Economics H195B: Senior Honors Thesis

Analyzing the Expenditure Share of Smoking in China

Shu-Hui Wee

University of California, Berkeley

Advisor: Professor Benjamin Faber[1]

Abstract

This paper uses panel data from the Chinese Health and Nutrition Survey from 1989 to 2011 to investigate how the household expenditure share is affected if there is at least one smoker in the household. The expenditure shares that were examined were for food, education, rent, furniture, electronics and vehicles. This was done by using a fixed effects model to control for the differences in time and province. The main finding is that having at least one smoker in the household results in a negative effect on the food, education, rent, furniture and electronics expenditure shares with all the results being significant besides that for food.

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I. Introduction

China is the world's largest tobacco producer and consumer and has been for many years, as such it is important to study its effects on the Chinese economy and its population (Eriksen et al., 2015). The extent and emphasis China places on growing tobacco is evident in that despite being a land scarce country, China grows tobacco on more agricultural land than that of India, Brazil, Malawi and United Republic of Tanzania combined (Eriksen et al., 2015). In 1980, China's tobacco production was similar to that of other major producers like Brazil, India, USA and Argentina; however, in the past 30 years, China has tripled its tobacco production and does not show signs of slowing down (Eriksen et al., 2015). The trend in China's tobacco consumption rates compared to that of other countries are similar to their tobacco production trends. With more than 320 million cigarette smokers in China (Hu and Mao, 2002), more cigarettes are smoked in China than in the next top 29 cigarette-consuming countries combined (Eriksen et al., 2015). According to World Bank data, the overall smoking prevalence among adults in China has decreased from 2000 to 2012 for both males and females. Smoking prevalence among males dropped from 56% in 2000 to 49% in 2012 and smoking prevalence among females dropped from 4% in 2000 to 2% in 2012 ("China | Data."). As such, the disproportionate increase in the number of cigarettes smoked in China is probably due to China's population growth and an increase in smoking intensity. In 2013, an average smoker in China smoked 22 cigarettes a day, nearly 50% more than in 1980 (Eriksen et al., 2015).

Unlike other parts of the world where cigarette consumption has plateaued, China's tobacco industry shows no sign of slowing down as cigarette consumption continues to rise (Eriksen et al., 2015). Tobacco poses a major threat to sustainable and equitable development as the tobacco-poverty link has increasingly been recognized in the global tobacco control

community (Do and Bautista, 2015). Furthermore, tobacco use can have negative consequences on the economic well-being on not just the smokers themselves but also on their immediate family members (Do and Bautista, 2015). As such, it is important to identify how cigarette consumption affects a households' expenditure and what the crowding out effects of smoking is.

In this paper, I seek to find out how having a smoker in the household affects the household's expenditure share in China. I have identified common household expenses, which includes a household's expenses on food, rent, education, household furniture, household electronics and vehicles. I go about finding it out by using a fixed effects model where I regress the dependent variables of the various expenditure shares on an independent variable that indicates if there is at least one smoker in the house. In this model, I control for household income, household size, urban-rural setting and education-level. My hypothesis is that having at least one smoker in the household will have a negative impact on household expenditures on food, rent, education, electronics, furniture and vehicles. Identifying if and how smoking affects a household's expenditure share will help to shape policy that the Chinese government should put into place so as to decrease the rates of smoking. A tax policy on tobacco can be devised to cut consumption and result in a net reduction in expenditure. This will have positive implications on the overall household welfare and the intra-household allocation of goods and services (John, 2008). This paper contributes to existing literature by using panel data and a fixed effects model, by looking at China's population as a whole and by identifying more expenditure shares.

II. Literature Review

This section is an analysis of existing literature that examine the crowding out effects of smoking and why it is important to see how it affects spending.

Studies have shown that the prevalence of cigarette smoking in China have increased poverty rates and decreased the standard of living. Using data from China's National Health Services Survey from 1998, Liu et al. (2006) found that the increase in poverty headcount in both urban and rural China can be attributed to the direct household spending on cigarettes and excessive medical spending attributable to smoking. They found that the poverty headcount in urban and rural areas increased by 6.4% and 1.9% respectively due to the direct household spending on cigarettes. Thus, they concluded that reducing the smoking rate is a poverty reduction strategy. Hu et al. (2005) also examined the effect smoking has on poverty rates in China. It is important to understand the relationship between smoking status, household standard of living and poverty in China because in spite of rapid economic growth, China is still considered a low income country. They found that on average, each additional pack of cigarettes per month would reduce other household expenditures by 2.9 Yuan per capita, which is between 9 and 12 Yuan per household, per month.

The crowding-out effect cigarette expenditures have on household expenditures can be seen in Do and Bautista's paper, "Tobacco Use and Household Expenditures on Food, Education, and Healthcare in Low- and Middle-Income Countries: A Multilevel Analysis" (2015). Do and Bautista (2015) used the World Health Survey from 2002 to 2004 to examine 43 low- and middle-income countries, including China, to see the association between household tobacco consumption among male income providers and three categories of household expenditures – food, education and healthcare. They found statistically significant associations of both daily and occasional tobacco use of the main male income provider with decreased household expenditures on food, education and healthcare. Even though their paper includes

countries in addition to China; however, since they are all low- and middle-income countries, I would expect the results for just China to be similar.

Wang et al. (2005) examined the impact of tobacco smoking on household expenditure patterns in rural China. They found that spending on tobacco affects human capital investment (e.g. education and health), future farming productivity and financial security (e.g. saving and insurance). They also recognized that smokers tend to spend more on alcohol, thereby exacerbating the impact of addictive substances on spending on basic needs like food, utilities and durable goods. An interesting finding that they had was that total household income was higher in households with tobacco expenditure than in households without tobacco expenditure. However, the effect tobacco consumption has on expenditure should still be worrying because household income declined as tobacco consumption increased if there was already tobacco expenditure in the household. Households with low-tobacco spending status had the highest average income and households with high-tobacco spending status had the lowest average income. For households with high tobacco and alcohol spending, they could spend nearly 23% of total expenditure on tobacco and alcohol consumption. This is in stark contrast to how much they spend on education and medical care as they spent about 6.1% and 5.5% of their total consumption on education and medical care related goods and services respectively. Households with no-tobacco spending, on the other hand, spent about 14.9% and 10.3% of their budget on the above categories respectively. There are some limitations to their study. Firstly, the data on consumption does not include in-kind consumption. Thus, food produced by farmers themselves are not captured in the data, which could be a significant amount since this study is focused on rural China. Secondly, they only focused on 2 provinces in rural China, which may not be representative of all of rural China.

The crowding out effects of smoking are definitely not unique to China. John (2008) looked at the crowding out effect of tobacco expenditure and its implications on household resource allocation in India. Not only did he look at how expenditure on basic needs were affected but he also examined its implications on nutrition intake. The results show that households with smokers had lower consumption of certain commodities such as milk, education, clean fuels and entertainment. Tobacco spending was also found to have negative effects on per capita nutrition intake. Households with tobacco consumers allocated more of their budget to cereals and cereal substitutes compared to non-tobacco consumers. Furthermore, milk and milk products were highly compromised in tobacco-consuming households. As milk and milk products are mostly consumed by children, it is worrying that their nutrition is affected due to the adult smokers in the household.

Pu et al. (2008) also analyzed crowding-out effects of tobacco outside of China by looking at data for Taiwan. Taiwan was chosen because they wanted to see the crowding-out effects of tobacco in a country with low tobacco expenditure and high income. They found that in a low tobacco expenditure country like Taiwan, the crowding out effects were still prevalent in a tobacco-consuming household. For higher income households, expenditures on necessities like food and medical care were not affected; however, spending on non-necessities were. As such, even for higher income households, tobacco expenditure can still hamper their standard of living.

The above literary works agree that smoking does affect household expenditure and there are significant crowding-out effects from smoking. My paper seeks to expand on the research already conducted by looking at a representative population of China and examining more specific expenditure shares in the household.

III. Data and Sample Description

The data came from the Chinese Health and Nutrition Survey (CHNS), which covered 9 survey years spanning from 1989 to 2011 and 12 different provinces. Table 1 shows a summary of the number of households surveyed in each province and each year. Beijing, Shanghai and Chongqing were only added in 2011, thus there is only data in 2011 for those provinces. The CHNS was designed to examine the effects of health, nutrition, and family planning policies and programs implemented by national and local governments to see how social and economic transformation of Chinese society was affecting the health and nutritional status of its population. The CHNS consists of many different surveys. In order to get the variables I wanted in my regression, I used the "Household Survey," the "Adult Questionnaire'" in the "Physical Activity Survey" and the "Food Market Survey." The individuals who answered the "Adult Questionnaire" are all aged 18 and older. The data in this survey is panel, with majority of the households taking part in every survey round that was available to them. This dataset had a total of 38,439 observations with each observation corresponding to a particular household in a particular survey year. The data offers a diverse sample with a huge variation of socioeconomic factors and related demographic measures. By the 2011 survey, the sample in the survey captured 47% of China's population (Zhang et al., 2013).

Table 2 is a summary of the dependent variables in the various regressions I carried out. There is a total of 7 different dependent variables. The various dependent variables are different expenditure shares of the household.

"expenditure_share_food" represents the household's expenses on rice, wheat flour, other grains, cooking oil, eggs, pork, beef, mutton and sugar in the market over the household's total expenses. This was the only type of food surveyed. The limited types of food included in food

expenditure helps to explain why the mean expenditure share on food is so low, with a mean of 0.9%.

"expenditure_share_education" and "expenditure_share_rent" are the expenses on education and expenses on rent over the household's total expenses respectively. The mean for the expenditure share on rent is 40.2%, which means that for those households that do spend on rent, rent takes up a huge amount of expenses.

"expenditure_share_furniture" is the household's total expenses on living room and bedroom furniture bought in the past 12 months over the household's total expenses in that year.

"expenditure_share_electronics" is the household's total expenses on entertainment electronics like the VCR, television, stereo and camera, bought in the past 12 months over the household's total expenses in that year. "expenditure_share_hh_electronics" represents the household's total expenses on household electronics like the washing machine, refrigerator, air conditioner, fan and microwave bought in the past 12 months over the household's total expenses. The means for both electronic expenditure shares are very similar with the one for entertainment products being 57.7% and the one for household goods being 55.7%.

"expenditure_share_vehicles" is the household's total expenses on motorcycles and cars purchased in the past 12 months over the household's total expenses in that year. The mean for expenditure share of vehicles is only 9.8%, which suggests that not many households surveyed purchased vehicles in the year they were surveyed because one will assume that the expenditure on vehicles should make up a significant portion of household expenses.

Table 3 is a summary of the independent variable I used in the regression. "smoker_dummy" is a dummy variable where 1 indicates if there is at least 1 smoker in the household and where 0 indicates if there are no smokers in the household. The mean number of smokers per household

is 0.617 with the minimum number of smokers per household being 0 and the maximum number of smokers per household being 11. A total of 19,693 households had at least 1 smoker in the household.

Table 4 is a summary of the 5 control variables I used in the regression. “hhincgross_cpi” is the household’s total income for that year surveyed but inflated to 2011 prices. “urban” is a dummy variable where 1 indicates if the household lives in an urban area and 0 indicates if the household lives in a rural area. “household_size” refers to the number of people in the household and it was found taking the sum of the number of people in the household who were surveyed and the number of people in the household who were not surveyed. “highest_educ” refers to the highest level of education attained in the household with a greater number referring to a higher level of education. “fx_pt” is a fixed effect variable that controls by province and by survey year. There are a total of 80 different fixed effect variables.

Table 1: Survey Years and Provinces Surveyed

Province	**Survey Year**								
	1989	1991	1993	1997	2000	2004	2006	2009	2011
Beijing									480
Liaoning	479	434	394		479	482	494	490	483
Heilongjiang				479	477	480	485	488	485
Shanghai									480
Jiangsu	440	432	427	481	494	490	489	498	487
Shandong	478	454	415	478	483	460	484	480	482
Henan	479	455	434	488	476	496	492	498	498
Hubei	479	464	437	480	487	488	490	500	490
Hunan	480	440	443	472	488	481	506	517	509
Guangxi	480	465	451	502	512	499	502	531	545
Guizhou	480	475	455	496	500	511	525	517	505
Chongqing									480

Table 2: Summary of Dependent Variables

Dependent Variable	Obs	Mean	Std. Dev.	Min	Max
expenditure_share_food	38,439	0.009	0.065	0	1
expenditure_share_education	38,439	0.016	0.114	0	1
expenditure_share_rent	38,439	0.402	0.489	0	1
expenditure_share_furniture	38,439	0.016	0.106	0	1
expenditure_share_electronics	38,439	0.577	0.455	0	1
expenditure_share_hh_electronics	38,439	0.557	0.457	0	1
expenditure_share_vehicles	38,439	0.098	0.279	0	1

Table 3: Summary of Independent Variable

Control Variable	Obs	Mean	Std. Dev.	Min	Max
smoker_dummy	38,439	0.515	0.500	0	1

Variable	Obs	Mean	Std. Dev.	Min	Max
smoker	38,439	0.6169515	0.7079708	0	11

Number of Smokers in the Household	Count of Households
0	18,746
1	16,295
2	2,922
3	423
4	32
5	4
9	13
10	2
11	2

Table 4: Summary of Control Variables

Control Variable	Obs	Mean	Std. Dev.	Min	Max
hhincgross_cpi	38,439	27,204.85	39,208.74	0	1,399,241
urban	38,439	0.332	0.471	0	1
household_size	38,439	3.601	1.502	0	14
highest_educ	38,439	4.551	3.375	0	26
fx_pt	38,439	40.982	23.160	1	80

IV. Model Description

In this paper, I used a fixed effects model because my data is panel data. Using such a model will allow me to control for the average differences across provinces and time in any observable or unobservable predictors. A total of 18 different regressions was carried out in this paper. The following models (Model 1-6) are the models I used to see how having a smoker in the household affects the various expenditure shares. Each model differs from the previous by

having another control variable added to it. 18 regressions were carried out – I carried out models 1 through 6 find the expenditure share on food; however, for the other 6 dependent variables, I only carried out model 1 and model 6.

$$expenditure\_share_{hpt} = ß_0 + ß_1 smoker\_dummy_{hpt} + \varepsilon_{hpt} \quad (1)$$

$$expenditure\_share_{hpt} = ß_0 + ß_1 smoker\_dummy_{hpt} + ß_2 hhincgross\_cpi_{hpt} + \varepsilon_{hpt} \quad (2)$$

$$expenditure\_share_{hpt} = ß_0 + ß_1 smoker\_dummy_{hpt} + ß_2 hhincgross\_cpi_{hpt} + ß_3 urban_{hpt} + \varepsilon_{hpt} \quad (3)$$

$$expenditure\_share_{hpt} = ß_0 + ß_1 smoker\_dummy_{hpt} + ß_2 hhincgross\_cpi_{hpt} + ß_3 urban_{hpt} + ß_4 household\_size_{hpt} + \varepsilon_{hpt} \quad (4)$$

$$expenditure\_share_{hpt} = ß_0 + ß_1 smoker\_dummy_{hpt} + ß_2 hhincgross\_cpi_{hpt} + ß_3 urban_{hpt} + ß_4 household\_size_{hpt} + ß_5 highest\_educ_{hpt} + \varepsilon_{hpt} \quad (5)$$

$$expenditure\_share_{hpt} = ß_0 + ß_1 smoker\_dummy_{hpt} + ß_2 hhincgross\_cpi_{hpt} + ß_3 urban_{hpt} + ß_4 household\_size_{hpt} + ß_5 highest\_educ_{hpt} + \phi_{pt} + \varepsilon_{hpt} \quad (6)$$

Expenditure_share$_{hpt}$ is the dependent variable that indicates the percentage change in expenditure share with every change in the independent variables. Subscript *h* refers to the household, *p* refers to the province that the household lives in and *t* refers to the survey year.

Smoker_dummy$_{hpt}$ is the independent variable that indicates if there is a smoker in the household or not. The other independent variables in the model are the control variables.

The control variables "household_size" and "highest_educ" were considered as factor variables when I carried out the regression.

ϕ_{pt} is the fixed effect variable fx_pt in Table 4, which controls the variables by province and time to account for any variation within provinces and by time.

ε_{hpt} is the errors term in the regression. In Model 6, I accounted for standard errors in the data by clustering the standard errors.

V. Regression Results and Analysis

Expenditure Share on Food

Table 5 displays the results from the regression done for the expenditure share on food. When I regressed expenditure share on food with the smoker dummy (Model 1), I got significant results at the 0.1% level with a t-statistic of 6.40. Model 1 tells me the average difference in the expenditure share on food for a household with at least 1 smoker and without a smoker is 0.42%. Using models 1 to 5, the coefficient on smoker_dummy is positive and are all significant at the 0.1% level, suggesting that households with smokers have a greater expenditure share on food than households without smokers. However, according to model 6, where I take into account fixed effects, the coefficient on the smoker dummy is -0.000593, which means that on average, households with a smoker spend 0.059% less than households without smokers. This difference is not only very minute, but it is also not significant as I get a t-statistic of -1.08. This means that I cannot reject the null hypothesis that having a smoker in the house does not affect the household's expenditure share on food. Even though this result is not significant, the negative relationship between having a smoker in the household and the expenditure share on food aligns with results from the studies presented in Section 2 of this paper.

Table 5: Regression Results for Expenditure Share on Food[2]

	(1) expenditure_share_food	(2) expenditure_share_food	(3) expenditure_share_food	(4) expenditure_share_food	(5) expenditure_share_food	(6) expenditure_share_food
smoker_dummy	0.00422***	0.00458***	0.00453***	0.00405***	0.00399***	-0.000593
	(6.40)	(6.94)	(6.85)	(6.05)	(5.94)	(-1.08)
hhincgross_cpi		-7.27e-08***	-7.23e-08***	-7.53e-08***	-7.24e-08***	-8.86E-09
		(-8.65)	(-8.58)	(-8.88)	(-8.29)	(-1.34)
urban			-0.000605	0.000391	0.000610	-0.000139
			(-0.86)	(0.55)	(0.79)	(-0.08)
_cons	0.00672***	0.00851***	0.00872***	-0.00365	-0.00358	0.0024
	(14.22)	(16.51)	(15.28)	(-0.22)	(-0.22)	(1.76)
R-Squared	0.0011	0.0030	0.0030	0.0048	0.0054	0.0663
N	38439	38439	38439	38439	38439	38439

t statistics in parentheses
* p<0.05, **p<0.01, *** p<0.001

Expenditure Share on Education

Table 6 displays the results from the regression done for the expenditure share on education. When I regressed expenditure share on education with the smoker dummy (Model 1), I get a coefficient of -0.00035. This means that on average, households with a smoker spend

[2] This is a truncated table. To see the full table with the coefficients for the indicator variables household size, highest education and the fixed effect variable, refer the appendix.

0.035% less than households without smokers. However, this result is not significant. When I add the controls (Model 6), I get a coefficient on the smoker dummy variable of -0.00546. This means that on average, controlling for income, household size, level of education in the household, urban-rural setting and fixed effects, households with at least one smoker have a smaller expenditure share on education than households without a smoker by 0.546% and this result is significant at the 5% level. This coefficient has a t-statistic of -2.24. This means that I can reject the null hypothesis that having a smoker in the house does not affect the household's expenditure share on education. Even though this result is significant, the difference in expenditure share is very small.

Table 6: Regression Results for Expenditure Share on Education

	(1) expenditure_share _education	(6) expenditure_share _education
smoker_dummy	-0.00035 (-0.30)	-0.00546* (-2.24)
hhincgross_cpi		-3.73e-08* (-2.21)
urban		-0.00966** (-2.79)
_cons	0.0160*** (19.08)	0.0186** (2.75)
R-squared	0.000	0.166
N	38439	38439

t statistics in parentheses
* p<0.05, **p<0.01, *** p<0.001

Expenditure Share on Rent

Table 7 displays the results from the regression done for the expenditure share on rent. When I regressed expenditure share on rent with the smoker dummy (Model 1), I get a coefficient of -0.0723. This means that on average, households with a smoker spend 7.23% less than households without smokers. This result is significant at the 0.1% level with a t-statistic of -14.52. However, the R-squared for this regression is 0.0055, suggesting there is almost 0 correlation between the expenditure share on rent and having a smoker in the household. When I add the controls (Model 6), I get a coefficient on the smoker dummy variable of -0.0160. This means that on average, controlling for income, household size, level of education in the household, urban-rural setting and fixed effects, households with at least one smoker have a smaller expenditure share on rent than households without a smoker by 1.6% and this result is significant at the 5% level. This coefficient has a t-statistic of -2.54. This means that I can reject the null hypothesis that having a smoker in the house does not affect the household's expenditure share on rent.

Table 7: Regression Results for Expenditure Share on Rent

	(1) ependiture_share_rent	(6) ependiture_share_rent
smoker_dummy	-0.0723*** (-14.52)	-0.0160* (-2.54)
hhincgross_cpi		-0.00000109*** (-10.44)
urban		0.477*** (27.34)
_cons	0.439*** (122.89)	1.002*** (26.90)
R-squared	0.0055	0.438
N	38439	38439

t statistics in parentheses
* p<0.05, **p<0.01, *** p<0.001

Expenditure Share on Furniture

Table 8 displays the results from the regression done for the expenditure share on furniture. When I regressed expenditure share on furniture with the smoker dummy (Model 1), I get a coefficient of 0.000776. This means that on average, households with a smoker spend 0.0776% more than households without smokers. This result is not significant, having a t-statistic of 0.72. Furthermore, the R-squared for this regression is 0, suggesting there is 0 correlation between the expenditure share on rent and having a smoker in the household. When I add the controls (Model 6), I get a coefficient on the smoker dummy variable of -0.00303. This means that on average, households with at least one smoker have a smaller expenditure share on

furniture than households without a smoker by 0.303% and this result is significant at the 5% level. This coefficient has a t-statistic of -2.32. This means that I can reject the null hypothesis that having a smoker in the house does not affect the household's expenditure share on furniture. The R-squared for model 6 is 0.943, which suggests there is a strong correlation between the expenditure share on furniture and the independent variables.

Table 8: Regression Results for Expenditure Share on Furniture

	(1) expenditure_share_ furniture	(6) expenditure_share _furniture
smoker_dummy	0.000776	-0.00303*
	(0.72)	(-2.32)
hhincgross_cpi		-1.14E-09
		(-0.14)
urban		-0.01000***
		(-3.99)
_cons	0.0154***	0.00802***
	(19.91)	(3.51)
R-squared	0.000	0.943
N	38439	38439

t statistics in parentheses
* p<0.05, **p<0.01, *** p<0.001

Expenditure Share on Entertainment Electronics and Household Electronics

Table 9 displays the results from the regression done for the expenditure share on entertainment electronics and household electronics. I combined these regressions into one table so that there is a visual comparison between the 2 types of electronics. I wanted to compare these 2 types of electronics because I regard household electronics as more of a necessity for the household than entertainment electronics. When I regressed expenditure share on entertainment electronics with the smoker dummy (Model 1), I get a coefficient of -0.0234. This means that on average, households with a smoker spend 2.34% less than households without smokers. This result is significant at the 0.1% level with a t-statistic of -5.05. However, the R-squared for this regression is 0.001, suggesting there is almost 0 correlation between the expenditure share on entertainment electronics and having a smoker in the household. When I add the controls (Model 6), I get a coefficient on the smoker dummy variable of -0.0178. This means that on average, households with at least one smoker have a smaller expenditure share on entertainment electronics than households without a smoker by 1.78% and this result is significant at the 1% level. This coefficient has a t-statistic of -3.25. This means that I can reject the null hypothesis that having a smoker in the house does not affect the household's expenditure share on leisure electronics.

When I regressed expenditure share on household electronics with the smoker dummy (Model 1), I get a coefficient of -0.0302. This means that on average, households with a smoker spend 3.02% less than households without smokers. This result is significant at the 0.1% level with a t-statistic of -6.47. However, the R-squared for this regression is 0.001, suggesting there is almost 0 correlation between the expenditure share on household electronics and having a smoker in the household. When I add the controls (Model 6), I get a coefficient on the smoker

dummy variable of -0.0161. This means that on average, households with at least one smoker have a smaller expenditure share on household electronics than households without a smoker by 1.61% and this result is significant at the 0.1% level. This coefficient has a t-statistic of -3.49. This means that I can reject the null hypothesis that having a smoker in the house does not affect the household's expenditure share on household electronics.

The results show that the effect having a smoker in the household has on the expenditure share on both entertainment electronics and household electronics are very similar. This means that I am unable to come to a conclusion if having a smoker in the household affects expenditure on goods that are not necessities more so than others.

Table 9: Regression Results for Expenditure Share on Entertainment Electronics and Household Electronics

	(1) expenditure_share_electronics	(6) expenditure_share_electronics	(1) expenditure_share_hh_electronics	(6) expenditure_share_hh_electronics
smoker_dummy	-0.0234*** (-5.05)	-0.0178** (-3.25)	-0.0302*** (-6.47)	-0.0161*** (-3.49)
hhincgross_cpi		-0.00000153*** (-13.16)		-0.00000135*** (-12.76)
urban		0.342*** (17.91)		0.376*** (19.73)
_cons	0.589*** (176.87)	0.933*** (31.93)	0.573*** (171.36)	0.924*** (28.70)
R-squared	0.001	0.378	0.001	0.410
N	38439	38439	38439	38439

t statistics in parentheses
* p<0.05, **p<0.01, *** p<0.001

Expenditure Share on Vehicles

Table 10 displays the results from the regression done for the expenditure share on vehicles. When I regressed expenditure share on vehicles with the smoker dummy (Model 1), I get a coefficient of 0.0465. This means that on average, households with a smoker spend 4.65% more than households without smokers. This result is significant at the 0.1% level, having a t-statistic of 16.39. However, the R-squared for this regression is 0.007, suggesting there is almost 0 correlation between the expenditure share on vehicles and having a smoker in the household. When I add the controls (Model 6), I get a coefficient on the smoker dummy variable of 0.0146. This means that on average, households with at least one smoker have a larger expenditure share on vehicles than households without a smoker by 1.46% and this result is significant at the 0.1% level. This coefficient has a t-statistic of 3.72. This means that I can reject the null hypothesis that having a smoker in the house does not affect the household's expenditure share on vehicles. Using the results from Model 6, the expenditure share on vehicles is the only dependent variable that has a positive relationship with having a smoker in the family.

Table 10: Regression Results for Expenditure Share on Vehicles

	(1) expenditure_share_vehicles	(6) expenditure_share_vehicles
smoker_dummy	0.0465*** (16.39)	0.0146*** (3.72)
hhincgross_cpi		0.000000404*** (5.16)
urban		-0.0798*** (-9.06)
_cons	0.0744*** (36.55)	-0.128*** (-4.93)
R-squared	0.007	0.136
N	38439	38439

t statistics in parentheses
* p<0.05, **p<0.01, *** p<0.001

In all the expenditure share regressions, the coefficient on household income is negative besides the regression done for expenditure share on vehicles. The negative coefficient means that an increase in household income decreases the expenditure share of that variable. This makes sense because the greater the income for the house, the more likely they will have other expenses so the variables I included would not take up as huge a percentage as a lower income household. The positive coefficient on household income for the expenditure share on vehicles could be because households with higher income tend to buy more expensive vehicles than households with lower income.

There are limitations to my research. Firstly, the food expenses are only limited to those food products mentioned and though those are food staples; however, it may not be entirely representative of the true food expenses by households. Secondly, my research does not take into consideration who makes the spending decision in the household, thus I am not able to see how the person who makes the household spending decision affects the expenditure share.

VI. Conclusion

Looking at the different results from the regressions of the various expenditure shares, I can come to a conclusion that having a smoker in the household in China does negatively affect the expenditure shares on food, education, rent, furniture and electronics. In order to not decrease the standard of living and increase the poverty rates in China, it is therefore imperative that measures are taken by the government to decrease smoking prevalence in China.

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VIII. Appendix

Table 11: Regression results of Expenditure Share on Food

	(1) expenditure_share_food	(2) expenditure_share_food	(3) expenditure_share_food	(4) expenditure_share_food	(5) expenditure_share_food	(6) expenditure_share_food
smoker_dummy	0.00422***	0.00458***	0.00453***	0.00405***	0.00399***	-0.000593
	(6.40)	(6.94)	(6.85)	(6.05)	(5.94)	(-1.08)
hhincgross_cpi		-7.27e-08***	-7.23e-08***	-7.53e-08***	-7.24e-08***	-8.86E-09
		(-8.65)	(-8.58)	(-8.88)	(-8.29)	(-1.34)
urban			-0.000605	0.000391	0.000610	-0.000139
			(-0.86)	(0.55)	(0.79)	(-0.08)
0.household_size				0	0	0
				(.)	(.)	(.)
1.household_size				0.00872	0.00906	-0.000293
				(0.52)	(0.54)	(-0.23)
2.household_size				0.00891	0.00944	0.000201
				(0.54)	(0.57)	(0.17)
3.household_size				0.0111	0.0115	-0.000351
				(0.66)	(0.69)	(-0.29)
4.household_size				0.0161	0.0166	0.00262
				(0.97)	(0.99)	(1.47)
5.household_size				0.0135	0.0141	0.0007
				(0.81)	(0.84)	(0.47)
6.household_size				0.0127	0.0133	0.0000389
				(0.76)	(0.80)	(0.02)

7.household_size	0.0131	0.0140	0.000412
	(0.78)	(0.83)	(0.24)
8.household_size	0.019	0.0203	0.00867*
	(1.12)	(1.19)	(2.31)
9.household_size	0.0182	0.0197	0.00844
	(1.02)	(1.11)	(0.80)
10.household_size	0.0154	0.0173	0.00672
	(0.76)	(0.85)	(0.70)
11.household_size	0.0125	0.0140	-0.00138
	(0.56)	(0.62)	(-0.30)
12.household_size	0.028	0.0312	0.00691
	(0.90)	(0.94)	(0.72)
13.household_size	0.00861	0.0122	-0.00217
	(0.24)	(0.34)	(-0.38)
14.household_size	0.00629	0.0106	0.00583
	(0.09)	(0.16)	(1.82)
0.highest_educ		0	0
		(.)	(.)
1.highest_educ		-0.0023	-0.00118
		(-1.45)	(-1.22)
2.highest_educ		-0.002353	-0.000913
		(-0.99)	(-0.89)
3.highest_educ		-0.001782	-0.00105
		(-0.49)	(-0.80)
4.highest_educ		-0.001201	-0.000836
		(-0.25)	(-0.56)

5.highest_educ	0.000830	-0.00018
	(0.54)	(-0.11)
6.highest_educ	-0.000224	-0.00104
	(-0.14)	(-0.71)
7.highest_educ	0.00111	0.000211
	(0.62)	(0.11)
8.highest_educ	0.000871	0.000853
	(0.47)	(0.38)
9.highest_educ	-0.00551	-0.00284
	(-1.28)	(-1.15)
10.highest_educ	-0.00373	-0.0034
	(-1.67)	(-1.52)
11.highest_educ	-0.000794	0.000161
	(-0.29)	(0.06)
12.highest_educ	-0.00690*	-0.00645*
	(-2.06)	(-2.16)
13.highest_educ	-0.00474	-0.00531
	(-1.27)	(-1.77)
14.highest_educ	-0.00178	-0.00191
	(-0.36)	(-0.30)
15.highest_educ	-0.00602	-0.00539
	(-1.02)	(-1.33)
16.highest_educ	-0.00853	-0.00729*
	(-1.20)	(-2.62)
17.highest_educ	0.0155	0.0126
	(1.71)	(0.66)
18.highest_educ	-0.00866	-0.00761*

	(-0.89)	(-2.37)
19.highest_educ	-0.00599	-0.00758**
	(-0.44)	(-2.79)
20.highest_educ	-0.01295	-0.00578
	(-0.55)	(-1.68)
21.highest_educ	-0.0119	-0.00818*
	(-0.63)	(-2.10)
22.highest_educ	-0.01393	-0.00583
	(-0.33)	(-1.57)
23.highest_educ	-0.0111	-0.0278**
	(-0.38)	(-2.97)
24.highest_educ	-0.006794	-0.00586
	(-0.02)	(-0.83)
25.highest_educ	-0.00133	0.000806
	(-0.03)	(0.40)
26.highest_educ	-0.01333	-0.00641
	(-0.18)	(-1.22)
1.fx_pt		0
		(.)
2.fx_pt		-0.00193
		(-1.61)
3.fx_pt		0.0148***
		(12.73)
4.fx_pt		0.0312***
		-26.81
5.fx_pt		-0.00138
		(-1.26)

6.fx_pt	-0.0013 (-1.16)
7.fx_pt	-0.00124 (-1.11)
8.fx_pt	-0.0011 (-1.03)
9.fx_pt	-0.000861 (-0.79)
10.fx_pt	0.0553*** (48.62)
11.fx_pt	-0.00133 (-1.22)
12.fx_pt	-0.00112 (-1.11)
13.fx_pt	-0.00113 (-1.11)
14.fx_pt	-0.00105 (-1.02)
15.fx_pt	-0.000884 (-0.87)
16.fx_pt	-0.0000397 (-0.18)
17.fx_pt	-0.00225 (-1.70)
18.fx_pt	0.0197*** (15.18)

19.fx_pt	0.0302***
	(24.60)
20.fx_pt	0.0231***
	(20.52)
21.fx_pt	-0.00159
	(-1.50)
22.fx_pt	-0.00139
	(-1.30)
23.fx_pt	-0.0014
	(-1.30)
24.fx_pt	-0.00106
	(-1.00)
25.fx_pt	-0.00107
	(-1.03)
26.fx_pt	-0.0024
	(-1.78)
27.fx_pt	0.0231***
	(17.73)
28.fx_pt	0.0269***
	(20.58)
29.fx_pt	0.0244***
	(19.78)
30.fx_pt	-0.0018
	(-1.59)
31.fx_pt	-0.00168
	(-1.41)
32.fx_pt	-0.00161

	(-1.41)
33.fx_pt	-0.00134
	(-1.24)
34.fx_pt	-0.00132
	(-1.22)
35.fx_pt	-0.00247
	(-1.91)
36.fx_pt	0.0141***
	(11.00)
37.fx_pt	0.0175***
	(13.55)
38.fx_pt	0.0221***
	(18.59)
39.fx_pt	-0.00195
	(-1.71)
40.fx_pt	-0.00182
	(-1.54)
41.fx_pt	-0.00174
	(-1.41)
42.fx_pt	-0.00153
	(-1.34)
43.fx_pt	-0.00171
	(-1.46)
44.fx_pt	-0.00256
	(-1.90)
45.fx_pt	0.0254***
	(19.33)

46.fx_pt	0.0377***
	(29.73)
47.fx_pt	0.0400***
	(32.36)
48.fx_pt	-0.00196
	(-1.66)
49.fx_pt	-0.00196
	(-1.61)
50.fx_pt	-0.00199
	(-1.54)
51.fx_pt	-0.00163
	(-1.37)
52.fx_pt	-0.00163
	(-1.39)
53.fx_pt	-0.00249
	(-1.82)
54.fx_pt	0.0133***
	(10.26)
55.fx_pt	0.0628***
	(51.76)
56.fx_pt	0.0803***
	(68.15)
57.fx_pt	-0.00169
	(-1.52)
58.fx_pt	-0.00149
	(-1.35)

59.fx_pt	-0.00174
	(-1.58)
60.fx_pt	-0.00162
	(-1.45)
61.fx_pt	-0.00145
	(-1.29)
62.fx_pt	-0.00242
	(-1.93)
63.fx_pt	0.0243***
	(19.05)
64.fx_pt	0.0286***
	(23.76)
65.fx_pt	0.0291***
	(24.49)
66.fx_pt	-0.00204
	(-1.78)
67.fx_pt	-0.00211
	(-1.74)
68.fx_pt	-0.00215
	(-1.72)
69.fx_pt	-0.0019
	(-1.62)
70.fx_pt	-0.00186
	(-1.55)
71.fx_pt	-0.00241
	(-1.70)
72.fx_pt	0.00986***

						(7.36)
73.fx_pt						0.0228***
						(16.78)
74.fx_pt						0.0232***
						(17.86)
75.fx_pt						-0.00185
						(-1.57)
76.fx_pt						-0.00185
						(-1.40)
77.fx_pt						-0.00193
						(-1.43)
78.fx_pt						-0.00181
						(-1.39)
79.fx_pt						-0.00171
						(-1.31)
80.fx_pt						-0.00142
						(-1.39)
_cons	0.00672***	0.00851***	0.00872***	-0.00365	-0.00358	0.0024
	(14.22)	(16.51)	(15.28)	(-0.22)	(-0.22)	(1.76)
R-Squared	0.0011	0.0030	0.0030	0.0048	0.0054	0.0663
N	38439	38439	38439	38439	38439	38439

t statistics in parentheses

* p<0.05, **p<0.01, *** p<0.001