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Transmission mechanism and gender identity: Smoking behavior between parents and their children of the same gender

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Abstract

This study examines how parents' smoking behavior is transmitted to their children, focusing on the role of gender identity. Through an original survey, respondents were asked about their parents' smoking behavior when the respondents had been primary-school students. Findings from the regression analysis revealed that female respondents were more likely to smoke if their mothers smoked frequently. Furthermore, a mother was less likely to smoke if she had a daughter, while a father was more likely to smoke if he had a son.

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1. Introduction

It is widely acknowledged that an individual's smoking behavior has a negative impact on the people around, such as his or her immediate family (Adda and Cornaglia 2010; Frijters et al. 2011; Wehby et al. 2011; Darden et al. 2018). This gives parents an incentive for smoking cessation (Blackburn et al. 2005; Yamamura and Tsutsui 2019). Conversely, an individual's smoking behavior is said to be dependent on circumstances and norms shared by people (Göhlmann et al. 2010; Yamamura 2011; Jusot et al. 2013; Darden and Gilleskie 2016; Rodríguez-Planas and Sanz-de-Galdeano 2019). Indeed, several researchers have found that the transmission mechanism from parents to their children tends to influence people's behavior in daily life (Stoklosa et al. 2018; Yamamura and Tsutsui 2020). Albanese et al. (2016) found that the values that an individual receives from his or her parents have a correlation with the values transmitted to the his or her own children. Children are known to mimic their parents' behavior and attitude toward smoking. Gender identity has been observed and correlated with differences in behavior (Akerlof and Kranton 2000; Yamamura and Tsutsui 2020). It is believed that gender identity plays a key role in this mechanism. Existing research has explored how the transmission mechanism of smoking differs with regard to the gender of parents and their children, and parent-child gender matches. Most studies found a "like father, like son" and "like mother, like daughter" correlations for smoking behavior in the USA (Darden and Gilleskie 2016) and UK (Loureiro et al. 2010). However, these findings could be influenced by cultural norms rooted in western society. Therefore, using data from Japan, this study examines whether these correlations exist in Asia.

I conducted an internet survey wherein I asked over 7,000 adults not only about their smoking behavior, but also the smoking behavior of their parents when the respondents had been elementary school students. Further, I asked the respondents how many sons and daughters they have. Based on the data, I examined how the smoking behavior of a respondent's parents and the existence (and gender) of the respondent's children are correlated with the respondent's smoking behavior. After controlling for several variables, I found that (1) respondents mimicked the smoking behavior of the parent with the same gender as their own; (2) a respondent's smoking behavior depended on whether he or she had a child of the same gender, although having children of a different gender did not affect the behavior.

2. Data and Model

I conducted an internet survey in October 2018. The Nikkei Research Company was commissioned to conduct it. Since I aimed to collect over 7000 observations to increase the statistical power of the study while remaining within budget, the survey was conducted until the said number had been collected. Indeed, 7148 respondents filled the questionnaire and submitted it. The sample comprises 3579 male and 3569 female respondents. The respondents are Japanese adults aged 20–65 years from all regions of Japan.

Internet-based surveys are often subject to sample selection bias since some sub-populations tend to respond less. Therefore, attention should be paid to the possibility of selection bias, although the sample's demographic composition is similar to that of the 2015 Japan Census. In the survey, apart from smoking related questions, some other questions were included to control various factors in the estimations.

To assess the transmission mechanism of smoking behavior, the estimated function takes the following form:

$$SMOK_i = \alpha_0 + \alpha_1 FATHER\ SMOK_i + \alpha_2 MOTHER\ SMOK_i + \alpha_3 SON_i + \alpha_4 DAUGHTER_i + X'_i B + u_i,$$

where $SMOK_i$ represents the dependent variables for individuals, and *i and α* represent the marginal effect of independent variables.

Both, an upper limit (41 cigarettes per day) and a lower limit (0 cigarettes per day) have been included. Therefore, the two-limit Tobit model has been used for estimation. Various control variables have been included and expressed as vector X'[1].

The key independent variables FATHER SMOK and MOTHER SMOK have been used to test the impact of the smoking behavior of a respondent's father and mother, respectively, when the respondent had been a child. Further, SON and DAUGHTER have been included to explore whether having children influenced the respondent's smoking behavior. In addition to a whole sample, I further classified it into male and female samples to compare the results of parents and children of one gender with those of the other. I thereby examined whether respondents were influenced by the smoking behavior of their parent of the same gender or that of the opposite gender. I also investigated into the type of behavior that respondents intend to exhibit to be role models to their same and different gender children.

A closer examination by Yamamura and Tsutsui (2019) reveals that the number of cigarettes that an individual consumes involves a two-step decision-making process. Firstly, the individual decides whether to smoke or not. Then, in the second step, the individual decides how many cigarettes will be consumed. Hence, in an alternative model, it is reasonable to use a Heckman model. In the first step, I used the Probit model (the dummy variable is the dependent variable). After selection, the Ordinary Least Square (OLS) model was used in the second step. In the first , the set of independent variables used in the Heckman model is equivalent to that of the random Tobit model. In the second, SON and DAUGHTER are excluded from the set of independent variables in the OLS estimation because they have not been found to be linked to the quantity of cigarette consumption in prior research (Yamamura and Tsutsui 2019). The log-formed dependent variable can be used because the dependent variable does not have a 0 value.

[1] Control variables are the respondent's age and its square term, household income, marital status, job status dummies, educational background dummies, residential prefecture dummies.

3. Results

Table 1 displays the basic statistics and definitions of key variables in this paper. SMOK shows larger values for the male sample than for the female sample. From the values of FATHER SMOK and MOTHER SMOK, I observe that the fathers smoked more frequently than the mothers did. This is generally observed in Japan (Yamamura 2011; Yamamura and Tsutsui 2019).

In columns (1) to (3) of Table 2, we see from the results of the baseline specification that both FATHER SMOK and MOTHER SMOK indicate a positive sign and are statistically significant. Based on the male sample, FATHER SMOK is statistically more significant than MOTHER SMOK. On the other hand, based on the female sample, MOTHER SMOK is statistically more significant than FATHER SMOK, and the value of MOTHER SMOK's coefficient is approximately three times greater than that of FATHER SMOK. As for the existence of a child, as seen in the results of the whole sample, SON and DAUGHTER do not show statistical significance. It is interesting to observe that, based on the female sample, DAUGHTER indicates a negative sign and is statistically significant at the 1 % level. In contrast, based on the male sample, SON shows a positive sign and statistical significance at the 5 % level. The interpretation of these results suggests that gender identity and its correlation with smoking behavior gives parents an incentive to behave like good role models with regard to smoking, in front of their same gender child. Female identity deters a mother from smoking, thereby reducing the likelihood of her daughter smoking. However, this does not hold true for a father and son because male identity is congruous with smoking. Considering an alternative specification where BOTH PARENTS SMOK (dummy of both parents being smokers) is included as an independent variable, the sign of this variable is positive and statistically significant at the 1% level in columns (4) to (6) of Table 2. It is unexpected to observe that the statistical significance of FATHER SMOK disappears and shows a negative sign in columns (4) to (6). Therefore, the father's smoking behavior is not related to his son's or daughter's smoking behavior. This implies that daughters mimic the smoking behavior of their same-gender parent, and therefore, transmission is observed only between mothers and daughters.

Table 3 shows that the results using the female sample are consistent with those of Table 2. In column (5), using the male sample, the logarithm of FATHER SMOK and MOTHER SMOK shows significant positive effects in the second stage for the number of cigarettes consumed and not in the first stage of the likelihood of the respondent smoking. For both Ln(FATHER SMOK) and Ln(MOTHER SMOK), the coefficient is 0.20 in the second stage using a male sample, which implies that the impact of the father smoking on his son is not different than that on his daughter. Thus, Tables 2 and 3 jointly indicate that the same-gender transmission mechanism of smoking is observed only between a mother and her daughter.

4. Conclusions

Based on primary data, I conducted regressions and found that respondents were more likely to smoke if their parents of the same gender smoked frequently when the respondents were aged 6-–12 years. However, this holds only for a mother and her daughter. Female respondents were less likely to smoke if they had a daughter, while male respondents were more likely to smoke if they had a son. Based on gender identity with regard to smoking, a mother is the role model for her daughter. The finding of this paper is different from existing works which identify "like father, like son" correlations in smoking behavior in the USA (Darden & Gilleskie 2016) and UK (Loureiro et al., 2010). However, we find that a mother's role is crucial in influencing her daughter's smoking habit not only in Western countries, but also in Japan.

These findings suggest that a mother's smoking behavior is transmitted to her daughter and that female gender identity is transmitted over generations, resulting in differences in smoking behavior between the two genders.

Additionally, a mother's influence is seen not only on her daughter, but also on her son, although the impact is greater on the daughter than on the son. In my interpretation, a mother is believed to spend more time on child rearing, and therefore, communicates and interacts with her children more frequently. Inevitably, her children mimic her behavior that persists later in life.

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Table 1. Definitions of variables and their mean values

	Definition	All	Male	Female
SMOK	Number of cigarettes that the respondent smoked per day. From 0 (Not at all) to 41 (Equal to or more than 41 cigarettes).	1.79	2.62	0.93
FATHER SMOK	Frequency of the respondent's father's smoking behavior when the respondent had been an elementary school student. From 0 (Never smoking) to 7 (Everyday).	2.98	2.95	3.00
MOTHER SMOK	Frequency of the respondent's mother's smoking behavior when the respondent had been an elementary school student. From 0 (Never smoking) to 7 (Everyday).	0.53	0.54	0.52
BOTH PARENTS SMOK	Dummy that takes 1 if both mother and father smoked when the respondent was an elementary school student, otherwise 0.	0.36	0.46	0.30
SON	Dummy that takes 1 if the respondent has a son, otherwise 0.	0.29	0.30	0.28
DAUGHTER	Dummy that takes 1 if the respondent has a daughter, otherwise 0.	0.27	0.29	0.27
MALE	Dummy that takes 1 if the respondent is male, otherwise 0.	0.50	----	----

Table 2. Regression estimation (Two-limit Tobit): Dependent variable: SMOK

	(1) Whole sample	(2) Male	(3) Female	(4) Whole sample	(5) Male	(6) Female
FATHER SMOK	0.45*** (0.08)	0.49*** (0.12)	0.37** (0.18)	−0.27 (0.17)	−0.09 (0.19)	−0.34 (0.34)
MOTHER SMOK	0.79*** (0.19)	0.49* (0.25)	1.24*** (0.27)	0.62*** (0.20)	0.32 (0.27)	1.08*** (0.29)
BOTH PARENTS SMOK				5.31*** (1.27)	4.68*** (1.28)	5.89** (2.51)
SON	0.77 (0.85)	2.03** (0.93)	−0.27 (1.13)	0.69 (0.82)	1.88** (0.94)	−0.18 (1.13)
DAUGHTER	−1.22 (0.82)	0.42 (0.85)	−3.68*** (1.39)	−1.20 (0.81)	0.39 (0.84)	−3.62*** (1.36)
MALE	10.2 (0.90)			10.1 (0.92)		
Pseudo R-square	0.04	0.02	0.05	0.04	0.02	0.05
Left-censored obs	5974	2735	3239	5974	2735	3239
Right-censored obs	1158	12	326	1158	12	326
Obs	7148	3579	3569	7148	3579	3569

Note: Numbers in parentheses are robust standard errors clustered at the residential prefecture level. *, **, and *** indicate significance at the 10 %, 5 %, and 1 % levels, respectively. Numbers without parentheses are coefficients of each variable. Various control variables are included: Respondent's age and its square term, household income, marital status, job status dummies, educational background dummies, number of children.

Table 3. Heckman- model estimation: Dependent variable Ln (SMOKING) in the second stage

	(1) Whole sample	(2) Male	(3) Female	(4) Whole sample	(5) Male	(6) Female
	First Stage (Probit): Dependent variable: Dummy that takes 1 if the respondent smokes, otherwise 0.					
Ln (FATHER SMOK)	0.08*** (0.02)	0.09*** (0.02)	0.07** (0.03)	−0.06 (0.05)	−0.07 (0.06)	−0.06 (0.07)
Ln (MOTHER SMOK)	0.14*** (0.03)	0.08* (0.04)	0.24*** (0.05)	0.10*** (0.03)	0.03 (0.46)	0.21*** (0.05)
BOTH PARENTS SMOK				0.33*** (0.09)	0.37*** (0.12)	0.28* (0.15)
SON	0.05 (0.05)	0.13** (2.00)	−0.02 (0.08)	0.04 (0.05)	0.12* (0.07)	−0.02 (0.08)
DAUGHTER	−0.06 (0.05)	0.07 (0.07)	−0.21*** (0.07)	−0.06 (0.05)	0.06 (0.07)	−0.22*** (0.08)
MALE	0.55*** (0.46)			0.55*** (0.46)		
	Second Stage (OLS): Dependent variable: Ln (SMOK)					
Ln (FATHER SMOK)	0.04 (0.08)	0.16** (0.08)	0.08 (0.07)	0.25*** (0.08)	0.20** (0.10)	0.04 (0.14)
Ln (MOTHER SMOK)	0.09 (0.13)	0.19** (0.09)	0.28* (0.16)	0.13 (0.11)	0.20*** (0.07)	0.27* (0.15)
BOTH PARENTS SMOK				−0.51 (0.34)	−0.12 (0.316	0.09 (0.33)
MALE	0.09 (0.51)			−0.01 (0.52)		
Pseudo R-square in the First Stage	0.08	0.04	0.09	0.08	0.04	0.10
Wald Chisquare in the Second Stage	130	105	60	137	121	61
First Stage Obs	7148	3579	3569	7148	3579	3569
Second Stage Obs	1174	844	330	1174	844	330

Note: Numbers in parentheses are robust standard errors clustered at the residential prefecture level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Numbers outside parentheses are coefficients of each variable. Various control variables are included: Respondent's age and its square term, household income, marital status, job status dummies, educational background dummies, and number of children.