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2 February 2011

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Abstract.

Using individual level data (the Japanese General Social Survey), this paper aims to explore how interaction between genders contributes to the cessation of smoking in Japan, where females are distinctly less inclined to smoke than males. Controlling for various socioeconomic factors and selection bias, I find through a Heckman-type selection estimation that rates of female employment in workplaces are negatively associated with male smoking but not with female smoking. These results suggest that male smokers are more inclined to cease smoking when they are more likely to have contact with nonsmokers of the opposite sex.

Overall, this empirical study provides evidence that the psychological effect of the presence of people in one's surroundings has a direct significant effect upon smoking behavior. However, this effect is observed only among males and not females.

Running title: Smoking behavior

JEL classification: I10, Z13

Keywords: Female labor participation, Labor market, Smoking behavior

I. INTRODUCTION

Compared with Western countries, in general, the prevalence of smoking among females in Asian countries is distinctly lower than that of males. For instance, in 2006, the smoking prevalences for males and females in the United States were 23.9% and 18.0 %, while those in the United Kingdom were 23.0 % and 21.0 %, respectively. On the other hand, smoking prevalences for males and females in Japan were 39.9 % and 10.0 %, respectively (OECD, 2009)[1]. In post World War II Japan, females have risen in social position and hence have a greater influence in Japanese society[2]. Concerning smoking, most Japanese females are nonsmokers and thought to dislike smoking behavior. As the social status of females has risen, a social atmosphere discouraging smoking seems to have become more prevalent.

Various characteristics of the people we encounter in our daily environments are assumed to affect our utility functions (Becker, 1996). For example, the people in one's surroundings are thought to influence individual decision making and hence behavior through social interaction (e.g., Evans et al., 1992; Gaviria and Raphael, 2001, Glaeser et al., 2001., Powell et al., 2005). In some cases, the particular circumstances deter behavior that harms social welfare or goes against social norms (e.g., Becker and Murphy, 2000; Funk, 2005; Huck and Kosfeld, 2007; Posner and Rasmusen, 1999). When one smokes in a public place, others in the vicinity may indicate their annoyance toward the smoker. This causes the smoker to feel embarrassed, thereby generating a psychological cost of smoking. Yamamura (2011) provided evidence that the psychological cost imposed by the presence of surrounding people deters smoking behavior in Japan. It seems plausible, therefore, to argue that in Asian countries smokers may make more efforts to quit smoking if they work in workplaces where there are many female employees, because they are more likely to be nonsmokers. That is, we can expect female labor participation to help influence smokers to quit smoking through social pressure.

The influence of workplace circumstances on smoking behavior has been examined

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[1] In the early 20th century in Western countries, females were far less inclined to smoke cigarettes than males (Waldron, 1991). This gender gap in smoking might be partly explained by the greater social power of males in Japanese society (Waldron et al., 1988).

[2] Japan ratified its "Convention on the Elimination of all Forms of Discrimination Against Women" in 1979 at the United Nations General Assembly (See http://www.un.org/womenwatch/daw/cedaw/).

(e.g., Evans et al., 1999; Gottlieb et al., 1990; Morozumi and Ii, 2006, Wan, 2006). Previous works dealing with cigarette consumption in Asian countries did not consider social pressure caused by females on smoking behavior, despite the fact that the difference in smoking ratios between genders is remarkably large in Asian countries (e.g., Haden, 1990; Kim and Seldon, 2004; Luo et al., 2003; Yorozu and Zhou, 2002; Yuanliang and Zongyi, 2005). Hence, for this study I use individual level data from Japan to examine the extent to which the ratio of female employees in the workplace contributes to the cessation of smoking.

II. OVERVIEW OF THE CONDITION IN JAPAN

It is widely acknowledged that the smoking rate of females is significantly smaller than that of males in Asian countries such as Japan (e.g., Morozumi and Ii, 2006; Yorozu and Zhou, 2002). If females have a relatively lower social status, then it seems to be merely a matter of etiquette in Japan for male smokers to ask females nearby for permission to smoke (Yorozu and Zhou, 2002).

While the social position of females has improved and females have become influential in post-World War II Japan, the Equal Employment Opportunities Law for Men and Women that was enacted in 1985 further improved employment opportunities for females. Females started joining the labor force instead of being housewives, which resulted in their having increasing influence on modern social behaviors, such as smoking in the workplace. As a result, the participation of females in the labor market appears to have accelerated the social norm of “not smoking for the sake of nonsmokers” through smoking-related interaction[3]. The improvement of the status of females in society seems to have affected not only informal rules such as social norms, but also formal rules; for example, the Health Promotion Law was implemented in 2003, which, as described in Article 25, aims to prevent passive smoking in public places[4]. According to a survey conducted by Morozumi and Ii (2006), the percentage of Japanese

[3] Smoking related interactions are supposed as follows: Females tend to ask smokers at work not to smoke. When females are employed equal numbers to males, then smokers are more likely to be informed that their smoke bothers someone at work.

[4] "Passive smoking" refers to a situation where a person (usually a non-smoker) is forced to breathe in the smoke of others' cigarettes in a closed environment. Article 25 of the Law stipulates that "those who are in charge of managing the facilities where many unspecified people gather shall make efforts in taking necessary measures to prevent passive smoking."

workplaces where smoking is prohibited is 9.5%, while that of workplaces where there are separate smoking and non-smoking areas is 47.9%. Furthermore, Morozumi and Ii (2006) found through what they call the Difference in Difference approach that workplace policies to deter smoking significantly reduced smoking prevalence and cigarette consumption, while also encouraging smokers to quit smoking. However, as implemented, the purpose of Article 25 is only to promote efforts related to the promotion of health. Thus, there is no penalty for its violation. This suggests that social pressure reinforces formal rules. Put another way, there seems to be an interaction between formal and informal rules.

III. METHODS

3.1 Data

This paper uses Japanese General Social Survey data (hereafter, JGSS), which is individual level data. The JGSS surveys used were conducted throughout Japan in 2002 and adopted a two-step stratified sampling method. The survey asks standard questions concerning the characteristics of an individual and his/her family through face-to-face interviews. The questions cover information related to smoking habits, workplaces, demographic (age and gender) status, income and education levels, prefecture of residence, and secondary school grade performance at the age of 15[5]. With respect to the habit of smoking, respondents were asked, “Do you smoke?” The possible responses to this question were "Yes”, “I used to smoke, but have stopped”, and “No”. This information allowed the construction of variables to describe the respondents, such as those who had experienced smoking, those who had never smoked, and those who had quit smoking[6].

The survey collected data from adults between the ages of 20 and 89. This paper aims to explore the effect of female employees on smoking behavior. Therefore, the sample is restricted to those who worked in a workplace at the time of the study. Furthermore, because this paper examines effects of the various abovementioned

[5] Data for this secondary analysis, "Japanese General Social Surveys (JGSS)” by Ichiro Tanioka, was provided by the Social Science Japan Data Archive, Information Center for Social Science Research on Japan, Institute of Social Science, University of Tokyo.
[6] It should be noted that I could not obtain the information about when the respondents quit smoking for those who quit smoking.

individual characteristics, the samples used for estimations were reduced to 2,239 for regression estimations.

The variables used for the regression estimations are shown in Table 1, which shows the definition of the variables and their mean values. Consistent with the previous discussion, the rates of respondents who had smoked (SMOKEXP) were 76.0 % for males and 19.1 % for females. The rates of those who were current smokers (SMOK) were 47.5 % for males and 13.8 % for females. From these data, we know that the smoking cessation rate (SMOKEXP-SMOK) for this population was 28.5 % for males and 5.3 % for females. That is, among males who were not current smokers, approximately half of them had previously been smokers, but later quit. The rates of female employees in the workplace where the respondents worked (FRAT) were 23.7 % for male respondents and 59.2 % for female respondents. This suggests that females are more likely to work in workplaces where there is a high ratio of female employees.

3.2.Estimation method

A Japanese prefecture is roughly equivalent to a state in the United States or a province in Canada. There are 47 prefectures in Japan. Figure 1 shows the association between the average percentage of female employees in the workplaces where respondents worked and the average smoking rates among all the respondents within a prefecture. The sample shown in Figure 1 (1) consists of male and female respondents, that in Figure 1 (2) consists of male respondents only, and that in Figure 1 (3) consists of female respondents only. A cursory examination of Figures 1 (1) reveals a negative relationship between the rate of female employees in the workplace and the smoking rate. Figure1 (2) also shows a positive relationship between these two factors when a sample of female respondents is used. In contrast, as demonstrated in Figure 1 (3), there is no such association between the rate of female employees in the workplace and the smoking rate when I restrict sample to female respondents. These results suggest that social pressure from female employees may help deter smoking among males but not among females.

To further explore smoking behavior, a dummy variable which takes a value of 1 when one is a current smoker was used as a dependent variable. However, because it is plausible that nonsmokers prefer to work in workplaces with fewer smokers, the results of estimations using this variable could also indicate the possibility of workplace conditions having the effect of attracting non-smoking employees rather than actually

deterring smoking behavior. Hence, to clarify this issue of causality, it is necessary to examine whether those who previously smoked have quit. As mentioned earlier, respondents were categorized into smokers, those who used to smoke but had quit, and nonsmokers. This information allows for selection models such as the Heckman Probit models to be used. In the first stage, therefore, I used the Probit model to select those who had smoked in the past regardless of their current smoking habits. In this stage, I used GRAD15 (school grade at the age of 15) as an independent variable because previous smoking habits are known to be determined by previous conditions rather than current conditions[7]. I also used the age group dummies as independent variables in the first stage because the generation in which one is born affects not only current conditions but also past conditions. Then, in the second stage, I once again used the Probit model to examine whether those who had smoked in the past had quit.

The function used for the estimation takes the following form:

(First stage estimation)

$SMOKEXP_i = \alpha_0 + \alpha_1 GRAD15_i + \mathbf{x_i}' \beta + u_i$,

(Second stage estimation)

$SMOK_i = \gamma_0 + \gamma_1 FRAT_i + \gamma_2 EDU_i + \mathbf{x_i}' \lambda + \mathbf{y_i}' \theta + e_i.$,

where $\mathbf{x_i}' = (x_{i1}, x_{i2}, \ldots, x_{i,k})$, $\beta = (\beta_1, \beta_2, \ldots, \beta_k)$, $\lambda = (\lambda_1, \lambda_2, \ldots, \lambda_k)$. $\mathbf{y_i}' = (y_{i1}, y_{i2}, \ldots, y_{i,m})$, $\theta = (\theta_1, \theta_2, \ldots, \theta_m)$. The vector of age group dummies is represented by $\mathbf{x_i}$. The vector of income group dummies is represented by $\mathbf{y_i}$. $SMOKEXP_i$ and $SMOK_i$ represent the dependent variable in person i. SMOKEXP, which takes 1 if the person has previously smoked, otherwise 0. SMOK takes 1 if the person currently smokes, otherwise 0. u_i and e_i represent the error terms. In addition to the estimation using the full sample, I also divided the sample into male and female respondent groups to compare the effects of the independent variables.

Assuming that females are more likely to be nonsmokers based on the OECD (2009) data, FRAT is expected to take a negative sign if female employees increase the psychological cost of smoking. FRAT is considered the key variable for examining the effect of female labor participation on smoking behavior.

Several control variables were included to capture individual characteristics: EDU

[7] In the case of addictive goods such as cigarettes, current consumption and past consumption have been found to be in a complementary relationship (Becker, 1996).

(level of education captured by schooling years), age group dummies, and income group dummies[8].

IV. RESULTS

For the purpose of ascertaining the determinants of quitting smoking, Table 2 presents the results of the Probit model using the sample restricted to those who had experienced smoking. Table 3 presents the results of the Heckman Probit model, which used a sample of not only the sample used in Table 2, but also those who had never smoked. This is because selection bias related to having smoked is controlled for in the Heckman Probit model. In Tables 2 and 3, the results using the combined male and female samples, only the male sample, and only the female samples are shown in columns (1), (2), and (3), respectively.

From Table 2, it can be seen that FRAT takes a negative signs in all columns. However, it is statistically significant only in columns (1) and (2). Consistent with our expectations, these results imply that higher proportions of female employees in the workplace help deter smoking among males, but not among females.

As for Table 3, before discussing the second stage results, an examination of the first stage reveals that GRAD15 shows significant negative signs in all estimations. This indicates that the higher one's school grades at the age of 15, the lower the likelihood that the person will smoke. One possible interpretation of this result is that high grades leads to greater human capital, and therefore one's expected income increases. Smoking is thought to harm one's health, resulting in a decrease in future income. If one expects to earn a high income in the future, therefore, the person is less likely to smoke because of this expected reduction of income caused by smoking. Most of the age group dummies yielded significant positive signs for males, while the same dummies yielded significant negative signs for females. It follows from this that males belonging to older generations are more likely to have smoked while females of the same generations are less likely to have smoked. This seems to accurately reflect the changes currently occurring in modern Japanese society.

In the second stage, FRAT takes a negative sign in all columns, and is statistically significant in columns (1) and (2). These results are similar to those shown in Table 2.

[8] It should be noted that the price of cigarettes is the same everywhere in Japan, and thus there was no need to control for a price effect in this paper.

By combining the results of Tables 2 and 3, I argue that the proportion of female employees in the workplace increases the psychological cost of smoking and thus influences male smokers to cease smoking. Such social pressure from females has, however, no effect on female smokers. Turning to the control variables, as shown in columns (2) and (3), the sign of EDU is negative and statistically significant for males but not for females, which is similar to the results shown in Table 2. Better-educated males can be thought to experience more benefits than costs from quitting smoking, because the expected increase in their income from being in better health is larger than that of less-educated males. It is surprising that most of the age group dummies yielded significant negative signs for males, whereas none of age group dummies were statistically significant for females. This suggests that older males are more likely to care for their health, which in turn leads to their quitting smoking. On the other hand, females who have smoked are not as influenced by workplace circumstances, education or age.

The combined results of Tables 2 and 3 provide evidence that increases in the number of female employees in workplaces plays a part in influencing female smokers to quit smoking through social pressure.

V. CONCLUSION

Circumstances such as one's workplace environment are thought to influence smoking behavior. If the proportion of nonsmokers increases in a society, leading to a stronger "anti-smoking" norm, then the psychological cost of smoking increases. In Asian countries such as Japan, there is a large gender gap in smoking rates, and this characteristic of smoking behavior seems to contribute to the cessation of smoking. Using individual-level data, this paper explored how one's surrounding environment tends to lead to smoking cessation in Japan. Controlling for various selection biases and socioeconomic conditions, the major finding is that while a higher percentage of female employees in the workplace influences male smokers to cease smoking, this influence is not seen among female smokers.

Overall, the current empirical study provides evidence that the psychological effect of the presence of others in one's surroundings has a direct effect upon smoking behavior, although this effect is observed only among males and not females. This finding is consistent with the evidence suggesting the effects of social pressure on smoking

behavior (Yamamura, 2011). Furthermore, the results of the current paper suggest that social pressure seems to differ between males and females. For policymakers who wish to further reduce the negative externality of smoking, these results should be interesting with respect to the reasons the respondents quit smoking. However, with respect to smoking prevention research, the observed positive externality to deter smoking derived from female participation in the labor force has yet to be taken into account. Hence, both policymakers and researchers should consider the interaction between female labor participation and smoking prevention strategies to increase social welfare.

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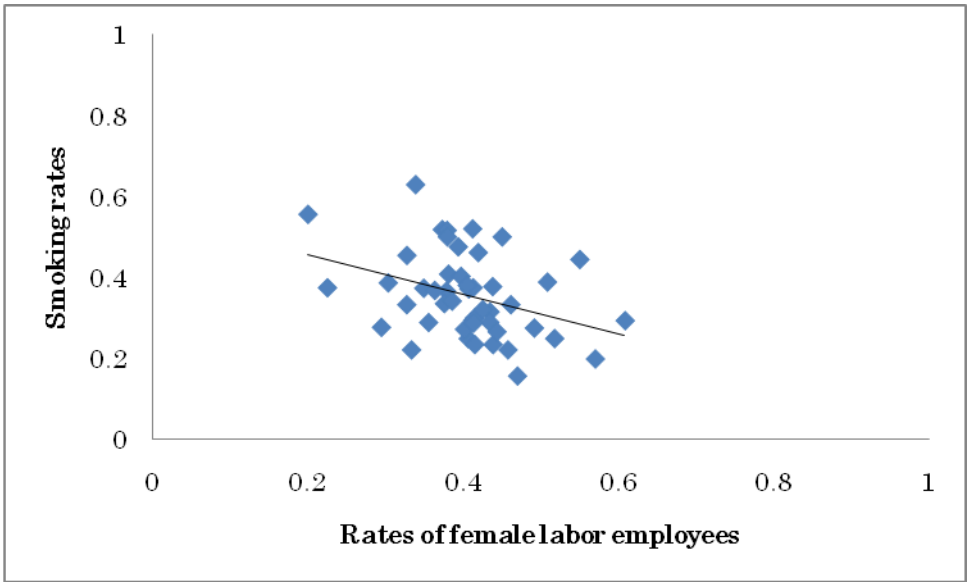
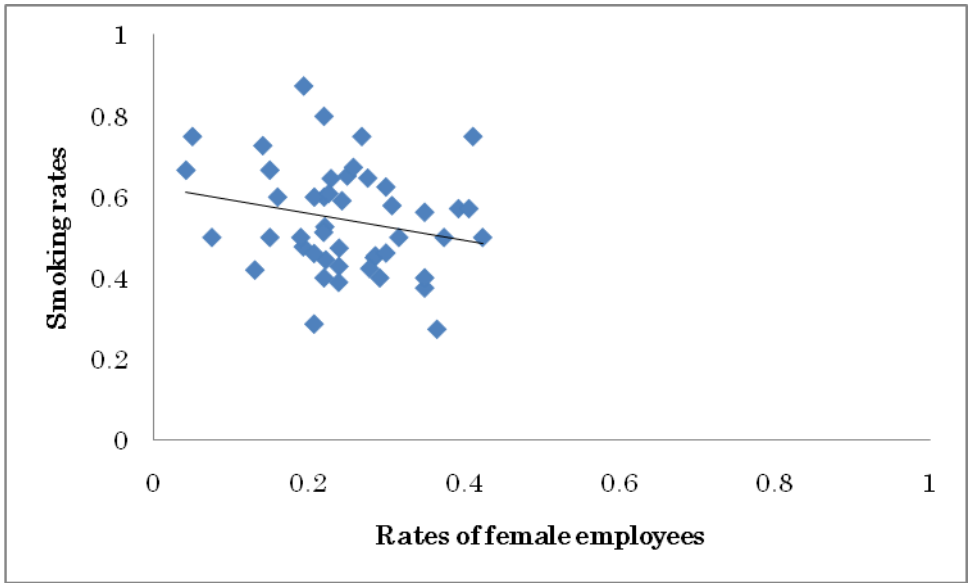
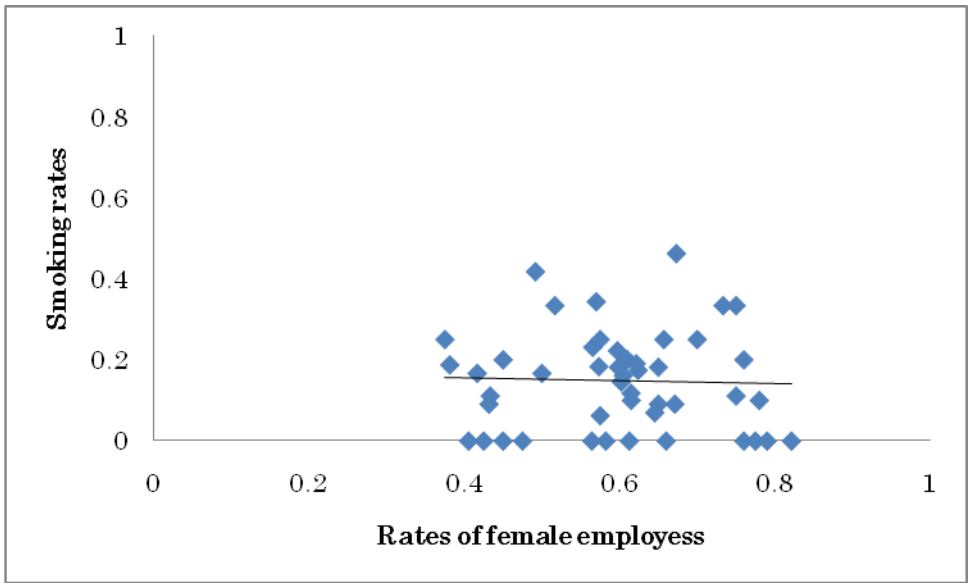


(1) Sample consisting of male and female respondents



(2) Sample consisting of male and female respondents



(3) Sample consisting of female respondents

Fig. 1. Rates of female employment and smoking in workplaces.

Note: Rate of female employment in workplaces is the average rate within a prefecture. Smoking rate is the average rate of smoking among respondents within a prefecture.

TABLE 1.

Variable definitions and mean values across genders.

Variable	Definition	MALE	FEMALE	ALL
SMOKEXP [a]	Those who have smoked take 1, otherwise 0 (%)	76.0	19.1	45.0
SMOK [a]	Those who currently smoke take 1, otherwise 0 (%)	47.5	13.8	29.2
FRAT[a]	Proportion of female employees in workplaces where respondents worked (%)	23.7	59.2	39.6
EDU	Schooling years	12.2	11.7	11.9
Age20-29[a]	20–29 year-old age group (%)	12.9	11.2	11.9
Age30-39[a]	30–39 year-old age group (%)	13.7	15.1	14.5
Age40-49[a]	40–49 year-old age group (%)	15.7	16.7	16.3
Age50-59[a]	50–59 year-old age group (%)	21.4	21.0	21.1
Age60-[a]	60+ year-old age group (%)	36.3	36.0	36.2
GRAD15	Respondents' school grades at the age of 15, ranging from 1 (poor) to 5 (excellent).	3.25	3.34	3.30

Note: Numbers are mean values, and numbers in parentheses are standard deviations.
a. Rate reported rather than mean value; thus standard deviation is not reported.

TABLE 2

Regression results on smoking (Probit model).

	Heckman (Dependent variable: SMOK)		
Variable	(1) ALL	(2) MALE	(3) FEMALE
FRAT	-0.55***	-0.35*	-0.43
	(-3.53)	(-1.87)	(-0.96)
EDU	-0.06***	-0.08***	0.06
	(-2.81)	(-2.93)	(0.67)
Age 20–39	Reference Group		
Age 30–39	0.005	-0.10	0.12
	(0.03)	(-0.55)	(0.39)
Age 40–49	-0.43**	-0.61***	-0.22
	(-2.08)	(-2.76)	(-0.57)
Age 50–59	-0.29	-0.48**	-0.04
	(-1.53)	(-2.45)	(-0.09)
Age 60+	-0.97***	-1.22***	-0.44
	(-4.43)	(-4.65)	(-0.62)
Constant	1.90***	2.80***	-0.27
	(3.45)	(4.45)	(-0.21)
Income dummies	YES	YES	YES
Log pseudo-likelihood	-443	-343	-84
Number of observations	776	618	159

Notes: All observations are restricted to those who have smoked. Numbers represent marginal effects. Numbers in parentheses are z-statistics obtained by robust standard error clustered at the prefecture where respondents reside. *, **, and *** indicate significance at the 10, 5 and 1 percent levels, respectively. YES means that dummy variables, consisting of 19 income groups, are included to capture the level of income. Age group dummies are included in all estimations but not reported to save space.

TABLE 3

Regression results on smoking (Heckman Probit model).

	Heckman (Dependent variable: SMOK)		
Variable	(1) ALL	(2) MALE	(3) FEMALE
FRAT	-0.44**	-0.34*	-0.12
	(-2.27)	(-1.84)	(-0.88)
EDU	-0.04*	-0.07***	0.01
	(-1.86)	(-2.73)	(0.75)
Age 20–39	Reference Group		
Age 30–39	0.004	-0.15	0.07
	(0.03)	(-0.87)	(0.65)
Age 40–49	-0.36*	-0.66***	-0.03
	(-1.91)	(-3.18)	(-0.27)
Age 50–59	-0.23	-0.53***	0.08
	(-1.30)	(-2.83)	(0.49)
Age 60+	-0.43	-1.13***	0.13
	(-0.99)	(-3.64)	(0.33)
Constant	2.07***	2.90***	0.66
	(4.67)	(4.78)	(1.40)
Income dummies	YES	YES	YES
	First stage (Dependent variable: SMOKEXP)		
GRAD15	-0.10***	-0.07*	-0.19**
	(-3.49)	(-1.65)	(-3.66)
Age 20-39	Reference Group		
Age 30-39	-0.008	0.29**	-0.27*
	(-0.08)	(2.22)	(-1.83)
Age 40-49	0.009	0.41***	-0.25*
	(0.11)	(3.22)	(-1.73)
Age 50-59	-0.009	0.42***	-0.56***
	(-0.12)	(3.53)	(-3.74)
Age 60+	-0.67***	-0.09	-1.45***
	(-6.92)	(-0.70)	(-8.03)
Constant	0.14	0.48***	-0.003
	(1.13)	(3.01)	(-0.02)
rho	-0.69	-0.40	-0.46
Log pseudo-likelihood	-1822	-908	-512
Number of observations	2239	918	1321
Censored Observations	1463	300	1163
Uncensored Observations	776	618	159

Notes: Numbers represent marginal effects. Numbers in parentheses are z-statistics obtained by robust standard errors clustered at the prefecture where respondents reside. *, **, and *** indicate significance at the 10, 5 and 1 percent levels, respectively. YES means that dummy variables, consisting of 19 income groups, are included to capture

the level of income in the second stage. Age group dummies are included in all estimations of the second stage but not reported to save space. Convergence was not fulfilled when EDU was included in column (3), and hence the result using only the university graduate dummy is reported.