected the Drinking expenditure.

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