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A Study on the Determinants of Smoking Demand of College Students

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Abstract

The purpose of this study is to estimate the determinants of the smoking demands of university students. For this study, a total of four four-year universities and two-year colleges in Seoul and provincial areas were surveyed. The model for analyzing the demand for smoking was applied with a double hurdle model, and determinants to participate in smoking in the first stage and the amount of smoking in the second stage were analyzed. According to the analysis results, the determinants to participate in smoking as a first stage are gender, grade, college type, major category, and parents' income, which have a statistically significant effect, and the analysis of the amount of smoking as a second has been analyzed as the variables that influence gender, grade, college location, major, parents' income type and income amount.

Keywords: *College Students, Smoking, Demand, Determinants, Double Hurdle Model*

1. Introduction

It is already well known in many studies that smoking causes many diseases, deaths, and accidents, causing serious social problems. More specifically, it has been reported that smoking causes serious health problems for both men and women, such as cancer and disease, resulting in significant socioeconomic cost losses. The World Health Organization (WHO)'s Framework Convention on Tobacco Control policy forum on tobacco control noted that there are about 6 million people dying from smoking-related diseases worldwide annually, and that the number of deaths from smoking-related diseases in the 21st century is forecast to be more than 1 billion without proper anti-smoking actions [1].

As such, the results of research on smoking have been investigated and reported very easily and frequently, both domestically and internationally through various research results. For example, the Korea national health insurance data showed that smokers had 4.6 times for men and 2.5 times for women higher risk of deaths by lung cancer compared to non-smokers, and also other chronic diseases and overall death rates higher [2]. In particular, college students who in the transition period from adolescence to adulthood are reported to be highly likely to be exposed to various risk factors such as smoking and drinking. This is because college students are a group that has a number of side effects from the smoking culture and behavior that the younger generation can easily distort, along with the sense of freedom from various regulations since admission.

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These findings show that prevention is most important because the smoking problem of college students has a profound impact on health levels in adulthood, and that it is necessary to conduct in-depth and multidimensional studies through active intervention, but few studies have so far surveyed the level of smoking behavior and health life for college students on national scale. Based on this research background, the purpose of this study is to estimate the factors that influence smoking of college students.

The analysis results can be used as basic data to control the smoking culture in college campus, and can also be used as very effective statistics for institutions that promote policies.

2. Literature Review

According to [3], Korean college students' smoking rate was 20.7 %. However, a few years have passed, average rose to 47.7 % (69.7 % of males, 25.7 % females) in the survey by the [4]. The Centers for Disease Control and Prevention and the National Health and Nutrition Survey continue to monitor the smoking status, and they are striving for anti-smoking and tobacco control policies, including running anti-smoking clinics at national health centers, probably because smoking has a lot of impact on our society. Nevertheless, the smoking rate in Korea is 11th among OECD countries and 36.6 % in adult males, the highest in the world [5]. Among them, statistics on smoking among adults aged 19-29 including college students within the blind spots of policy are reported at 34.8 % of men and 8.9 % of women, while the ratio of non-smokers to second-hand smoke exposure in public places is 56.3 % of men and 49.7 % of women, so, the college students directly or indirectly exposed to the smoking environment [6].

College students' health risk behavior increases due to socio-psychological factors, including academic and post-graduation career issues, the formation of new human relationships, independence from parents and family members, and the acquisition of adult roles [7]. It is well known that smoking, especially as a risk factor for the occurrence of chronic diseases, involve high-risk drinking behavior or disproportionate eating habits, and can have wide range effects on physical, mental and social health, resulting in serious health problems.

In Korea, the cost of diseases caused by smoking is reported to account for about 6.6 % of the cost of health insurance and medical benefits [8]. In 2013, 42.1 % of adult males aged 19 or older smoked and 6.2 % of females smoking rate, 30s of male and 20s of female were the highest among them, and the lower the age and income the higher the smoking rate. In particular, college student smokers, who make up the bulk of the population in 20s, are likely to remain smokers even in adulthood, and are very important in the prevention and management of youth age as they incur personal and social costs from smoking. However, systematic health improvement projects for college students are practically lacking [4].

Meanwhile, college students' health-risk behavior is mixed with the characteristics of adolescents and adulthood. Smoking behavior is associated with a variety of factors, including gender, age, residential area, school life, lifestyle habits, and health concerns, and is more likely to result in other health risk behaviors than in none of them. That is, smoking increases the risk of drinking, physical activity, obesity and lack of sleep, and the rate of early sex experience. On the other hand, lower levels of subjective health awareness and mental health are reported to increase health risk behavior [9] [10] [11] [12].

According to a recent study by [13], the factors influencing college students' smoking behavior were statistically gender, grade, type of university (four-year or two-year), university location, residence type, and second-hand smoke exposure time. Female students had lower smoking levels than male students, and senior had 2.49 times higher smoking levels than freshman students. Two to three-year college students smoked 2.41 times higher than students at four-year universities, and private university students smoked 3.31 times higher

than those at national and public universities. It also differed depending on the location of the university. By type of residence, the smoking level of students living independently, such as self-contained or boarding houses, was 1.85 times higher than those of college students who had to live partially controlled lives, including their homes, relatives and dormitories.

3. Research Design and Analysis Model

3.1 Research Design

For the purpose of research on the demand for smoking among college students, one four-year university and one two-year college located in Seoul, and one four-year university and one two-year college located in Cheonan, Chungcheongnam-do were randomly selected and 250 questionnaires were distributed to each college. In a two-month survey, 930 questionnaires were retrieved. In addition, 913 questionnaires were used in the actual analysis, except for those that had high missing values and were difficult to utilize in the analysis. The content of the questionnaire consisted of questions about demographic characteristics (gender, age, parents' income, income type) and the characteristics of students (college type, grade, major category, residence). Questions related to the demand for smoking also included questions about whether to smoke or not and the number of cigarettes to smoke a day.

3.2 Research Model

Appropriate statistical analysis methods that can be applied in estimating consumer participation and consumption determinants for a good (In this study, participation and consumption decision on smoking) include sample selection models such as the Tobit model, the Double hurdles model, and the Heckman model. [14]. A double model is an effective method when the separation of participation decisions and consumption decisions is an important issue when modelling the demand for goods, and there are no special constraints on the variables that affect the process of decision-making participation and determination of consumption. To observe a positive consumption in a double model, it is assumed that the consumer must be a potential consumer for a given good and must actually consume that good [15]. The advantage of the double hurdler model over the Tobit model is that it accepts variables that have different influence on decision-making of participation and consumption. A double hurdle model can provide a wide range understanding of consumer behavior because it classifies consumer behavior in two stage. In other words, consumer behavior on smoking can be classified into a two-stage process. The first stage is the decision to participate in smoking, and the second stage is the decision on the amount of smoking. The double hurdle model is more useful than the Tobit model, because consumer behavior can be estimated with two stages, but it cannot be said that the double hurdle model is necessarily a better model than the Tobit model and produces only useful results. Because the demand for participation in smoking and the amount of smoking may be included in the same decision-making process, and the demand for participation and the level of smoking may be included in different decision-making processes.

The double hurdle model has been applied to a variety of disciplines due to its advantages in estimating the demand-and-spending determinants of consumer behavior in two stage. For example, alcohol beverage consumption determinants [16], tobacco demand determinants [17], instant food consumption determinants [18], meat consumption determinants [19] and travel expenditure determinants [20] are good examples.

4. Results

Table 1 shows the demographic characteristics of the sample and the characteristics of the sample, such as its majors in college, parents' income, major categories, and place of residence. A special point about the sample is that the number of questionnaires returned at two-year colleges is lower than that at four-year university.

Table 1. Characteristics of Samples (N=913)

Characteristics		Frequency(%)	Characteristics		Frequency(%)
Gender	Male	664(72.7)	Majors	Humanities	88(9.6)
	Female	249(27.3)		Sociology	258(28.3)
College type	4-year type	731(80.1)		Education	28(3.1)
	2-year type	182(19.9)		Engineering	314(34.4)
Grade	Freshman	103(11.6)		Natural science	80(8.8)
	Sophomore	198(21.7)		Medical	50(5.5)
	Junior	252(27.6)		Art, music and physical education	95(10.4)
	Senior	357(39.1)	Residence	Seoul	271(29.7)
Monthly Income(Won)	2millions or lower	350(38.3)		Metropolitan area	254(27.8)
	2 ~4 millions	300(32.9)		Province area	388(42.5)
	4 ~6 millions	173(18.9)	Parents' income type	Dual-income	367(40.2)
	More than 6 millions	90(9.9)		Single-income	546(59.8)

Table 2 shows the definitions of the variables used in the analysis and the basic statistics. For analysis purposes, each variable was treated as dummy variable with 1 and 0. For example, are treated as 1 for male students and 0 for female students to estimate whether they smoked.

Table 2. Definition of variables (N=913)

	variables	Definition	Standard deviation
Independent variables	Gender	Male=1, else=0	0.727(0.445)
	Grade	Freshman=1, else=0	0.216(0.412)
		Sophomore=1, else=0	0.276(0.447)
		Senior=1, else=0	0.391(0.488)

	College type	4-year type=1, else=0	0.800(0.399)
	College Location	Seoul=1, else=0	0.296(0.457)
		Metropolitan area=1, else=0	0.278(0.448)
	Majors	Humanities=1, else=0	0.096(0.295)
		Sociology=1, else=0	0.282(0.450)
		Education=1, else=0	0.030(0.172)
		Engineering=1, else=0	0.343(0.475)
		Natural science=1, else=0	0.087(0.282)
		Medical=1, else=0	0.054(0.227)
	Income type	Dual-income=1, else=0	0.401(0.490)
	Monthly Income(Won)	2 ~4 millions =1, else=0	0.328(0.469)
		4 ~6 millions =1, else=0	0.189(0.392)
		More than 6millions =1, else=0	0.098(0.298)
Dependent variable(1, 2)		Smoking participation status Smoking amount	0.280(0.449) 3.261(5.941)

Table 3 shows the first and second stage analysis of smoking demand determinants using the double hurdle model. First, according to the first stage analysis about whether smoking, male students have a much more positive influence on smoking demand (significant level 1%) than female students. In other words, male students are smoking much more than female students. By the grade, freshman there is analyzed that there is a positive influence (significant level 5 %) on smoking demand. Analysis of whether students belong to a four-year or two-year college showed that four-year university students have a negative impact on the smoking demand. These results can be interpreted as students of two-year college smoking much more than students of four-year universities. Colleges' located areas are classified in Seoul, metropolitan area, province and analyzed result, students who located in the Seoul have a negative influence (significant level 10%). If the reverse interpretation of the results is that college students in Province area other than Seoul smoke more.

Table 3. Determinants of Smoking Demand (N=913)

	Double hurdle model	
	Coefficient(t-ratio)	Coefficient(t-ratio)
Variables	Smoking participation	Smoking amount
Male	**1.113(7.639)*** **	**5.004(3.080)*** **

Freshman	**0.403(2.365)****	-1.132(-0.987)
Sophomore	0.228(1.297)	**-2.340(-1.861)***
Junior	0.189(1.038)	-1.491(-1.113)
4-year type	**-0.402(-2.943)*****	-0.206(-0.228)
College in Seoul	**-0.199(-1.696)*****	**-2.157(-2.537)****
College in Metropolitan area	-0.016(-0.149)	**-1.549(-2.000)****
Humanities	-0.139(-0.609)	**-5.746(-3.351)*****
Sociology	-0.066(-0.388)	**-1.967(-1.685)***
Education	**-1.002(-2.148)****	-5.979(-0.823)
Engineering	**-0.282(-1.711)***	**-3.228(-2.856)*****
Natural science	-0.262(-1.195)	**-2.821(-1.895)***
Medical	-0.092(-0.370)	**-4.272(-2.593)*****
Dual-income household	-0.024(-0.247)	**-1.867(-2.594)*****
2 ~4 millions	**0.191(1.661)***	-0.464(-0.555)
4 ~6 millions	**0.265(1.924)***	1.695(1.746)
More than 6 millions	**0.391(2.238)****	**1.999(1.731)***
Constant	**-1.301(-5.395)*****	12.559(6.002)
Sigma	-	**4.908(19.790)*****
Log likelihood function	-474.4199	-744.8647
Chi squared = 134.5723	.0000000	-
Observations after truncation	-	252

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

The major categories are categorized as humanities, sociology, education, engineering, natural sciences and medical. As the result of analysis, the education and engineering students had negative influence at 5% and 10% significant levels respectively. On the other hand, the rest of the majors have no influence on the smoking demand. The results of estimating parents' monthly income as a variable showed that there was a statistically significant influence on each layer of income.

The dependent variable for the second stage analysis of the double hurdle model is the amount of smoking. The first stage estimates the decision to participate in smoking, and the second stage estimates the amount of smoking. In gender, Male has a positive influence on the amount of smoking compared to Female (significant level 1%). It is analyzed that Sophomore students have negative influence (significant level 10%). There is no difference between four-year university students and two-year college students. In the analysis by colleges' location, students at universities in Seoul and Metropolitan area had negative influence, while students at universities in Province area had positive influence. The analysis of smoking volume classified by major showed that Humanities and Sociology had a negative influence of 1% and 10%, respectively. In addition, Engineering students (1%), Natural science students (10%), and Medical students (1%) can also be interpreted as having negative influence. Students in dual-income families as a parents' income type was of negative influence at the 1% significant level and students in high-income households whose parents' monthly income exceeded 6 million won had positive influence on the amount of smoking at the 10% level.

5. Discussion

This study focused on smoking status among college students in Metropolitan area and college students in Province area. Because the results of this study tried to analyze from a different perspective from the preceding studies, it is possible to compare some variables, but not most of them are not. For example, the results of higher smoking rates and amounts of male students compared to female students, or the results of higher smoking rates for students at college located in Province area compared to Metropolitan areas are same with the results from the preceding studies. However, it is impossible to compare the analysis result about the smoking participants and the amount of smoking by the major category.

Through these findings, the following policies can be proposed. The smoking rate of male students in Korea is relatively higher than of female students, but the smoking rate of female students is also on a steady rise. This may be inferred that women have an incentive to break away from the traditional gender stereotype through smoking, and it may not be related to the social atmosphere that emphasizes gender equality. Therefore, it is necessary to prepare policy and action for the increase in smoking young women.

There are some limitations to this study. First, the research design attempted to analyze the smoking status of college students and the various factors affecting smoking, but omitted the application of various interesting variables such as parents' correlation with smoking, students' allowance, part-time job, stress, and drinking. And also failed to apply whether completion of the anti-smoking program that recently held at colleges and students' opinions about smoking and non-smoking. The application of these variables is requested to the following researchers who may be derived from this study.

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