Nicotine & Tobacco Research, 2020, 1–8
doi:10.1093/ntr/ntaa103
Original Investigation
Received June 19, 2019; Editorial Decision May 26, 2020; Accepted June 6, 2020
Advance Access publication XXXX XX, XXXX

Original Investigation

Class Status and Social Mobility on Tobacco Smoking in Post-Reform China Between 1991 and 2011

Xiaozhao Y. Yang

School of Sociology and Anthropology, Sun Yat-sen University, Guangzhou, China

Corresponding Author: Xiaozhao Y. Yang, School of Sociology and Anthropology, Sun Yat-sen University, 51000 Guangzhou, China. E-mail: yosefyang@outlook.com

Abstract

Introduction: There is growing attention to social mobility's impact on tobacco use, but few studies have differentiated the two conceptually distinct mechanisms through which changes in social class can affect tobacco smoking: the class status effect and the mobility effect.

Aims and Methods: We applied Diagonal Reference Modeling to smoking and heavy smoking among respondents of the 1991 China Health and Nutrition Survey who were revisited two decades later in 2011 (n = 3841, 49% male, baseline mean age was 38 years). We divided the sample into six social classes (non-employment, self-employed, owners, workers, farmers, and retirees) and measured social mobility by changes in income and occupational prestige.

Results: About 61.7% of men were smokers and those from the classes of workers, owners, and self-employees consumed more cigarettes compared to the unemployed, but women smokers (3.7%) tend to be from the lower classes (unemployed and farmers). Controlling for social class, each 1000 Yuan increase in annual income led to smoking 0.03 more cigarettes ($p < .05$) and 1% increase ($p < .05$) in the likelihood of heavy smoking among men, but the income effect is null for women. Upwardly mobile men (a 10-points surge in occupational prestige) smoked like their destination class (weight = 78%), whereas men with downward mobility were more similar to peers in the original class (weight = 60%).

Conclusions: Contrary to the social gradient in smoking in other industrial countries, higher class status and upward mobility are each associated with more smoking among Chinese men, but not among women.

Implications: Tobacco control policies should prioritize male smoking at workplaces and the instrumental purposes of using tobacco as gifts and social lubricant. Taxation may counter the surge in smoking brought by individuals' income increase after upward mobility. Caution should be paid to women joining the similar social gradient in smoking as they gain foothold in the labor market.

Introduction

Ever since the late modernity, constant structural changes in economy and society have rendered the impact of social mobility extremely powerful and relevant for individuals' health behaviors.[1–5] China is perhaps the most prominent example that has lifted the most massive scale of people out of poverty and experimented with dramatic social mobility that may impact substance use.[6–8] With tobacco smoking having escalated to become the leading causes of morbidity and mortality in the general population,[9] how the rising country's tremendous reshuffle of social classes and rapid mobility in the last two to three decades has impacted smoking deserves attention.

An oddity of the social gradient in smoking motivates the current study on social mobility and smoking. Social mobility is simply the movement of individuals across different social strata. When the strata can be reasonably ranked by the possession of desirable goods

such as money, prestige, or political power, the social mobility with an ensuing increase in the desirable goods is upward mobility, otherwise the movement is deemed downward mobility.[4] Naturally, individuals desire upward mobility. The paradigm in health research also takes for granted that upward mobility causes salutary health behaviors and substance use, as a form of adverse health behavior, can be mitigated by upward mobility. However, many studies have explicated how substance use may occur following upward mobility.[10–13] Qualitative studies revealed that social smoking and ritual drinking are common conducts permeating the high-income and prominent-status social circles.[6,14–16] To further complicate the issue, upward mobility may also increase tobacco consumption via higher purchasing power.[13,17]

Another vital issue precluding academians from fully understanding social mobility's impact on smoking has to do with the two distinct mechanisms that may simultaneously occur during a socially mobile event: the class status effect and the pure mobility effect.[18–20] The two distinct working mechanisms of social mobility have been discussed with regard to their political and demographic impact,[1–3,21] but remain severely wanting in health research.[22]

To be specific, the class status effect occurs when people become assimilated and grow similar to others in the same class.[23] By virtue of being in a class, one develops specific behaviors and beliefs. The fact that individuals from the same class resemble each other should not be taken a result of mobility but is rather seen as the "outcome of a process of status attainment".[20] The class status effect can be further divided by two sources for those who experienced social mobility: the effect emitted by one's original class and the effect from one's destination class. The class effect from the destination class is particularly pronounced for aspiring individuals who attempt to climb up the social ladder by imitating others in a higher class.[3,4] For example, if some special cultural norms encourage business owners to smoke, people newly joined the owner class may also smoke to fit in. For the class effect, I propose three hypotheses:

H1: Class statuses have independent and significant effects on tobacco smoking, that is, individuals in certain classes are more likely to smoke after controlling for other relevant variables.

H1a: Individuals who undergone upward mobility will resemble their peers in the destination class in terms of smoking.

H1a: Individuals who undergone downward mobility will resemble their original class in terms of smoking.

The class status effect should be conceptually differentiated from the pure mobility effect, which happens when the mobility process per se incurs changes in health behaviors.[22] Say, a homeless person and a teacher both become business owners, they have experienced drastic different degrees of mobility, but subject to the same class status effect at the destination and different class status effect at the origin. Socially mobile events have causative power in itself because changes are stressful and may induce "wear and tear" in physical and mental health, disrupt networks, worsen allostatic loads, and force adjustment.[2–4,24] Scholars have shown that downward mobility or non-mobility is associated with more drinking,[25] smoking,[26] and cardiovascular diseases.[27] Even when one's socioeconomic class has considerably improved, maladaptation in the new class still thwarts self-esteem[28] and stressors could increase with heightened job demand.[29] For the independent mobility effect a hypothesis is derived as follows:

H2: After accounting for class statuses and control variables, upward social mobility is associated with more smoking.

Methodology

Sample

This study uses the China Health and Nutrition Survey (CHNS), a continuing collaborative project conducted by multiple institutions between China and the United States since 1989, including the University of North Carolina Population Center and the Chinese Ministry of Public Health. The survey adopted multistage random cluster sampling to cover nine provinces of China. Counties of the nine provinces were stratified by income to yield four counties from each province. The CHNS taken in 1991 was the first wave to feature substance use information. I took the sample of adults (age ≥16) who were interviewed in wave 1991 and revisit these respondents after two decades in wave 2011 (n = 3841) to construct social mobility and changes in class statuses. Students and soldiers were dropped from analysis (n = 554) for not having a conventional non-institutionalized occupation, but retirees who inevitably emerged as a result of 20 years of timing were retained.

Measurement

Dependent Variable

I use two measures for smoking: the number of cigarettes smoked currently in 2011 and heavy smoking, which describes smokers who consumed more than 10 cigarettes/day. Heavy smoking differs from cigarette counts as a different approach to sensitivity test, which can demonstrate whether the class and mobility effects still hold for the tobacco use that may have a root in biological addiction rather than social purposes.

Class Status and Mobility

A large proportion of the studies on social mobility and substance use measured social mobility as the changing levels of income. This economic approach to measuring social class ignores the fact that wealth is not an essence of class but a mere reflection of classes' dominance relationships.[30,31] As in many communist or former communist countries, the Marxian classification of classes has a tremendous impact on individuals' well-being and economic position in China, such classification also was the basis of an encompassing welfare system. Therefore, for class status, I categorized social classes based on the Marxian class analysis of the means of material production (whether one owns at least partially the unit where she/he works at) and the relationship of labor reproduction (whether one works for others). As a result six general social classes were constructed: the unemployed, employees/workers, the self-employed, employers/owners, farmers, and the retired. The retirees constitute a large proportion of the sample (36.7% in 2011) after 20 years of the survey, they are distinguished from the entire population by age advancement, and I have controlled age for their confoundedness.

For mobility, I measured it by the absolute change in class prestige and the absolute change in nominal income by 1000 Yuan between 1991 and 2011.[18] A prestige score assigned to each category was consulted with Li's study[32] on Chinese occupational prestige and economic status. This codification derived from an empirical analysis of the occupational prestige ranking among mainland Chinese in the 2000s, in which the typical unemployed have prestige score of 25, workers have 60, self-employed have 55, owners have 75, farmers have 32, and the retired were assigned the average of 49. Based on this codification, upward mobility refers to an increase in

class prestige by 10 points, and downward mobility refers to a reduction of 10 points in class prestige.

Several covariates were used as control variables to account for the causes that may mask the relationship between smoking and class status and mobility: age, baseline body mass index (BMI), urban residency, and final educational level.

Analytical Approach

I employed diagonal reference modeling from the log-linear family to decompose the class status effect (H1) and the independent mobility effect (H2).[18,20] This log-linear method analyzes contingency tables with two separate types of parameters: a weighting matrix for the effects of class categories and a vector of covariates. The weight matrix has a different scale for row and column marginals to assess whether the origin class or the destination class has a stronger impact on the dependent variable. Researchers can also incorporate covariates as needed to control for extraneous influences and test the effect of pure mobility, such as the change in prestige. The basic form of the diagonal reference model expressed as follows:

$$\mu_{ij} = \mu + p\upsilon_i + (1-p)\upsilon_j + \beta x_{ij} + e_{ij}$$

where the effect of ith class $\upsilon_i$at the origin is complementary to the effect of jth class υ_j at the destination on the same scale, and they sum up to 1. Weighting factor p is then expressed as $\frac{e^{\delta_k}}{e^{\delta_k}+e^{\delta_{k+1}}}$, where δ_k is the overall marginal effects of k types of movement (there are k types of combination by origin and destination classes). This weight quantifies the tendency that a group of subjects resemble the nonmobile people from class υ, see Refs [22,33,34]. For example, a weight p of 0.3 on $\upsilon_{i=\text{bourgeoisie},\ j=\text{farmer}}$ means that bourgeoisie who became farmers resemble farmers' smoking, relative to bourgeoisie smoking, by a ratio of 3:7. x_{ij}represents any characteristics pertain to the cell of jth column and dth row, such as the change in income or age. For more discussion on its technical development, see Refs [18,34].

I have then tested diagonal reference models separately for men and women for the vast divergence in smoking between the two genders. Because the few cigarette counts among females is too sparse for the models to converge, I used different dependent variables and link functions for the male and female models. Poisson link function was used to fit men's models with cigarette count as the dependent variable, whereas logit class binomial link function is used for female respondents' binary smoking status (smoking vs. nonsmoking). The realization of the diagonal reference model was conducted with the "gnm" package of R.[34]

Results

Sample Characteristics

A total of 3841 respondents who were recruited in the 1991 survey had still remained in 2011 with valid basic information. In this sample tracked over 20 years, 34.4% were smokers in 2011, 19.8% were heavy smokers, and the average number of cigarettes among all respondents is 5.38/day. The average age of the sample is 38 years, 48.9% of the sample were male, and 19.1% lived in urban areas.

Table 1. Descriptive Statistics of the Sample

N = 3841 Variables	Mean (*SD*)	Range of values
Number of daily cigarettes	5.38 (9.95)	0 to 82
Smoking prevalence	34.4%	
Heavy smoking prevalence	19.8%	
Income in 1991 Yuan (¥1 = $0.96 USD in 2011[a])	1349 (1359)	1 to 24 167
Income in 2011 Yuan (¥1 = $0.28 USD in 2011[a])	14 959 (21 013)	1 to 444 001
Change in income	13 614 (20 940)	−16 226 to 13 614
Prestige in 1991	33.04 (11.88)	0 to 70
Prestige in 2011	29.7 (11.93)	0 to 70
Change in prestige	−3.40 (15.29)	−70 to 70
Male	48.89%	
Baseline age	38.32 (11.34)	16 to 76
Baseline BMI	21.57 (2.63)	13.45 to 40.34
Urban	19.1%	
Education level	1.47 (1.19)	0 to 4
Class in 1991		
Unemployed	3.94%	
Owners	4.88%	
Workers	18.98%	
Farmers	65.84%	
Self-employed	1.55%	
Retired	4.80%	
Class in 2011		
Unemployed	5.99%	
Owners	4.14%	
Workers	10.57%	
Farmers	32.88%	
Self-employed	9.68%	
Retired	36.74%	

Percentages displayed for categorical variables. Standard deviation for percentage (p) used sqrt(p * (1 – p)/N).
[a]Exchange rate between Yuan and USD using purchasing power parity (1.73 in 1991 and 3.51 in 2011) and adjusting for dollar inflation at a factor of 1.64.

Most people had quite a slim body shape at an average BMI of 21.6. The average income was 1349 Yuan in 1991, which increased to 14 959 Yuan in 2011, and the average income change was 13 614 Yuan across 20 years. Occupational prestige was 33.04 on average in 1991, but declined to 29.7 in 2011, probably due to the increasing cases of unemployment and retirement among the respondents.

Table 2 presents the mean of cigarettes and the prevalence of smokers (in %) tabulated by male respondents' class status in 1991 and 2011. The marginal count for columns represents smoking level among aggregate classes in 2011, which shows that the self-employed have the highest counts of cigarettes (13.2) and smoking prevalence (68.3%), followed by owners (12.7 cigarettes and 66.7%) and workers (12.3 and 59.4%). The shade cells along the diagonal line consist of people without class status change. In other words, these diagonal cells give rise to the constant class effect that is unaffected by class mobility. Among the constant class statuses, owners smoked the most heavily (14.3 cigarettes and 70.4%), followed by farmers (11.9 and 64.7%), workers (11.9, 59.5%), self-employees (8.83, 66.7%), and the unemployed (8.8, 50%).

Table 3 features women's smoking by class statuses reported at the origin and destination surveys. The smoke-free situation among women is evident as most categories in class combinations do not contain any smokers. Among the constat class statuses on the diagonal line, female retirees were the heaviest smokers (1.31 cigarettes and 12.7%), followed by female farmers (0.30, 2.2%) and workers (0.19, 2.7%). Women in all other constant classes unaffected by class mobility were nonsmokers.

Class Status Effect and Mobility Effect on Smoking

Table 4 presents diagonal reference models on cigarette counts for men and the binary smoking status for women. Model 0 gives estimates of the overall smoking level of each class. For male, self-employees smoked the most (2.61, $p < .001$), followed in order by owners (2.53, $p < .001$), workers and farmers (both 2.50, $p < .001$), the unemployed (2.12, $p < .001$), while the retirees smoked the least (1.43, $p < .001$). For female, the estimated smoking level is below zero, the class most likely to smoke is retirees (−1.83, $p < .001$), followed by the unemployed (−3.41, $p < .001$) and farmers (−3.61, $p < .001$). Model 0 is a baseline model for the reference. Still, a gender pattern of smoking emerges in that male higher classes (particularly owners and workers) smoked more than male lower classes (the unemployed and farmers). In comparison, female smokers were concentrated among lower classes (eg, farmers and the unemployed).

The delta parameters in the upper section were used to calculate the gamma weights for marginal effects, which summates up to 1. The weights tell us how important were destination class and origin class for substance use. In model 0 with only class status and no mobility events, people tend to adhere to the smoking level in their class at origin (0.69).

Model 1 further included two indicators of social mobility: change in income and change in prestige. Change in income is positively associated with smoking (0.003, $p < .001$), and change in prestige is marginally associated with smoking with a confidence level above 90%. After accounting for the independent mobility effect, the worker class now overtook owners and self-employees to smoke the most (3.18, $p < .001$). For the female model 1, neither income change nor prestige change is associated with being a smoker. Controlling for income and prestige changes, female retirees are still the most likely to smoke (−1.83, $p < .001$), followed by the unemployed (−3.45, $p < .001$) and farmers (−3.74, $p < .001$).

Important demographic background information may influence the class gradient in smoking, so model 2 further incorporated age, BMI, urban residency, and educational level. These last models show that change in income is still associated with more cigarette counts among men (0.03, $p < .05$), whereas the mobility effect is null for women. As a result, hypothesis H2 can be confirmed for the male population. Among men, owners smoked the most (21.33, $p < .001$), followed by the self-employed (20.9, $p < .01$), workers (19.85, $p < .001$), farmers (19.1, $p < .001$), retirees (14.72, $p < .01$), and lastly the unemployed (13.87, $p < .01$). Among women, retirees still smoked the most (−5.5, $p < .001$), followed by the unemployed (−6.16, $p < .001$), workers (−6.41, $p < .001$), farmers (−6.77, $p < .001$), while the least-smoking class was self-employees (−32.9, $p < .001$).

Gamma weights of the final model also indicate that for men who experienced upward mobility, their cigarette counts were closer to peers in the destination class (0.78 > 0.22). In contrast, men who underwent downward mobility, their smoking adhered more closely to the original class (0.60 > 0.40). The weights confirm hypotheses H1a and H1b, which proposed individuals will be assimilated during upward mobility but less so during downward mobility. However, for females, this phenomenon does not exist: females' smoking is strongly determined by their class at the origin (0.99 > 0.01).

Sensitivity Test With Heavy Smoking

The heavier form of tobacco use may have a stronger origin in biological addiction, instead of the social and ritual imperatives behind many Chinese people's smoking. Therefore, Table 5 presents diagonal reference models on heavy smoking to test whether class status effect and mobility effect still exist for heavy smoking among men (the heavy smoking rate among women was too low to technically allow for estimation convergence). The models indicate that the mobility effect still exists for heavy smoking among men. Every 1000

Table 2. Contingency Table of Average Daily Cigarettes and Smoking Prevalence (%) Among Men by Origin and Destination Class

N = 3841	Class in 2011						
Origin class	Unemployed	Owners	Workers	Farmers	Self-employed	Retired	Total
Unemployed	8.8 (60%)	2.5 (50%)	12.25 (75%)	7 (60%)	9.67 (66.7%)	8.33 (100%)	9.14 (69%)
Owners	.75 (25%)	14.33 (70.4%)	8.18 (45.5%)	9.93 (53.3%)	11.88 (62.5%)	10.28 (65.2%)	10.78 (61%)
Workers	15.31 (62%)	11.29 (67.6%)	11.86 (59.5%)	10.63 (65.1%)	13.24 (69.7%)	8.19 (53.5%)	11.22 (61%)
Farmers	8.47 (57%)	13.88 (66.6%)	13.13 (59.7%)	11.97 (64.7%)	13.61 (68.1%)	8.82 (56.3%)	11.62 (62.6%)
Self-employed	16.67 (66%)	5.33 (33.3%)	12.86 (57.1%)	11 (100%)	8.83 (66.7%)	7.67 (66.7%)	10.33 (66.7%)
Retired				5 (100%)		4 (31.6%)	4.03 (33.3%)
Total	10.62 (57.8%)	12.73 (66.7%)	12.33 (59.4%)	11.74 (64.7%)	13.2 (68.3%)	8.34 (54.7%)	11.21 (61.7%)

Shaded cells for the diagonal line.

Table 3. Contingency Table of Average Daily Cigarettes and Smoking Prevalence (%) Among Women by Origin and Destination Class

N = 3841	Class in 2011						
Origin class	Unemployed	Owners	Workers	Farmers	Self-employed	Retired	Total
Unemployed	0 (0%)	0 (0%)	0 (0%)	1.14 (10.7%)	0 (0%)	1.52 (6.5%)	0.88 (5.2%)
Owners	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Workers	0 (0%)	0 (0%)	0.19 (2.7%)	0.54 (7.7%)	0 (0%)	0.11 (1.3%)	0.12 (1.5%)
Farmers	0 (0%)	0.67 (6.7%)	0 (0%)	0.30 (2.2%)	0 (0%)	0.61 (5.8%)	0.38 (3.4%)
Self-employed	0 (0%)		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%9
Retired				1.67 (16.6%)		1.31 (12.7%)	1.33 (12.9%)
Total	0 (0%)	0.32 (3.2%)	0.06 (0.9%)	0.35 (2.8%)	0 (0%)	0.63 (5.6%)	0.42 (3.7%)

Shaded cells for the diagonal line.

Yuan increase in income is associated with a 1% increase in the odds ratio of heavy smoking (0.01, $p < .05$). Given that the average increase in income is 13 614 Yuan, the risk of heavy smoking resulting from the mobility effect is estimated to increase by 13.6%. For the class status effect, after controlling for mobility variables and covariates, owners were most likely to be heavy smokers (1.71, $p < .05$), followed by workers (1.43, $p < .05$) and farmers (1.41, $p < .05$). Unlike cigarette counts, heavy smoking is no more significantly prevalent among retirees and the unemployed. The gamma weights indicate that upward mobility brings individuals closer to their destination class (0.82 > 0.18). However, people who underwent downward mobility still adhere to their original classes in terms of heavy smoking.

Conclusions

This study was motivated by two ongoing puzzles in the literature. First, how can class status effect on health behaviors, which affects the members of a given class by virtue of assimilation and homophily, be differentiated from mobility effect, which emanates from the changing of one's social position? Second, given the normative values of smoking for socialization in the Chinese context, is higher class status negatively associated with smoking in China as in the West?

By applying diagonal reference modeling, a log-linear method to decompose the different sources of class status and mobility (measured by prestige and income), to the China Health Nutrition Survey from 1991 and 2011, this study established support for an independent mobility effect on smoking and heavy smoking among males. Every 1000 Yuan surge in annual income is associated with smoking 0.03 more cigarettes among men. Earlier studies have suggested social mobility, regardless of the destination class and the direction of the mobility, may introduce a "disassociative condition" that disrupts interpersonal relations and increases stress.[2,4] This study renders evidence to support such a claim in the realm of substance use.

There are also distinct class gradients in smoking contrasting males and females. For males, the active members in the labor force, including workers, owners, and self-employees, smoked more cigarettes than the unemployed, farmers, and retirees. In contrast, female retirees and farmers had the highest likelihood of smoking. Admittedly, social classes do not always align to a rank order in which some classes necessarily dominate other classes, but we may still assign a rank to these classes based on the relative power harbored in their labor relationships and economic means[31] or based on the perceived prestige, albeit it is ad hoc, of each class.[32] In the context of this study, owners had higher prestige and stronger control over economic means and in the process of labor reproduction than workers and the self-employed, and male owners also smoked more than male workers and self-employees in the fully adjusted model. Male workers and self-employees, who have better prestige than farmers and the unemployed, also happened to smoke more than the latter groups. Thus, we have provisional evidence arguing that, given the context, higher class status is associated with more smoking among men, but not among women.

The class status effect can be decomposed into two mutually exclusive sources that are traced to the class at the origin (class recorded in 1991) and the class at destination (class reported in 2011). Upwardly mobile men are found to adopt a similar smoking intensity of their peers at the destination class, whereas downwardly mobile and nonmobile men adhered to their original class' smoking intensity. Considering that the Chinese upper classes hold various smoking etiquettes,[15,16,35] this finding suggests that the new members of the upper class may have to conform to the smoking standard in order to assimilate. In contrast, people moving down the social strata are not motivated as much to fit in with their new underclass identity.

Policy Implications

Data over the two decades of China's market reform and restructure have not shown the trend of smoking among higher and working-class men abetted. This study urges an alignment of tobacco control with occupational health policies when smoking is closely correlated with the stratification based partly on the occupational structure. The higher smoking rate and stronger smoking intensity among working men take root ultimately in a workplace culture that appraises the significance of connections and social status over meritocratic achievement so that smoking as a social lubricant finds its vast utility in China's labor pool.[6,16] Therefore, tobacco control needs to prioritize workplaces as the primary battlefield and target individuals who are engaged in jobs that require extensive network connections, such as those in the State-owned enterprises, family business, and public relations. The existence of an independent mobility effect on smoking suggests that income increase may boost the purchasing power to acquire cigarettes, against which a tobacco tax hike should achieve a desirable effect.[36] Mobility effect may also come from the heightened stress throughout social changes, which sounds a note of caution about the need for mental health support integrated within tobacco control policies.

Limitations

I acknowledge a few points that limit the generalizability of this study. First, due to the nature of the contingency table and of the diagonal reference model, no more than two survey waves can be used

Table 4. Diagonal Reference Models on Overall Smoking, Stratified by Gender

	Male smoking (link function by Poisson)			Female smoking (link function by Binomial)		
	Model 0	Model 1	Model 2	Model 0	Model 1	Model 2
Weights						
$\delta_{\text{no change}}$ origin	0.24	0.45	0.08	0.33	−0.20	0.17
δ_{upward} origin		0.22	−0.89		1.08	2.81
δ_{downward} origin		0.06	0.54		0.74	2.57
$\delta_{\text{no change}}$ end	−0.54	−0.45	−0.21	−0.13	−0.004	0.65
δ_{upward} end		0.25	0.64		−0.75	−2.60
δ_{downward} end		−0.06	0.40		−0.79	−2.72
$\gamma_{\text{no change}}$ origin (q_1)	0.69 (0.03)	0.71 (0.03)	0.57 (0.26)	0.61 (0.11)	0.45 (0.14)	0.69 (0.23)
γ_{downward} origin (q_2)		0.74 (0.03)	0.60 (0.28)		0.79 (0.44)	0.99 (0.14)
γ_{upward} origin (q_3)		0.70 (0.15)	0.22 (0.58)		0.83 (0.30)	0.99 (0.11)
$\gamma_{\text{no change}}$ end ($1-q_1$)	0.31 (0.03)	0.29 (0.03)	0.43 (0.26)	0.39 (0.12)	0.55 (0.14)	0.31 (0.23)
γ_{downward} end ($1-q_2$)		0.26 (0.03)	0.40 (0.28)		0.21 (0.45)	0.01 (0.14)
γ_{upward} end ($1-q_3$)		0.30 (0.15)	0.78 (0.58)		0.16 (0.30)	0.01 (0.14)
Variable parameters						
Class						
Unemployment	2.12 (0.08)***	2.04 (0.08)***	13.87 (3.57)**	−3.41 (0.69)***	−3.45 (0.94)***	−6.16 (1.52)***
Owners	2.53 (0.04)***	2.51 (0.04)***	21.33 (3.81)***	−6.02 (2.19)**	7.91 (6.85)	−2.20 (9.62)
Workers	2.50 (0.02)***	3.18 (0.02)***	19.85 (3.50)***	−5.16 (0.86)***	−4.08 (0.99)***	−6.41 (1.42)***
Farmers	2.50 (0.01)***	3.08 (0.01)***	19.11 (3.38)***	−3.61 (0.22)***	−3.74 (0.30)***	−6.77 (1.26)***
Self-employed	2.61 (0.05)***	2.99 (0.05)***	20.88 (3.82)***	−52.64 (220.1)	−44.8 (172.12)	−32.38 (0.01)***
Retired	1.43 (0.08)***	2.14 (0.08)***	14.72 (4.32)**	−1.83 (0.26)***	−1.82 (0.29)***	−5.50 (1.49)***
Change in ¥1000		0.003 (0.00)***	0.03 (0.01)*		−.003 (0.01)	0.002 (0.09)
Change in prestige		0.001 (0.00)†	−0.02 (0.03)		0.03 (0.02)	0.02 (0.02)
Baseline age			−0.11 (0.04)**			0.05 (0.02)**
Baseline BMI			−0.11 (0.14)			0.05 (0.04)
Urban			−2.32 (0.97)*			−0.84 (0.41)*
Final education			−0.57 (0.34)			−0.12 (0.15)
AIC, degree of freedom	27 113, 1607	26 653, 1586	10 560, 1342	555.7, 1887	567.9, 1862	529.7, 1728

Upper panel has weights as parameters, and lower panel contains coefficients (standard errors in parentheses).

Note for statistical significance: *$p < .05$, **$p < .01$, ***$p < .001$, †$p < .10$.

Table 5. Diagonal Reference Models on Male Heavy Smoking

	Male heavy smoking (link function by Binomial)		
	Model 0	Model 1	Model 2
Weights			
$\delta_{\text{no change}}$ origin	0.26	0.43	0.73
δ_{upward} origin		−0.51	−1.63
δ_{downward} origin		−0.01	−0.26
$\delta_{\text{no change}}$ end	−0.31	−0.55	−0.95
δ_{upward} end		0.49	1.54
δ_{downward} end		−0.04	0.47
$\gamma_{\text{no change}}$ origin (q_1)	0.64 (0.10)	0.73 (0.10)	0.84 (0.12)
γ_{downward} origin (q_2)		0.73 (0.12)	0.72 (0.17)
γ_{upward} origin (q_3)		0.49 (0.49)	0.18 (0.42)
$\gamma_{\text{no change}}$ end ($1-q_1$)	0.36 (0.10)	0.27 (0.10)	0.16 (0.12)
γ_{downward} end ($1-q_2$)		0.27 (0.12)	0.28 (0.17)
γ_{upward} end ($1-q_3$)		0.51 (0.49)	0.82 (0.42)
Variable parameters			
Class			
Unemployment	−1.23 (0.44)**	−1.38 (0.68)*	−0.19 (1.09)
Owners	0.05 (0.24)	−0.22 (0.24)	1.71 (0.67)*
Workers	−0.13 (0.14)	−0.33 (0.15)*	1.43 (0.62)*
Farmers	−0.17 (0.08)*	−0.28 (0.09)**	1.41 (0.59)*
Self-employed	0.05 (0.32)	−0.10 (0.39)	1.27 (0.73)†
Retired	−1.97 (0.44)***	−2.51 (0.56)***	−0.32 (0.95)
Change in ¥1000		0.01 (0.003)**	0.01 (0.003)*
Change in prestige		0.001 (0.004)	−0.004 (0.006)
Baseline age			−0.02 (0.01)**
Baseline BMI			−0.04 (0.03)
Urban			−0.29 (0.18)
Final education			−0.04 (0.06)
AIC, degree of freedom	27 113, 1607	2129, 1586	1762, 1342

Note for statistical significance: *$p < .05$, **$p < .01$, ***$p < .001$, †$p < .10$.

to construct the changes in social class status. I have chosen 1991 and 2011 surveys because 1991 was the first wave in the CHNS with information on smoking, and a span of 20 years covers a reasonably long period of time with significant progress in the society to result in meaningful changes in the class structure and smoking behaviors. Some results could vary if another combination of survey waves, say 1995 and 2015, was chosen. Second, the lack of a sufficient number of female smokers has rendered the models for the female sample unstable. This technical issue was especially problematic for female heavy smokers to the point that the model could only converge for the male sample. Female smoking in China is an eminently interesting topic that contradicts experiences seen in other countries and expectations set by the theories. It even differs from the trend of female smoking in other East Asian countries like Japan and Singapore. For this reason, future studies should adopt more nuanced techniques and qualitative methods to explore why some Chinese women smoke while most of them abstain.

Funding

The early stage of this research has received financial support from the Robert Eichhorn Fellowship in Medical Sociology. The support also comes from Seed Grant of the Hundred Talents Project of Sun Yat-sen University.

Acknowledgments

I wish to thank friends and colleagues who offered useful suggestions on this study, they are Tingzhong Yang, Anning Hu, Brian Kelly, Chichen Zhang, Mike Vuolo, James Anderson, Jack Spencer, Jason Houle, and folks I met at the 3rd Health and Population Change Conference in Macau including Yu Li, Jianhua Lu, Tianji Cai, Yuying Tong, Lei Jin, as well as the two anonymous reviewers. I also thank Editor Kamran Siddique for the effort in searching across a huge pool of reviewers.

Declaration of Interests

The author is not aware of conflict of interests with any affiliations, membership, or financial holdings that may affect the objectivity of this study. This study is in no part associated with any entities engaged in the production, cultivation, and sale of tobacco and tobacco-derived products. The study is conducted in full compliance with the 1964 Declaration of Helsinki and its amendments as the criteria of ethical conduct.

References

1. Van der Slik FWP, De Graaf ND, Gerris JRM. Conformity to parental rules: asymmetric influences of father's and mother's levels of education. *Eur Sociol Rev.* 2002;18(4):489–502.
2. Blau PM. Social mobility and interpersonal relations. *Am Sociol Rev.* 1956;21(3):290–295.
3. Clifford P, Heath AF. The political consequences of social mobility. *J R Stat Soc Series A (Statistics in Society)*. 1993;156(1):51–61.
4. Sorokin PA. *Social and Cultural Mobility:* Free Press; 1959:99–145.
5. Simons AM, Groffen DA, Bosma H. Socio-economic inequalities in all-cause mortality in Europe: an exploration of the role of heightened social mobility. *Eur J Public Health*. 2013;23(6):1010–1012.
6. Yang XY, Hendley A. The gendered effects of substance use on employment stability in transitional China. *Health Sociol Rev.* 2018:1–18.

7. Cao Y, Hu C-Y. Gender and job mobility in postsocialist China: a longitudinal study of job changes in six coastal cities. *Soc Forces*. 2007;85(4):1535–1560.
8. Cheng T, Selden M. The origins and social consequences of China's Hukou system. *China Q*. 1994;139:644–668.
9. Gu D, Kelly TN, Wu X, et al. Mortality attributable to smoking in China. *N Engl J Med*. 2009;360(2):150–159.
10. Hamilton V, Hamilton BH. Alcohol and earnings: does drinking yield a wage premium? *Can J Econ*. 1997;30(1):135–151.
11. Lye J, Hirschberg J. Alcohol consumption and human capital: a retrospective study of the literature. *J Econ Surveys*. 2010;24(2):309–338.
12. Wu B, Mao ZF, Rockett IR, Yue Y. Socioeconomic status and alcohol use among urban and rural residents in China. *Subst Use Misuse*. 2008;43(7):952–966.
13. Auld MC. Smoking, drinking, and income. *J Hum Resour*. 2005;40(2):505–518.
14. Dikötter F, Laamann L, Xun Z. Narcotic culture. a social history of drug consumption in China. *British J Crim*. 2002;42(2):317–336.
15. Benedict C. *Golden-Silk Smoke: A History of Tobacco in China, 1550–2010*. Berkeley and Los Angels, CA: University of California Press; 2011.
16. Rich ZC, Xiao S. Tobacco as a social currency: cigarette gifting and sharing in China. *Nicotine Tob Res*. 2012;14(3):258–263.
17. Srivastava P. *Recreational Drug Consumption: An Economic Perspective*. Dordrecht, The Netherlands: Springer International Publishing; 2013.
18. Hendrickx J, De Graaf ND, Lammers J, Ultee W. Models for status inconsistency and mobility: a comparison of the approaches by Hope and Sobel with the mainstream square additive model. *Qual Quant*. 1993;27(4):335–352.
19. Sobel ME. Diagonal mobility models: a substantively motivated class of designs for the analysis of mobility effects. *Am Sociol Rev*. 1981:893–906.
20. Goldthorpe JH. Progress in sociology: the case of social mobility research. In: Svallfors S, ed. *Analyzing Inequality: Life Chances and Social Mobility in Comparative Perspective*. Stanford, CA: Stanford University Press; 2005:56–82.
21. Billingsley S, Drefahl S, Ghilagaber G. An application of diagonal reference models and time-varying covariates in social mobility research on mortality and fertility. *Soc Sci Res*. 2018;75:73–82.
22. van der Waal J, Daenekindt S, de Koster W. Statistical challenges in modelling the health consequences of social mobility: the need for diagonal reference models. *Int J Public Health*. 2017;62(9):1029–1037.
23. McPherson M, Smith-Lovin L, Cook JM. Birds of a feather: homophily in social networks. *Annu Rev Sociol*. 2001;27:415–44.
24. Houle JN, Martin MA. Does intergenerational mobility shape psychological distress? Sorokin revisited. *Res Soc Stratif Mobil*. 2011;29(2):193–203.
25. Hart CL, Davey Smith G, Upton MN, Watt GC. Alcohol consumption behaviours and social mobility in men and women of the Midspan Family study. *Alcohol Alcohol*. 2009;44(3):332–336.
26. Ribet C, Zins M, Gueguen A, et al. Occupational mobility and risk factors in working men: selection, causality or both? Results from the GAZEL study. *J Epidemiol Community Health*. 2003;57(11):901–906.
27. Hart CL, Smith GD, Blane D. Social mobility and 21 year mortality in a cohort of Scottish men. *Soc Sci Med*. 1998;47(8):1121–1130.
28. Pajo E. *International Migration, Social Demotion, and Imagined Advancement: An Ethnography of Socioglobal Mobility*: Springer; 2008.
29. Koltai J, Schieman S. Job pressure and SES-contingent buffering: resource reinforcement, substitution, or the stress of higher status? *J Health Soc Behav*. 2015;56(2):180–198.
30. Wright EO, Perrone L. Marxist class categories and income inequality. *Am Sociol Rev*. 1977;42(1):32–55.
31. Wright EO. *Class Counts: Comparative Studies in Class Analysis*: Cambridge University Press; 1997.
32. Li C. Prestige stratification in the contemporary china: occupational prestige measures and socio-economic index. *Sociol Res*. 2005;2:3.
33. Clifford P, Heath AF. The political consequences of social mobility. *J R Stat Soc Series A (Statistics in Society)*. 1993:51–61.
34. Turner H, Firth D. *Generalized Nonlinear Models in R: An Overview of the GNM Package*. 2007.
35. Yang XY, Anderson JG, Yang T. Impact of role models and policy exposure on support for tobacco control policies in Hangzhou, China. *Am J Health Behav*. 2014;38(2):275–283.
36. Yu L, Cohen JE, Hoe C, Yang T, Wu D. Male smoking reduction behaviour in response to China's 2015 cigarette tax increase. *Tob Control*. 2019:tobaccocontrol-2019-055053.