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Abstract

Using Japan's prefecture-level panel data from 1989-2001, this paper examines the influence of the social norm on a person's smoking behavior when the complementary relationship between smoking and drinking is taken into account. The key findings through a dynamic panel model controlling for unobserved prefecture-specific fixed effects are as follows: (1) Influence from others is stronger when people live more closely and cohesively. A tightly knit society results in a reduction of smoking through smoking-related interaction. (2) Smoking and drinking have a complementary relationship, and it is stronger when the consumption of alcohol is greater at the start. (3) The complementary relationship between smoking and dinking is attenuated if the cost of committing the annoying conduct (i.e., smoking) is high.

Overall, this empirical study provides evidence that the psychological effect of the presence of surrounding people has a direct significant effect upon smoking behavior and, further, that it attenuates the complementary relationship between smoking and drinking, thereby reducing cigarette consumption. These results indicate that not only formal rules but also tacitly formed informal norms are effective deterrents to smoking.

JEL classification: I10; I12; Z10

Keywords: Smoking behavior, Social norm

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I. Introduction

It is generally acknowledged that Japan's per capita cigarette consumption and smoking rate has been remarkably high among major industrialized nations (World Bank, 1999). However, in Japan some literature has pointed out that compared with other industrialized nations, the government did not sufficiently make an effort to raise public awareness about the health hazards of smoking (Yorozu and Zhou, 2002; Luo et al., 2003)[1]. For instance, Yorozu and Zhou (2002) refer to the absence of antismoking ordinances and regulations and the lack of dissemination of information about the health hazards of smoking. Nonetheless, the consumption of cigarettes has declined gradually in Japan. Thus, given that the formal rules and laws enacted by the government were not sufficiently effective in reducing cigarette consumption, there should be other mechanisms involved in the control of smoking which has lead to a reduction of cigarette consumption.

A person innately does not pay much attention to which side of the road they drive on, and thus they would normally choose to simply drive on the same side as everyone else. This phenomenon shows an aspect of human nature that relates to social existence. The influence of the attitude and conduct of others on a person's behavior seems apparent among neighbors and colleagues in schools and workplaces (Beker and Murphy, 2000; Brock and Durlauf, 2001; Crane, 1991; Evans et al., 1992; Gaviria and Rapahel, 2001; Glaeser et al., 1996; Manski, 1993). The interactive mechanism above also applies to a person's choice of demand behavior. What others consume stimulates a person's demand for it as well. That is to say, the more popular goods are, the more people want them. Consequently, interactions among people through conversations and daily life may affect aggregated demand behavior toward goods such as cigarettes (Powell et al., 2005). When this interactive mechanism is considered, as Coleman (1990) pointed out, actors harmed by an action that benefits the actor in control of the action experience negative externalities, as exemplified by nonsmokers sitting near a smoker. The problem for nonsmokers, therefore, is how to limit such actions taken by smokers.

Compared with Europe or North America, in general the smoking prevalence of females is remarkably lower than that of males in the Asian nations of Japan, Korea,

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[1] The situation in Korea is similar (Kim and Seldon, 2004). Other existing work examining smoking behavior in Asia includes Japan (Haden, 1990) and China (Yuanliang and Zongyi, 2005).

Thailand, and Singapore. For example, the smoking prevalences of males and females in the U.S.A are 27.7% and 22.5 %, respectively. On the other hand, those of Japan are 59.0 % and 14.8 %, respectively (Worldbank, 1999). These data imply that as a whole the smoking prevalence of Japan is higher than that of the U.S.A, although that of females is distinctly lower in Japan than in the U.S.A. Japan ratified its "Convention on the Elimination of all Forms of Discrimination Against Women" in 1979 at the United Nations General Assembly[2]. Consequently females have risen in social standing and therefore have a larger influence on the social lives of the Japanese. With regard to smoking, most females in Japan are non-smokers who dislike smoking behavior. As the social status of females has risen, the anti-smoking atmosphere has become more prevalent[3]. Such an atmosphere also seems to shape the general anti-smoking social norm in Japan.

If one smokes in a public place and the surrounding people indicate their annoyance against him, then the person may feel embarrassed and thereby generate the psychological cost of committing the rude behavior of smoking. The psychological cost of smoking depends on anti-smoking social norms, which are shaped by local interactions (Funk, 2005). Furthermore, the apprehension of bad behavior such as crime or smoking depends on the watchfulness of citizens (Huck and Kosfeld, 2007). Neighborhood watch is likely to be more effective if the community members are more closely related. Accordingly, assuming that neighborhood watch and psychological cost are complementary and that the majority of a community's members consist of nonsmokers, then the social norm that bans community members from smoking will be stronger in a more cohesive community. In the long run, the entire community will come to ostracize those who break such informal rules, such as smokers (Posner and Rasmusen, 1999). I believe that informal rules such as social norms are the key determinants of the attitudes of smokers in Japan. This is why in this study I pay particular attention to the role of social norms in the regulation of smoker attitudes and thus include the proxy variables of social disorganization[4].

The empirical study of Dee (1999) and Gruber et al. (2003) provides evidence of a robust complementarity between cigarettes and alcohol[5]. To put it differently,

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[2] See http://www.un.org/womenwatch/daw/cedaw/.

[3] Due to limitations of data, the effect of females on cigarette consumption is not directly estimated in this research.

[4] The cohesiveness of society has another aspect as well. According to Putnam (2000), social networks built in a cohesive society may reinforce healthy norms, socially isolated people are more likely to smoke ore engage in various health damaging behaviors.

[5] Recently, Arcidacono et al. (2007) also investigate the relationship between smoking

reductions in drinking are associated with a lower prevalence of smoking. Such a complemetarity seems to be affected by the informal social norm created through the watchfulness of the neighborhood or colleagues at work. The anti-smoking social norm appears to attenuate the complementarity between smoking and drinking. Nevertheless, the empirical links between social norms and complementary goods has yet to be considered in the literature. Therefore, the object of this paper is to explore such links using the panel data of Japan from 47 Japanese prefectures for the years 1989-2001 and controlling for unobservable fixed effects. The contribution of this paper is a combined analysis of the importance of the social norm and complementary goods on smoking behavior.

This paper also contributes to the cigarette demand literature by examining the determinants of smoking incorporating both the direct and indirect effects of the social norm (via reduction of the complementarity of alcohol consumption) on smoking behavior. The organization of this paper is as follows: Section 2 surveys cigarette consumption in Japan and advances a testable hypothesis. Section 3 presents the simple econometric framework. Section 4 discusses the results of the estimations. The final section offers concluding observations.

II. Review of cigarette consumption in Japan

Review

I begin this section by studying the figures that outline the current state of smoking in Japan. A cursory examination of Figure 1, which demonstrates the transition of per capita consumption of cigarettes in Japan, suggests that consumption has declined gradually over time. Subsequently, Figure 2 illustrates the average per capita consumption of cigarettes by prefecture for both high alcohol consumption and low consumption groups, which are equally divided by the initial year's alcohol consumption[6]. Figure 2 reveals that the consumption of cigarettes by the high alcohol consumption group is obviously higher than that of the low alcohol consumption group. On the other hand, the downward slope of the high alcohol consumption group is steeper than that of the low alcohol consumption group. This implies that the consumption of alcohol is positively associated with that of cigarettes and that the decrease in the consumption of cigarettes is more evident in the high alcohol consumption group than in the low consumption group. In other words, although the complementarity of smoking and drinking can be observed, it becomes weaker over

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and drinking.

[6] The initial year is defined as 1989.

time in prefectures where alcohol consumption is higher in the initial year. As a result, the difference in smoking consumption between them diminishes over time.

The relationship between cigarettes and alcohol consumption is also indicated in Figure 3, in which alcohol and cigarette consumption are represented in the horizontal and the vertical axis, respectively. Further, Figures 3 a) and 3 b) show the high and low alcohol consumption groups, respectively, which are divided in a same manner of Figure 2. From these figures, it can be seen that a positive relationship is observed more clearly in Figure 3 a) than in Figure 3 b), meaning that the complementarity between drinking and smoking is more obvious if the consumption of alcohol is higher.

To sum up the evidence presented above, smoking is associated more positively with drinking despite the fact that their complementarity declines more rapidly in the areas where the consumption of alcohol is higher.

Hypothesis

As earlier suggested, the per capita cigarette consumption in Japan has dominated industrialized nations in recent years. However, there is a remarkable difference in the smoking prevalences of males and females, which are about 60 % and 15 %, respectively (World bank, 1999). A growing body of literature suggests that social interaction mechanisms may be crucial determinants of behavior. It is asserted that an increase in the prevalence of a given behavior at the peer level may lead to an increased probability of such behavior at the individual level (Manski, 1993; Becker, 1996; Becker and Murphy, 2000; Glaeser et al., 1996). Assuming that the society consists mainly of males in Japan, there may be a social interaction mechanism that enhances the prevalence of smoking since the majority of people in the society are smokers. Indeed, it is widely acknowledged that females have a relatively low social position in Japan. Under such circumstances, it is generally believed to be merely a matter of etiquette in Japan to ask another person sitting beside one for permission to smoke (Yorozu and Zhou, 2002).

However, recently the social position of females has improved and females have become influential in the modern society of Japan. This change reflects the Equal Employment Opportunities Law for Men and Women, which was enacted in 1985 in order to improve the employment opportunities of females. In the process of their rise in social position, females tend to increase their influence on modern social behaviors such as smoking at workplaces and accelerate the social norm of “not smoking for the sake of nonsmokers” through smoking-related interaction[7]. The higher the

[7] Smoking related interactions are supposed as follows: A female tends to ask smokers

psychological cost, the stronger the nonsmoking norm becomes. The strength of nonsmoking norms plays a critical role in deterring members of a society from smoking. In short, as the social standing of females improves, the nonsmoking social norm emerges and leads to decreases in cigarette consumption. Informal norm enforcement among interacting male and female members of society tends to be stronger and more effective if the members communicate more cohesively and closely (Putnam, 2000). Accordingly I raise the following Hypothesis 1 concerning the effect of social norms on smoking.

Hypothesis 1: A tightly knit society can achieve a reduction in smoking through smoking-related interaction.

Dee (1999) presents evidence of the complementarity of drinking and smoking that is in line with the findings shown in the figures presented in the previous subsection. In addition to their complementarity, both cigarettes and alcohol are considered to be addictive goods, such that the initial consumption of alcohol is positively associated with the subsequent consumption of cigarettes. Hence, my conjecture is that their complementarity tends to have the property of addictive goods. Thus the past consumption of alcohol should stimulate the current complementarity between smoking and drinking. Accordingly, I advance the following empirical Hypothesis 2 concerning this complementarity.

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Hypothesis 2: The complementarity of smoking and drinking is stronger when the consumption of alcohol is greater initially.

The psychological cost of committing a rude behavior comes from the watchfulness of the neighborhood or colleagues at a workplace. On the condition that the cost rises, smokers drink but are less likely to smoke at the party where nonsmokers are present even if smokers would like to jointly consume cigarettes and alcohol. This psychological cost is expected to have an influence not only directly on smoking but also indirectly on its complementarity. As a consequence, I postulate Hypothesis 3 with respect to the effects of the informal social norm upon smoking.

Hypothesis 3: The complementarity between smoking and dinking is attenuated if the

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at work not to smoke. When females are equally employed as males, then smokers are more likely to be informed that their smoke bothers someone at work.

cost of committing the annoying conduct of smoking is high.

III Model

Data

Except for cigarette price, data used in the regression estimation as independent variables are collected from Asahi Shinbunsha (various years). The price data is obtained from the Japan Statistical Yearbook (various years) published by the Statistics Bureau of the Ministry of Internal Affairs and Communication. The structure of the data is panel, consisting of 47 prefectures and spanning 13 years (1989 - 2001). Hence the raw data set includes various prefecture-level data on various variables. Table 1 depicts the descriptive statistics for all of the variables used in the regression estimation.

Econometric Framework

To test the hypotheses raised in the previous section, first I examine whether the social norm reduced the current cigarette consumption directly. Second, I examine how the social norm attenuates the complementarity of alcohol and cigarette consumption.

Following Becker and Murphy (2000), the estimated function takes the following myoptic addiction form[8]:

$$CIGA_{it} = \alpha_1 CIGA_{it-1} + \alpha_2 PRIC_{it} + \alpha_3 DENS_{it} + \alpha_4 SN1_{it} + \alpha_5 SN2_{it} + \alpha_6 DSN1_{it} + \alpha_7 DSN2_{it} + \alpha_8 ALCOL_{it} + \alpha_9 INCOM_{it} + \alpha_{10} SERVIC_{it} + \alpha_{11} CAR_{it} + \alpha_{12} POP_{it} + \delta_t + \nu_i + u_{it},$$

where $CIGA_{it}$ represents the dependent variable in prefecture i and year t. α's represents the regression parameters. In this estimation, as the main stress does not fall on the rational addictive behavior, I hypothesized that current cigarette consumption depends on past consumption but not future consumption. If the myoptic addictive behavior holds, then the expected signs of the lagged *CIGA* and *PRIC* become positive and negative, respectively[9].

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[8] The focus of this paper is not on rational addictive behavior. I thus used the myoptic function form. Nonetheless, when the rational addiction model is employed, the results of estimation are unchanged.

[9] Although the price measure is a single nationwide uniform cigarette price in Japan, the deflator is different among prefectures. The cigarette price can be deflated by the consumer price index, and therefore the relative cigarette price varies across

δ_t, v_i, u_{it} represent the unobservable specific effects in the t th year (a fixed effect time vector), the individual effects of i 's prefecture (a fixed effects prefecture vector) and an error term, respectively. δ_t represents the year specific effects and v_i holds the time invariant feature, while u is an error term. The structure of the data set used in this study is panel, and the independent variables include a lagged dependent variable. To address potential endogenous problems with the lagged independent variable, I carry out dynamic panel estimation developed by Arellano-bond (Baltagi, 2005), as dynamic panel models allow past realizations of the dependent variable to affect its current level. In addition, special attention must be paid to the omitted variable bias stemming from unobservable individual specific effects. This can be also controlled for by means of dynamic panel estimation. Year dummies were also incorporated to subdue δ_t,which represents the conditional and structural changes at the macro level that could affect cigarette consumption.

Proxies for social norms

Nonsmokers would suffer seriously from the smoking of surrounding people if they lived in a densely populated area since the externality of smoking is strong and directly affects others. Nonsmokers have a tendency to request smokers not to smoke or to express their annoyance with the smoking behavior. This is why the expected signs of *DENS* representing the density of the population measured by the population per km^2 is negative.

I now proceed to characterize the social norm that captures the informal social pressure on smokers from nonsmokers. The cost of annoying others depends on the social norms, which are shaped by local interactions (Funk, 2005). Individuals are more apt to smoke due to the decrease in the expected cost of annoying surrounding people such as community members or workplace colleagues if the community is disorganized and social norms are weak. According to the view of Putnam (2000), social disorganization can be regarded as the engine of rude behavior. Such disorganization undermines the social norms and marks urban areas where population turnover is high, one's neighbors are anonymous, and local organization is rare. The degree to which one is integrated into one's community depends upon the community's condition. To borrow an argument of Putnam (2000), frequent movers have weaker ties within the community, and so mobile communities seem to have less interactivity among neighbors than more stable communities. To put it differently, the more mobile a community is, the weaker the connectedness within it becomes. Hence, *DSN*

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prefectures.

1 and *DSN2,* denoting the number of population turnovers within a prefecture and the number of immigrants from other prefectures, respectively, can be considered as proxies for the decay of social norms. Accordingly, these coefficients are predicted to take a positive sign.

The following independent variables are used as proxies of the social norm. In traditional Japanese daily life, public baths were used by community members who, apart from the wealthy, ordinarily lived in houses without a private bath. Through the use of such baths people could get acquainted with neighbors and generate a social network. In modern Japan, most residences have their own baths, and people are therefore more likely to take a bath at home. However, a new type of public bath featuring more deluxe baths and saunas has recently developed, and these are used by all sectors of society, thus providing a place to meet neighbors and form social capital. The community center can be also considered as a place where people interact closely and enhance the cohesiveness among community members. Therefore the number of public baths and community centers, represented as *SN1* as *SN2*, respectively, where people can contact neighbors and deter them from annoying the others surrounding them, can thus also serve as a proxy for social norms. Therefore, I expect the signs of *SN1* and *SN2* to be negative.

Control variables

In addition to the social norm, I also focus on the effects of drinking[10] following the argument of Dee (1999) that the consumption of alcohol and cigarettes might constitute an important case as these goods are complementary. Thus, the *ALCOL* standing for alcohol consumption is expected to take a positive sign[11].

The cost of smoking is not only psychological but also economical. In the workplace, if ones customers, business partners, or counterparts dislike smoking, then a smoker can not build good relationships with them, and as a result team performance in the workplace is lowered. In particular, the cost of smoking appears to be high in the service sector, as employees tend to work within a locked room and can suffer more health damage from smoking. Following the enactment of a restrictive smoking policy (Gottlieb et al., 1990; William et al., 1999), the informal rule

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[10] The case Dee (1999) presents is of teen smoking and drinking. I conjecture that this relationship holds in not only teens but also in other generations.

[11] It should be noted that the price of alcohol must be used as the explanatory variable in order to more precisely examine the complementarity. However, I found difficulty in measuring the alcohol price since there are a number of kinds of alcohol, such as beer, whiskey, and wine, etc.

of preventing smoking should also form naturally and necessarily become effective. Hence, *SERVI*, denoting the number of service sector employments, would take a negative sign. Similarly, the space inside vehicles is closed, and therefore people riding inside vehicles should be more sensitive to smoking and to their health suffering more serious damage from its effects. The sign of *CAR*, which represents the number of vehicles, is expected to be negative.

3.2.4. Interaction terms with alcohol

In the subsequent estimation, I incorporate the additional cross products of $ALCOL_{it}$ and some dependent variables as follows: $DENS_{it}*ALCOL_{it}$, $SN1_{it}*ALCOL_{it}$, $SN2_{it}*ALCOL_{it}$, $DSN1_{it}*ALCOL_{it}$, and $DSN2_{it}*ALCOL_{it}$. As stated previously in Hypotheis 3, the complementarity between smoking and drinking becomes weaker when the cohesiveness of a tightly knit community leads to raising the psychological cost of smoking. If this holds, then the expected signs of $DENS_{it}*ALCOL_{it}$, $SN1_{it}*ALCOL_{it}$,, and $SN2_{it}*ALCOL_{it}$ become negative. On the other hand, $DSN1_{it}*ALCOL_{it}$ and $DSN1_{it}*ALCOL_{it}$ are expected to take a positive sign.

IV. Results

Basic results

Tables 2 and 3 present the results of the dynamic panel estimations. Estimations were conducted using not only the whole sample shown in (1) and (4), but also the high alcohol consumption prefectures in columns (2) and (5) and the low alcohol consumption prefectures in (3) and (6). Information derived from the estimations of splitting samples can be of great use for comparing the differences of social norm effects on smoking behavior between the two groups. Looking at the second row from the bottom of Tables 2 and 3 reveals that there is no second-order serial correlation for disturbances of the first-differenced equation for all dynamic panel (GMM) estimations. Therefore, Arellano-Bond type GMM estimators are consistent.

From the results of columns (1) and (4), it can be seen that *CIGA* and *PRIC* take positive and negative signs, respectively, which is in line with the myoptic addiction model. Turning to the key variables of this research, most of the proxies for the social norm or the decay of the social norm such as *DENS, SN1, SN2, DSN1,* and *DSN2*, take the predicted signs while being statistically significant, which is consistent with Hypothesis 1. *ALCOHOL*, *SERVI*, and *CAR* also take the expected signs and are statistically significant. *INCOM* takes a negative sign, implying that cigarettes are

inferior goods. This finding is contrary to that of the existing literature (Haden, 1990; Yorozu and Zhou, 2002). The reason why cigarettes become inferior goods is likely due to the emergence of substitute goods in the process of the economic development in Japan. These results strongly support my prediction that the social norm plays an important role in the decrease of cigarette consumption.

Next, let us compare the results of the high and low alcohol consumption groups. In particular, I will focus upon columns (2) and (3), where all explanatory variables are included. In column (2), whereas the coefficients of *DENS* and *SN1* take negative signs, those of *DSN1* and *DSN2* take positive signs, and they are all statistically significant with the exception of *DENS* and *SN1.* The fact that the coefficient of *ALCOL* takes the expected positive sign implies that the complementarity of dinking and smoking is valid. On the other hand, it is interesting to observe that in column (3) most of the proxies for the social norm or the decay of the social norm do not take the predicted signs, and none of them are statistically significant. Furthermore, contrary to the expected result, the coefficient sign of *ALCOL* is negative. When I compare the results of columns (5) and (6) in the alternative specification, the results are unchanged. Considering Figure 2 and Table 2 together, the social norm effects on smoking depend upon the initial consumption of alcohol, which is positively associated with the initial consumption of cigarettes. The effects of antismoking norms declined as the initial consumption of smoking and drinking fell, presumably because the smaller the externality from smoking, the less aggressive nonsmoker attitudes toward smokers became, which is in line with previously published results finding that the proportion of nonsmokers that suggested smokers to quit smoking decreased after the implementation of a restrictive smoking policy in the U.S.A. (Gottlieb et al., 1990). Another likely reason for the decrease of antismoking norms is that there becomes fewer opportunities for nonsmokers to express their opinions of annoyance to smokers as the number of places where people are allowed to smoke decreases.. In short, these results can be interpreted to mean the following. (1) The social norm has a tremendous effect on smoking when the consumption of alcohol is high, but not when it is low. (2) The complementarity between smoking and drinking depends upon the initial consumption of alcohol, confirming Hypotheis 2.

The estimation results are presented in Table 3, where the problem of simultaneous consumption between alcohol and cigarettes is controlled for by using the lagged value of *ALCOL.* Compared with the results shown in Table 2, I found that, as a whole, these results were no different, and therefore it can be concluded that both Hypothesis 1 and 2 were supported.

The impact of norms on complementarity

Switching now to the interaction terms of $ALCOL_{t-1}$ and the proxy variables for the social norm or its decay, the results are shown in Table 4 and Table 5. In columns (2) and (4) of both tables, population rates of 20-24, 25-39, and over 64 are used as additional instruments in order to control for endogeneity bias. As the focus of this study is on the impact of the social norm on the complementarity of smoking and dinking, it can be seen from Table 4 that in all estimations, as expected, the signs of $DENS_{it}*ALCOL_{it}$ are negative while those of $DSN1_{it}*ALCOL_{it}$ and $DSN2_{it}*ALCOL_{it}$ are positive and statistically significant with the exception of $DSN2_{it}*ALCOL_{it}$[12] in column (3). As for $SN1_{it}*ALCOL_{it}$, its coefficient signs are not stable although it is statistically insignificant in all estimations. With respect to $SN2_{it}*ALCOL_{it}$, its coefficients take the predicted negative signs and are statistically significant in columns (3) and (4) at the 1 % level. As shown in Tables 2 and 3, *SERVI* and *CAR* take significant negative signs, conforming to the expectations.

Turning to the results of the interaction terms of the lagged *ALCOL* used to eliminate the problem of simultaneous alcohol consumption, the results in Table 5 show that the dynamic panel estimation is suitable because there is no second-order serial correlation for disturbances of the first-differenced equation for all estimations[13]. Taken as a whole, the results after controlling for the endogeneity of alcohol consumption are the same as those shown in Table 4, and therefore are robust to alternative specifications. My interpretation of the results drawn from Tables 4 and 5 is consistent with the prediction described earlier and supports Hypothesis 3.

Up to this point I have presented the various estimated results of this study. Summing them up, I arrive at the conclusion that the estimation results examined in this section are consistent and reasonably support Hypotheses 1 to 3 raised in the preceding section.

V. Conclusion

The consumption of cigarettes is considered to be influenced by the informal social norm and social interaction. Therefore, the mechanisms related to the social norm and social interaction seem to be more influential among industrialized countries, and especially in Japan since it is a relatively homogeneous society. However,

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[12] It must be noted that there is a second-order serial correlation for disturbances of the first-differenced equation in columns (3) and (4).

[13] The causality of smoking and drinking is not evident, and thus the simultaneous problem arises.

researchers have heretofore not paid attention to this relationship, and therefore little is known about the effect of the social norm on smoking behavior.

The key findings through a dynamic panel model controlling for unobserved fixed effects are as follows:

(1) The influence from others is stronger when people live more closely and cohesively together. Thus, a tightly knit society can help to create a reduction of smoking through smoking-related interaction.

(2) Smoking and drinking are complementary, and this relationship is stronger when the consumption of alcohol is greater initially.

(3) The complementarity between smoking and drinking is attenuated if the cost of committing the annoying conduct (i.e., smoking) is high.

Summing up the evidence presented here, overall this empirical study provides evidence that the high psychological cost caused by those surrounding smokers has a direct significant effect upon smoking behavior and, further, that it attenuate the complementarity between smoking and drinking, thereby reducing cigarette consumption. I found that this research helps to explain one aspect of human nature related to social existence. The influence of the attitude of others on a person's behavior seems apparent. The findings derived from the current investigation using regression analysis can further bridge the complementary relationship between social norms and smoking behavior, and as such they are of value to researchers.

My argument is in part based on the critical assumption that as the social position of females improved, it more strongly affected smoking behavior. Nevertheless, it is not clear whether this assumption is valid. A future direction for this study will be to examine how the improvement of the social position of females has an influence on smoking behavior and thereby helps reduces the consumption of cigarettes in Japan.

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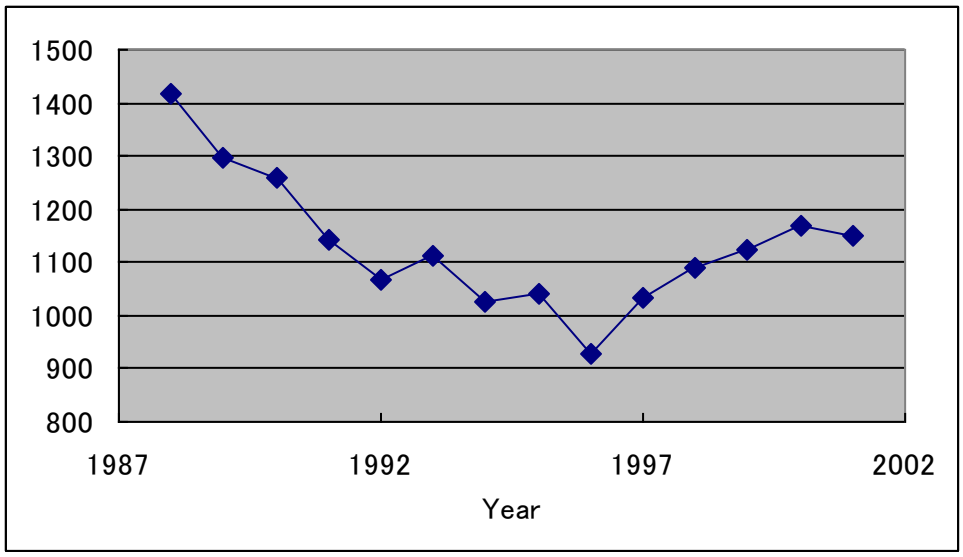


Fig 1. Monthly expenditures on cigarettes per household.

Notes: Data source is *Minryoku* edited by Asahi Shinbunsha.

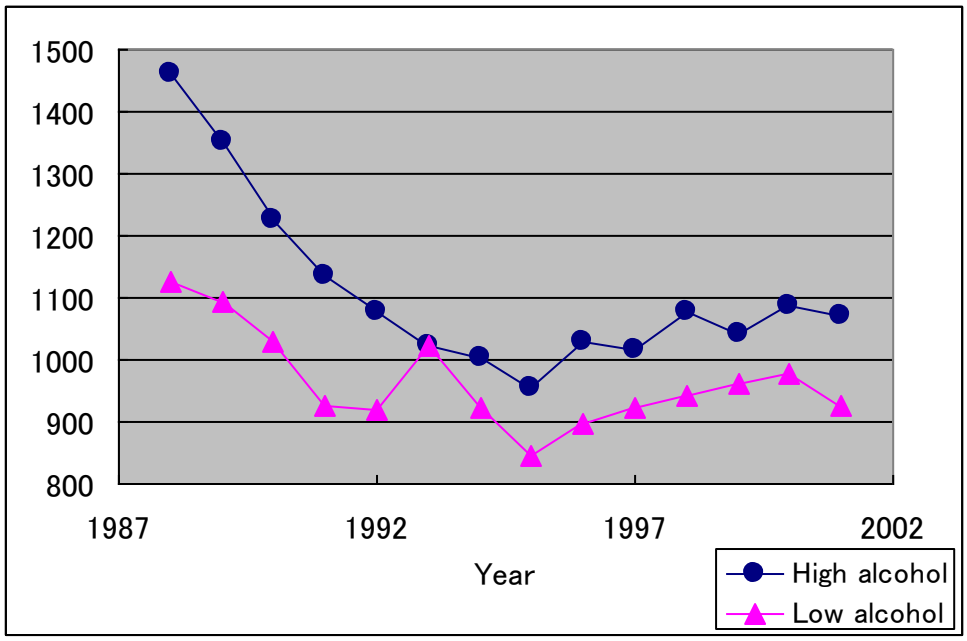
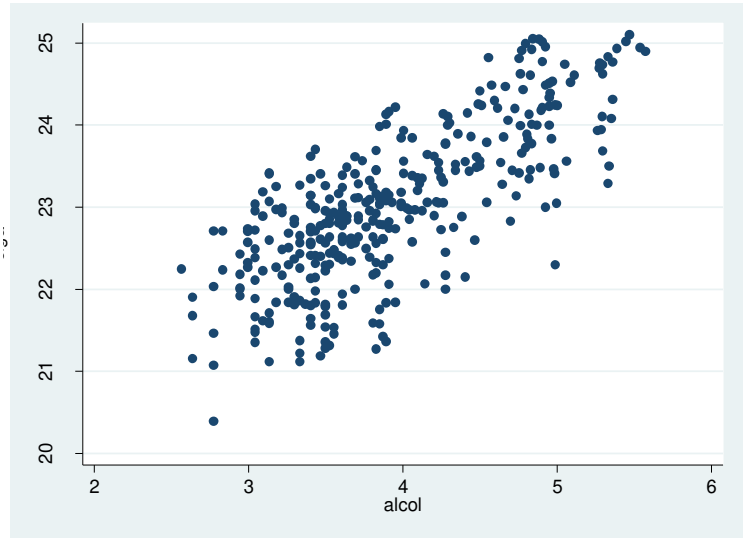
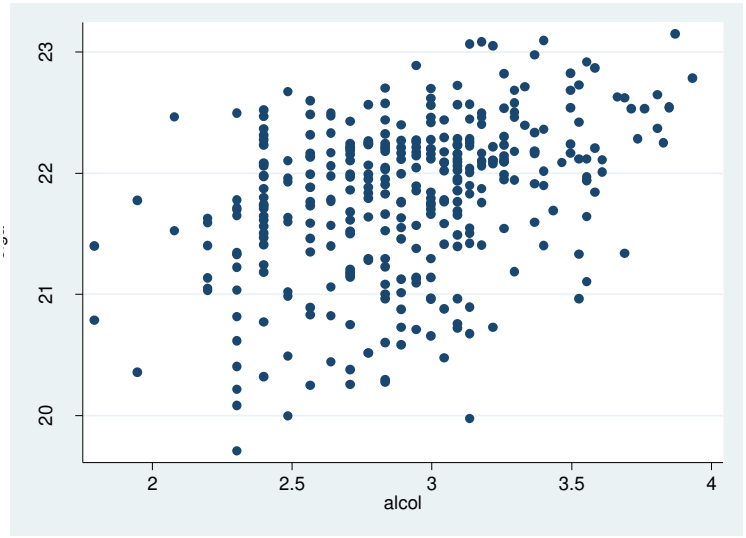


Fig 2. Monthly expenditures on cigarettes per household separately for high alcohol consumption area and low alcohol consumption area.

Notes: Data source is *Minryoku* edited by Asahi Shinbunsha.



a) High alcohol consumption region



b) Low alcohol consumption region

Fig 3. Relationship between monthly expenditures on cigarettes per household and alcohol consumption, separately for high alcohol consumption area and low alcohol consumption area.

Notes: Data source is *Minryoku* edited by Asahi Shinbunsha.

Table 1 Variable definitions, means, and standard deviations.

Variables	Definition	Mean	Standard deviation
CIGA	Cigarette expenditure [a]	9,370	12,909
PRIC	Cigarette price (Yen)	227.2	13.9
DENS	Density of population(number of population per km^2)	623	1,060
SN1	Number of public baths	547	525
SN2	Number of community centers	377	277
DSN1	Number of population turnovers within prefecture [b]	72.1	86.1
DSN2	Number of immigrants from other prefectures [b]	64.0	79.9
INCOM	Regional real income [a]	8,228	9,297
ALCOL	Alcohol consumption [a]	41.9	41.9
SERVI	Number of employments of service sector [b]	834.0	867.3
CAR	Number of cars [b]	142.8	122.2
POP	Total population [b]	2,645	2,387

Notes: [a] In Millions of Yen.

[b] In 1000s.

Values are the simple averages of the yearly values over the period 1988-2001. Data source is *Minryoku* edited by Asahi Shinbunsha.

Table 2. Regression results on cigarette smoking.

Variables	(1) *CIGA ALL*	(2) *CIGA HALCOL*	(3) *CIGA LALCOL*	(4) *CIGA ALL*	(5) *CIGA HALCOL*	(6) *CIGA LALCOL*
CIGA-1	0.12**	0.15**	0.002	0.06	0.10*	-0.02
	(2.98)	(2.76)	(0.04)	(1.60)	(1.81)	(-0.41)
PRIC	-30.0*10^7	-135.3	74.1	-51.6	-35.1	92.6
	(-0.14)	(-0.38)	(0.98)	(-0.25)	(-0.10)	(1.24)
DENS	-63.3*10^7	-62.1	-129.6	-95.7*	-72.8	-192.4*
	(-1.24)	(-0.90)	(-1.39)	(-1.92)	(-1.07)	(-2.18)
SN1	-1.86	6.08	-2.67	-26.1**	-20.1**	-1.22
	(-0.25)	(0.63)	(-0.44)	(-4.18)	(-2.48)	(-0.21)
SN2	-7.58	-63.3*	0.24	-4.23	-71.4**	-0.38
	(-0.65)	(-2.16)	(0.09)	(-0.37)	(-2.49)	(-0.15)
DSN1	190.1**	173.9**	-138.2	126.6**	118.1*	-135.3
	(4.01)	(2.61)	(-1.44)	(2.80)	(1.83)	(-1.43)
DSN2	230.7**	224.9**	-98.7	144.9**	138.1*	-130.7
	(3.85)	(2.91)	(-1.14)	(2.53)	(1.88)	(-1.55)
ALCOL	224.9**	251.2**	-30.9	194.2**	198.4**	-19.2
	(6.14)	(4.79)	(-1.32)	(5.48)	(3.95)	(-0.85)
INCOM	-2.13**	-1.44*	-1.00	-4.00**	-3.02**	-1.99*
	(-3.75)	(-1.93)	(-1.02)	(-8.50)	(-4.65)	(-2.29)
SERVIC	-141.4**	-129.2**	-43.0**	-145.3**	-130.2**	-38.1**
	(-12.9)	(-8.51)	(-3.08)	(-13.6)	(-8.74)	(-2.79)
CAR	-128.5**	-140.6**	-67.8*			
	(-6.19)	(-4.71)	(-2.27)			
POP	96.6**	86.3**	47.1*	125.9**	105.2**	65.0**
	(4.67)	(3.06)	(1.68)	(6.37)	(3.82)	(2.41)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Second-order autocorrelation	Z=0.55 p-value=0.58	Z=0.15 p-value=0.88	Z=1.61 p-value=0.10	Z=0.84 p-value=0.40	Z=0.83 p-value=0.40	Z=1.18 p-value=0.23
Sample	564	288	276	564	288	276
Groups	47	47	47	47	47	47

Notes: Numbers in parentheses are z-statistics obtained by robust standard error. * and ** indicate significance at 5 and 1 per cent levels respectively (one-sided tests).

Table 3. Regression results on cigarette smoking.

Variables	(1) *CIGA ALL*	(2) *CIGA HALCOL*	(3) *CIGA LALCOL*	(4) *CIGA ALL*	(5) *CIGA HALCOL*	(6) *CIGA LALCOL*
CIGA-1	0.11**	0.15**	-0.005	0.06	0.11*	-0.02
	(2.63)	(2.54)	(-0.08)	(1.61)	(1.95)	(-0.35)
PRIC	-61.1	-179.5	23.3	-52.0	-70.1	40.2
	(-0.28)	(-0.48)	(0.31)	(-0.25)	(-0.19)	(0.54)
DENS	-91.5*	-87.2	-89.9	-128.8**	-104.8	-143.9*
	(-1.75)	(-1.20)	(-0.97)	(-2.53)	(-1.47)	(-1.66)
SN1	-11.2	-6.63	-2.45	-34.3**	-29.1**	-1.40
	(-1.53)	(-0.69)	(-0.40)	(-5.42)	(-3.54)	(-0.24)
SN2	-6.94	-56.3*	0.81	-4.24	-64.5*	-1.26
	(-0.58)	(-1.84)	(-0.31)	(-0.36)	(-2.16)	(-0.49)
DSN1	163.1**	121.3*	-173.1*	87.6*	60.9	-168.1*
	(3.30)	(1.73)	(-1.81)	(1.87)	(0.91)	(-1.77)
DSN2	215.5**	198.4**	-96.1	127.9*	118.1	-123.5
	(3.49)	(2.47)	(-1.11)	(2.17)	(1.54)	(-1.47)
ALCOL-1	168.5**	144.6**	37.6	107.7**	68.3	43.1*
	(4.07)	(2.39)	(1.56)	(2.74)	(1.21)	(1.83)
INCOM	-1.91**	-1.31*	-1.03	-3.90**	-2.88**	-1.80*
	(-3.21)	(-1.65)	(-1.06)	(-8.02)	(-4.25)	(-2.06)
SERVIC	-153.2**	-140.8**	-40.8**	-155.3**	-138.7**	-36.8**
	(-13.8)	(-8.93)	(-2.93)	(-14.3)	(-8.97)	(-2.69)
CAR	-132.5**	-133.1**	-52.1*			
	(-6.05)	(-4.20)	(-1.78)			
POP	117.1**	109.4**	33.8	149.5**	130.1**	48.8*
	(5.61)	(3.72)	(1.21)	(7.54)	(4.57)	(1.82)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Second-order autocorrelation	Z=0.86 p-value=0.39	Z=0.35 p-value=0.72	Z=1.32 p-value=0.18	Z=0.44 p-value=0.66	Z=0.48 p-value=0.62	Z=0.95 p-value=0.34
Sample	564	288	276	564	288	276
Groups	47	47	47	47	47	47

Notes: Numbers in parentheses are z-statistics obtained by robust standard error. * and ** indicate significance at 5 and 1 per cent levels respectively (one-sided tests).

Table 4. Regression results on cigarette smoking.

Variables	(1) *CIGA*	(2) *CIGA#*	(3) *CIGA*	(4) *CIGA#*
CIGA-1	0.05	0.03	-0.01	-0.02
	(1.31)	(0.92)	(-0.38)	(0.72)
PRIC	-42.7	-30.2	-8.54	-43.8
	(-0.02)	(-0.16)	(-0.04)	(-0.23)
ALCOL	-37.3	-29.3	193.0*	149.1
	(-0.32)	(-0.27)	(1.79)	(1.48)
*DENS**	-0.15**	-0.15**	-0.11**	-0.11**
ALCOL	(-6.46)	(-6.30)	(-5.15)	(-4.91)
*SN1**	0.10*	0.08*	-0.02	-0.03
ALCOL	(2.05)	(1.80)	(-0.55)	(-0.77)
*SN2**	-0.28	-0.26	-0.58**	-0.45**
ALCOL	(-1.43)	(-1.48)	(-3.06)	(-2.62)
*DSN1**	2.07**	1.94**	2.15**	2.00**
ALCOL	(6.68)	(6.36)	(7.14)	(6.75)
*DSN2**	0.63*	0.79**	0.40	0.64**
ALCOL	(2.14)	(2.80)	(1.43)	(2.36)
INCOM	-2.76**	-2.65**	-4.61**	-4.60**
	(-4.99)	(-4.84)	(-9.94)	(-10.0)
SERVIC	-137.2**	-139.6**	-134.4**	-134.3**
	(-13.3)	(-13.8)	(-13.4)	(-13.7)
CAR	-126.8**	-127.2**		
	(-6.76)	(-6.97)		
POP	68.8**	62.7**	83.1**	74.2**
	(7.49)	(7.31)	(9.54)	(9.02)
Year dummy	Yes	Yes	Yes	Yes
Second-order autocorrelation	Z=0.50 p-value=0.61	Z=-0.63 p-value=0.53	Z=2.07 p-value=0.03	Z=-2.24 p-value=0.02
Sample	564	564	564	564
Groups	47	47	47	47

Notes: Numbers in parentheses are z-statistics obtained by robust standard error. * and ** indicate significance at 5 and 1 per cent levels respectively (one-sided tests).

Table 5. Regression results on cigarette smoking.

Variables	(1) *CIGA*	(2) *CIGA#*	(3) *CIGA*	(4) *CIGA#*
CIGA-1	0.03	0.01	0.003	-0.004
	(0.77)	(0.41)	(0.08)	(-0.11)
PRIC	62.9	39.6	136.2	60.3
	(0.30)	(0.20)	(0.67)	(0.30)
ALCOL-1	-217.9*	-222.4*	94.7	41.7
	(-1.81)	(-1.97)	(0.84)	(0.39)
*DENS**	-0.16**	-0.16**	-0.11**	-0.09**
ALCOL-1	(-5.95)	(-5.75)	(-4.07)	(-3.72)
*SN1**	0.03	0.01	-0.14**	-0.16**
ALCOL-1	(0.79)	(0.42)	(-3.74)	(-4.25)
*SN2**	0.03	0.07	-0.25	-0.09
ALCOL-1	(0.18)	(0.39)	(-1.19)	(-0.50)
*DSN1**	2.41**	2.21**	2.20**	1.96**
ALCOL-1	(7.09)	(6.66)	(6.64)	(6.07)
*DSN2**	1.06**	1.32**	0.36	0.67*
ALCOL-1	(3.14)	(4.08)	(1.13)	(2.17)
INCOM	-1.69**	-1.56**	-4.34**	-4.35**
	(-2.92)	(-2.71)	(-8.89)	(-9.03)
SERVIC	-155.0**	-158.0**	-150.8**	-151.4**
	(-15.0)	(-15.5)	(-14.9)	(-15.3)
CAR	-184.5**	-187.7**		
	(-8.59)	(-8.96)		
POP	75.9**	68.4**	104.9**	95.9**
	(8.06)	(7.65)	(12.1)	(11.5)
Year dummy	Yes	Yes	Yes	Yes
Second-order autocorrelation	Z=1.05 p-value=0.29	Z=-0.91 p-value=0.36	Z=1.13 p-value=0.25	Z=1.30 p-value=0.19
Sample	564	564	564	564
Groups	47	47	47	47

Notes: Numbers in parentheses are z-statistics obtained by robust standard error. * and ** indicate significance at 5 and 1 per cent levels respectively (one-sided tests).