Employer Subsidized Meals and FAFH Consumption in Urban China

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Abstract

This study investigates factors influencing household decisions on food away from home (FAFH) consumption with special interest given to the effects of employer subsidized meals on FAFH consumption. Using data from a new urban food consumption survey and collected by the Center for Chinese Agriculture Policy from 2009 to 2012 in 10 cities, a double-hurdle model is utilized to estimate the demand for FAFH as a whole and by type of facility (restaurant, fast-food outlet, and other facilities). The key findings suggest that households with at least one member receiving subsidized meals are more likely to participate in the FAFH market, but these households spend less when they dine out than their counterparts without employer subsidized meals.

Keywords: Subsidized meal, Food-away-from-home, Urban China, Double-hurdle model

JEL classification: D12

1. Introduction

Employer subsidized meals are common in urban China. Generally speaking, they have four forms: in-salary; in-ticket; free meal; and discounted meal. Meal subsidy in-salary is treated as part of wage earnings, which has no restriction on food consumption. Ticket, issued by the employer, is a kind of food vouchers or gift cards that only can be used to purchase meals at particular food outlets (usually near the workplace). Free and discounted meals are prepared at employer-owned food facilities (e.g., restaurants, cafeterias, or food shops). Employers offer meals to their employees during work days for free or at a charge that is below the market price for an equivalent meal. Apart from the in-salary subsidy, the remaining forms are non-cashable, non-transferrable, and viewed as job benefits (Bai et al. 2010). However, the effect of receiving a meal subsidy on FAFH consumption is unclear.

Although the literature on FAFH is rich, to our knowledge, no study has considered the effect of receiving employer subsidized meals on FAFH participation and expenditure. One paper by Bai et al. (2010), however, does investigate the effect of hosted meals on FAFH participation and expenditure. They examined a Box-Cox double-hurdle model with and without the value of hosted meals included in the independent variable set, respectively, and concluded that exclusion of hosted meals might amplify income effects on both the likelihood of dining out and the level of expenditures on FAFH. In their study, the hosted meal referred to the meal (fully or partially) hosted by employer, by friends or relatives, and by others. Although their study provides a good starting point, it may be more accurate to separate an employer hosted meal (which we call a subsidized meal) from other forms of hosted meals. Because subsidized meals are treated as part of the work benefit, employees are not expected to pay back or reciprocate. Further, the meal hosted by a non-employer is different by nature. It is viewed as a gift in

Chinese culture and the beneficiary, in most cases, will voluntarily reciprocate later by offering something else at a comparable value. Since a rational beneficiary realizes that tomorrow's expense on reciprocation will roughly offset today's gain, receiving a non-employer hosted meal has no foreseeably effect on the household's income constraint.

This study focuses on the households with at least one employed adult member present during the survey week and try to find out: (1) whether receiving subsidized meals has a significant effect on FAFH participation and expenditure, and (2) whether the effect varies by type of food facility. The remainder of this paper includes a discussion of the theoretical framework, specification of the empirical model, description of survey and data used in this study, report of empirical results, and the conclusion.

2. Theoretical framework

This study uses Becker's household production and consumption model (hereafter referred to as Becker's model) as the theoretical basis for the empirical model specification. The key assumption of Becker's model is that a household is both a producing and a consuming unit. The household utilizes market goods or services and non-market time of household members to produces commodities, which are consumed directly by members and not sold in the market, and maximizes its utility function subject to the household's production function, full income, total available time, and other household characteristics. The Becker's model can be mathematically expressed as:

$$U = U(Z_1, Z_2, \ldots, Z_n) \tag{1}$$

$$\text{s.t.} \quad Z_i = Z_i(X_i, t_{i1}, t_{i2}, \ldots, t_{im}; D), \qquad i = 1, 2, \ldots, n \tag{2}$$

$$T_{pk} = \sum_{i=1}^{n} t_{ik} = T_k - T_{wk} - T_{ck}, \qquad k = 1, 2, \ldots, m \tag{3}$$

$$I = \sum_{i=1}^{n} P_i X_i = \sum_{k=1}^{m} W_k * T_{wk} + V \tag{4}$$

where

Z_i = commodity i produced in the household for own consumption;

X_i = a vector of market goods and/or services used to produce Z_i;

T_{pk} = time spent by household member k in household production;

t_{ik} = time spent by household member k in the production of Z_i;

T_k = available time of household member k in the labor market and in household production;

T_{wk} = household member k's total working time in the labor market;

T_{ck} = household member k's total commute time between home and workplace;

I = household full income;

P_i = price of X_i;

W_k = wage rate for household member k;

V = household non-wage income; and

D = a vector of socio-demographic variables of household and/or household members.

Maximizing utility function (1), subject to constraints (2), (3) and (4), with respect to X_i and t_{ik}, the demand function for X_i is

$$X_i = f_i (P_1, \ldots, P_n, W_1, \ldots, W_m, V; D). \quad (5)$$

Following Yen (1993) and Nayga (1996), equation (5) can be multiplied by price (P_i) to yield the household expenditure on market good (X_i).

$$EXP_i = P_i * X_i = g (W_1, \ldots, W_m, V; D) \quad (6)$$

Equation (6) is commonly used in studies dealing with FAFH where X_i represents FAFH meal (e.g., Kinsey 1983; McCracken and Brandt 1987; Yen 1993; Manrique and Jensen 1998; Mutlu and Gracia 2006).

When a household has at least one family member receiving a subsidized meal from an employer, denoted by S, it will change the utility function to

$$U = U(Z_1, Z_2, \ldots, Z_n; S) \tag{7}$$

Since the number of meals an individual can consume in a given period is limited by his or her biological capacity, receiving a subsidized meal, to the household, means less commodity Z_i is needed to be produce at home, and, consequently, less X_i is required to be purchased from the market[1]. Then the effect of subsidized meal on the household income constraint can be expressed as

$$\sum_{i=1}^{n} P_i X_i - P_s * g^{-1}(S) = \sum_{k=1}^{m} W_k * T_{wk} + V \tag{8}$$

where $g^{-1}(S)$ denotes market goods or services needed if the household is assumed to produce the received S, and P_s is price of $g^{-1}(S)$. The interaction term, $P_s * g^{-1}(S)$, stands for the latent expenditure that the recipient of the subsidized meal receives or the market value of the subsidized meal if it were purchased. Let $V_s = P_s * g^{-1}(S)$.

Because a subsidized meal is usually not cashable and is treated as a work benefit, it is reasonable to assume that people will always take a subsidized meal if they have a choice to produce a meal by themselves, purchase a meal at market price, or consume a subsidized meal at the workplace. Given this assumption, the market value of a subsidized meal, Vs, can be viewed as determined exogenously for the recipient as well as his or her household. The demand function for X_i and expenditure on X_i given the household receives a subsidized meal can be expressed as

$$X_i^s = f_i(P_1, \ldots, P_n, W_1, \ldots, W_m, V, V_s; D), \text{ and} \tag{9}$$

$$EXP_i^s = P_i * X_i^s = g_i(W_1, \ldots, W_m, V, V_s; D). \tag{10}$$

[1] A similar expression was presented in the study by Bai et al. (2010), who added hosted meal (H) into the household utility function and incorporated the value of hosted meal into the household income constraint.

3. Empirical model

The household's decision to consume FAFH can be motivated by two sequential decision-making processes. Firstly, the household has to decide whether or not to dine out, which is usually called the participation decision. Secondly, for the one who chooses to consume away from home, an expenditure decision must be made (i.e., how much to spend on this meal); for the one who desires not to participate in the FAFH market, observed FAFH expenditure will be zero. A large number of zero consumption is a common issue in food consumption data. For a censored dependent variable, the application of Ordinary Least Squares (OLS) will result in biased and inconsistent parameter estimates (Amemiya 1985; Ma et al. 2006).

To obtain consistent estimates, we follow Bai et al. (2010) to examine an extended dependent double-hurdle model which allows for the interdependence between two hurdles and heteroskedasticity and non-normality of the error terms. Mathematically, the double-hurdle model can be expressed as

$$(11) \qquad y_i = \begin{cases} y_{2i}^* = X_{2i}'\beta_2 + u_{2i}, \ if \begin{cases} y_{1i}^* = X_{1i}'\beta_1 + u_{1i} > 0 \\ \quad and \\ y_{2i}^* = X_{2i}'\beta_2 + u_{2i} > 0 \end{cases} \\ \qquad 0 \qquad , otherwise \end{cases}$$

where y_i is the observed household expenditure, and y_{1i}^* and y_{2i}^* are two unobservable latent variables representing the participation hurdle and the expenditure hurdle, respectively. $X_{1i}'$is a vector of exogenous variables explaining the participation decision, $X_{2i}'$is a vector of exogenous variables explaining the expenditure decision, β_1 and β_2 are parameter vectors to be estimated, and the respective error terms, u_{1i} and u_{2i} , are assumed to be distributed as $[u_{1i}, u_{2i}]$'~ BVN(0, Σ), $\Sigma = \begin{bmatrix} 1 & \rho\sigma_i \\ \rho\sigma_i & \sigma_i^2 \end{bmatrix}$, which means the conditional distribution of the latent variables is bivariate normal.

To account for the non-normal errors, a Box-Cox transformation on y_i is applied. The original form of the one parameter Box-Cox transformation takes the following form (Box and Cox, 1964):

$$(12) \qquad y_i^T = \begin{cases} \frac{y_i^{\lambda}-1}{\lambda} & \text{if } \lambda \neq 0 \\ \log y_i & \text{if } \lambda = 0 \end{cases},$$

where y_i is the original data, y_i^T is the transformed data, and λ is an unknown transformation parameter. The likelihood function for the Box-Cox double hurdle (BCDH) model can be derived from (11) and (12) as

$$(13) \qquad \mathrm{L} = \prod_{y_i=0}[1 - \Psi\left(x_{1i}^{'}\beta_1, \frac{x_{2i}^{'}\beta_2+\frac{1}{\lambda}}{\sigma_i}, \rho\right)] \cdot \prod_{y_i>0}\left\{\Phi\left[\frac{x_{1i}^{'}\beta_1+\left(\frac{\rho}{\sigma}\right)\left(y_i^T-x_{2i}^{'}\beta_2\right)}{(1-\rho^2)^{\frac{1}{2}}}\right] y_i^{\lambda-1}\frac{1}{\sigma_i}\phi\left(\frac{y_i^T-x_{2i}^{'}\beta_2}{\sigma_i}\right)\right\}$$

where $\Psi(\cdot)$ is the standard bivariate normal cumulative distribution function with correlation ρ, and $\Phi(\cdot)$ and $\phi(\cdot)$ are the univariate standard normal cumulative distribution and density functions, respectively (Liu et al. 2012).

To capture heteroskedasticity of error terms in the BCDH model, the standard deviation of error term (σ_i) is specified as

$$(14) \qquad \sigma_i = W_i^{'}\gamma,$$

where W_i' is a set of exogenous variables, and γ is the parameter vector. In this study, W_i' is hypothesized to include household disposable income and household's geographic location based on model selection results. Then, we maximize (13) to estimate parameters β_1, β_2, σ, λ, ρ and γ.

4. Data and variables

The household survey data analyzed in this study were collected in 10 Chinese cities (i.e., Nanjing, Chengdu, Xi'an, Shenyang, Xiamen, Harbin, Taiyuan, Taizhou, Nanning, and

Lanzhou), and the surveys were conducted by the Center for Chinese Agricultural Policy (CCAP) at the Chinese Academy of Sciences. The Nanjing survey was conducted in 2009, Chengdu's in 2010, Xi'an's, Shenyang's and Xiamen's in 2011, and the remaining five cities in 2012 (Table 1). The CCAP survey has two separate but complementing parts: part I collects socio-demographics for each member in the household, and part II records every member's food consumption for three meals per day in the surveyed week. The meals are segregated into two groups: FAFH and food prepared at home. FAFH consumption in the survey includes all dine-in and to-go meals purchased from full-service restaurants, fast-food outlets, cafeterias, and small vendors or stands. The person who paid for the meal has to pay for (1) the ordered meal; (2) food preparation and service; and (3) dining place and environment. Besides self-paid FAFH expenditure, each household also reports the actual or estimated value of hosted meals received during the survey week. See Bai et al. (2010) and Liu et al. (forthcoming) for detailed information about the CCAP surveys.

The target population in this study is the households with at least one working adult present in the survey week. Out of 2026 total households in the 10-city surveys, 473 households had no employed family members and are excluded from the analysis (Figure 1). In terms of employment status, 2771 household members from 1553 households are employed. Of these, only 28 employees have a part-time job, while the remaining 2743 members (99%) work full-time. Overall, 53% of households received subsidized meals and the average value is 40.58 Chinese Yuan (hereafter referred to as Yuan) per week for households receiving a meal subsidy[2] (Table 2).

[2] Note: the value of subsidized meal, household FAFH expenditure and weekly disposable income are deflated using regional monthly consumer price indices (CPI) into 2012 Yuan.

The dependent variables are the household's total expenditure on FAFH in the survey week and the disaggregated expenditures at restaurants, fast-food outlets, and other commercial facilities, respectively. The independent variables in the participation hurdle X'_{1i} are household disposable income (weekly), household size, predicted household head's labor supply, the head's education level and age, presence of senior (age ≥ 60 years old) in the household, dummy variables to indicate whether the household received subsidized meals, whether it is a double-earner household and whether it residents in the south part of China[3][4]. The independent variables in the expenditure hurdle X'_{2i} includes all variables in X'_{1i} plus three other exogenous variables: number of FAFH visits on the weekend and two city-size dummies[5].

We draw on previous studies in the selection of explanatory variables. The positive relation between household income and FAFH consumption is widely detected in previous studies, despite the different forms of income (e.g., Liu et al., forthcoming; Ma et al. 2006; McCracken and Brandt 1987; Yen 1993). The value of household head's time has been shown empirically to have a significantly positive effect on FAFH consumption in the literature, while quantification of this variable has varied across studies. Kinsey (1983), Mutlu and Gracia (2006), Redman (1980), and Yen, Kasteridis, and Riley (2012) use an employment status dummy variable to reflect opportunity cost of head's time. McCracken and Brandt (1987) estimate the head's salary based on age, education, sex, location of residence of household heads, non-earned

[3] The head of the household is defined as the person who is the most familiar with food shopping and food consumption in the household. Female head accounts for 74.18% in the full sample and 73.90% in the truncated sample.

[4] Predicted household head's labor supply is calculated by a Tobit model. The dependent variable is the observed labor supply of head, which is the sum of head's working hours and round-trip commute time between home and workplace in a typical week. The independent variables are head's demographics (i.e., gender, age, marriage status, and education level), household size, two city-size dummies, and a regional dummy.

5 The variable, the number of FAFH visits on the weekend, has different values in four BCDH models. They are the total number of FAFH visits on the weekend, the number of visits on the weekend at restaurants, at fast-food outlets and at other commercial facilities, respectively.

income, spouse's earnings and the age and presence of children in the household. Bai et al. (2010), Bai et al. (2012), Jensen and Yen (1995), and Yen (1993) replace the observed labor supply with predicted labor supply of head in their estimation. Since the theory of conditional demand suggests use of work hours, not wage rates, as the explanatory variable (Shaw and Feather 1999), we use the predicted labor supply of head to measure the value of time[6].

The effect of head's education level is ambiguous because Bai et al. (2010) found that households with the head's education level above high school are less likely to eat out than other families, while Liu et al. (forthcoming), Yen (1993), and Yen, Kasteridis, and Riley (2012) found a positive effect. Head's age is found to have a negative impact on FAFH expenditure (e.g., Redman 1980; Yen 1993; Mutlu and Gracia 2006; Yen, Kasteridis, and Riley 2012). Similarly, the presence of a senior in the household was found to lower the probability of FAFH participation and expenditure level on FAFH consumption by Bai et al. (2010) and by Bai et al. (2012). Additionally, Bai et al. (2010) found that the value of hosted meal boosted household expenditure on FAFH.

Because work competes with food preparation at home for the time endowment, double-earner households have less time available for household food production than one-earner and no-earner households (Jacobs, Shipp and Brown, 1989). Paulin (2000) found that, on average, double-earner households have a higher FAFH expenditure than others. The inclusion of the weekend effect variable (number of visits on the weekend) is based on Liu et al. (forthcoming) and Byrne et al. (1996). They both find the number of FAFH visits on the weekend has significantly positive effects on FAFH expenditures in China and in the U.S., respectively. As

[6] Following Bai et al. (2010), we use the predicted labor supply of head from a Tobit model as a proxy to replace its corresponding observed value.

the household size increases, the FAFH consumption increases for both restaurant and fast-food outlets (Bai et al. 2012), but the growth rate decreases (McCracken and Brandt 1987).

Dummy variables that indicate geographic location have also been found to affect FAFH participation and expenditures. For example, Bai et al. (2010) found significant district effects in Beijing by using district dummies, and Liu et al. (forthcoming), investigating six urban Chinese cities, found significantly different city effects. Since we have 10 cities in our study, we decide to use two city-size dummy variables instead of nine city dummies. Based on information in a Notice released by the State Council P. R. China on November, 20th, 2014[7], the 10 cities are divided into three groups: Chengdu, with at least 10 million inhabitants, is the largest city in the survey; Nanjing, Xi'an, Shenyang, Harbin, Nanning and Taizhou belong to group 2, which have 5 to 10 million inhabitants; and the remaining three cities fall into group 3, which have 3 to 5 million inhabitants. Finally, we use one regional dummy to capture the difference between south and north China since region dummies are significant in several studies (e.g., McCracken and Brandt 1987; Mutlu and Gracia 2006; Nayga 1996; Yen 1993; Yen, Kasteridis, and Riley 2012).

Sample statistics of the expenditures are reported in Table 3 and Table 4. Overall, 83.64% of the sampled households participate in the FAFH market. The average weekly expenditure on FAFH for all households is 141.20 *yuan* and 168.80 *yuan* for those households with positive total FAFH expenditures during the survey week. The difference of FAFH expenditure between the full sample and truncated sample is 27.6 Yuan; while Harbin has the largest difference (50.37 Yuan) and Taizhou has the smallest (16.64 Yuan). The average household number of FAFH visits in the survey week is 8.26 for the full sample and 9.63 for the truncated sample. Xi'an's households, on average, have the largest number of FAFH visits,

[7] http://www.gov.cn/xinwen/2014-11/20/content_2781156.htm (Chinese).

which is slightly less than three times as that in Taiyuan in the full sample and more than twice as that in the truncated sample (Table 3).

In the CCAP survey, food facility type includes restaurants, fast-food outlets, cafeterias and other commercial food facilities. Table 4 summarizes the descriptive statistics of household expenditures at each food-type-facility during the survey week. In expenditure terms, an average household spends about 62 Yuan at restaurants, 38 Yuan at fast-food outlets, 24 Yuan at cafeterias, and 17 Yuan at other commercial food outlets. However, as for the FAFH market participation rate (or percentage of uncensored households), less than half of households dine out at restaurants (41.5%), or at cafeterias (45.9%) or at other commercial facilities (35.6%), while 56.9% of households consumed at fast-food outlets. In this study, we combined household expenditure at cafeteria with that at other commercial facility[8].

The statistical descriptions of exogenous variables specified in the BCDH model are reported in Table 5. The average household size is 3.1 person. Weekly household disposable income is about 1465 (1513) Yuan in the full (truncated) sample. A typical household head spends 48.9 hours a week in the labor market (including commute time between home and workplace) in the full sample and 48.7 hours in the truncated sample. In terms of head's education level, 42% (46%) of them received above high school education in the full (truncated) sample. The means of head's age are very similar in the two sub-samples, while the presence of senior in the household is higher in the full sample. In addition, more than half of the households have at least one family member receiving subsidized meals, and the number of double-earner households is slightly higher than that of single earner households. On average, households eat away from home on weekends more than two times per week.

[8] We estimated the BCDH model using FAFH expenditure at cafeterias as dependent variable, but it failed to converge.

5. Empirical results

Table 6 presents our econometric results and Table 7 shows the elasticities of the participation probability, conditional expenditure, and unconditional expenditure with respect to all exogenous variables. For continuous variables, the elasticities are evaluated at sample means, and for discrete regressors, average effects are calculated when the value of these variables changes from zero to one. We predict the unconditional expenditure elasticity (not reported) and the elasticity of the probability of consuming FAFH from the BCDH models, and we calculate the conditional expenditure elasticity because the total change in the unconditional expenditure in terms of an exogenous variable in a BCDH model can be disaggregated into the change in conditional expenditure and the change in participation probability (Bai et al. 2010; Bai et al. 2012).

Based on estimated results from the ML method, heteroskedasticity and dependence of error terms can be statistically tested. Specifically, the coefficients of variables in the sigma equation are significantly different from zero only for total FAFH expenditure and expenditure at restaurants, indicating that the error terms (u_{1i} and u_{2i}) suffer from heteroskedasticity in these two models. However, the estimated rho is statistically significant at the significance level of 0.01 for all four models, suggesting that the error terms of the participation and expenditure equations are contemporaneously correlated. Lastly, the Tobit model (lambda=0) is rejected since lambda is significantly different from zero at the significance level of 0.01.

5.1 Total expenditure on FAFH

The BCDH model for total expenditure on FAFH indicates that household disposable income, head's education level and age, the presence of senior, household receives subsidized meals, double-earner household, the number of FAFH visits on the weekend, city size and region all have significant influences on participation and expenditure decisions. Consistent with the

literature, households with higher income are more likely to eat out and spend more on FAFH consumption than poorer households. Correspondingly, the elasticity of participation probability and the conditional expenditure elasticity with respect to household weekly disposable income are 0.064 and 0.498, respectively, implying that a 10% increase in income will cause the probability of eating out to go up by 0.64% and a 4.98% rise in conditional FAFH expenditure, respectively. In comparison with similar studies, Bai et al. (2010) and Liu et al. (forthcoming) also found that the conditional expenditure elasticity is larger than the elasticity of participation probability, while Ma et al. (2006) found the opposite.

The effects of receiving subsidized meals on FAFH are significant for both participation and expenditure decisions. Households with at least one member receiving subsidized meals, on average, are 5.7% more likely to dine out, but spend 0.8% less in the FAFH market than those households without any subsidy. There are two likely explanations: relaxed income constraint and interaction between family members. As we mentioned before, receiving subsidized meals is equivalent to earning extra money from the employer, which relaxes the household's income constraint and gives it more access to the FAFH market. Another possibility is the impact from family members: one member may start from consuming subsidized meal away from home and then get used to dine out. His or her preference will influence the rest of the family, so the whole family will converge their preference and give priority to dine out than other options.

A few more factors are found to be significant. For example, households with the head's education level above high school are 8.7% more likely to dine out and the conditional expenditure is 36.8% higher than others. This finding is consistent with Liu et al. (forthcoming), but conflicts with Bai et al. (2010) who found negative effects of the head's education on both the probability and conditional elasticities. In addition, a 10% increase in the head's age will

cause conditional expenditure to shrink by 7%. Similarly, the presence of senior in the household negatively affects both FAFH participation and expenditure. Households with at least one senior are 7.8% less likely to participate in the FAFH market and spend 36.8% less when dining out, which is consistent with Bai et al. (2010). Double-earner households are 4.4% more likely to eat outside. A 10% increase in household size will cause a 2.9% rise in conditional expenditure, while the effect on the participation decision is insignificant. The more frequently a household dines out on the weekend, the more it spends: a 10% increase in FAFH visits on the weekend will contribute to a 3.1% growth in expenditure. Furthermore, households residing in the south part of China are 5.1% more likely to eat away from home, but spend 3.4% less when dining out. Households living in cities with 5 to 10 million inhabitants spend 20.1% less than those living in cities with more than 10 million inhabitants, while households living in cities with 3 to 5 million inhabitants spend 28.4% less than those living in cities with above 10 million inhabitants.

Surprisingly, the head's opportunity cost of cooking (quantified by the predicted labor supply) is insignificant in both hurdles. We also replace the predicted labor supply with actual labor supply, actual salary of head, and the head's employment status dummy (1=full- or part-time worker), respectively, to re-estimate the BCDH model, but none of these are found to significantly affect participation or expenditure in the FAFH market[9].

5.2 Expenditures on FAFH by type of food facility

Given the hypothesis that the demand for FAFH differs by type of food facility, disaggregated regression models are separately estimated for expenditures at restaurants, fast-food outlets, and

[9] When we use the actual labor supply and actual salary of head, only 1033 households are included.

other commercial facilities[10]. Income has a positive effect on participation and associated expenditure decisions at restaurants and fast-food outlets, but it is only significant for the expenditure decision at other commercial facilities. The elasticities of participation probability at each facility are 0.07, 0.07, and 0.03, respectively, meaning that a 10% increase of weekly disposable income will boost the likelihood of dining out by 0.7% at restaurants and at fast-food outlets, and by 0.3% at other commercial facilities. Accordingly, a 10% rise of income will create a 1.5% of increase in expenditure at restaurants, 2.1% at fast-food outlets, and 2.0% at other commercial facilities. Again, the value of head's time (i.e. predicted labor supply of head) is insignificant for all three disaggregated models.

Households with at least one member receiving subsidized meals are 5.2% more likely to consume at restaurants and spend 8.6% more than their counterparts. It indicates that receiving subsidized meals does relax the household's income constraint, while this income effect is small and the household still needs to carefully budget FAFH consumption to balance the frequency and expenditure[11]. In addition, households receiving a meal subsidy are 22% more likely to eat at other commercial facility, revealing that habit formation also plays an important role in the household's decisions on FAFH consumption. As we mentioned before, we combine the FAFH expenditure at cafeterias and the expenditure at other commercial facilities into one group, called expenditure at other facilities, and the expenditure at cafeterias accounts for a large portion of that category[12]. Subsequently, we can say that households receiving a meal subsidy have a higher

[10] Since the BCDH model for FAFH expenditure at restaurants failed to converge, we replace expenditure at restaurant with household total expenditure. The correlation between total expenditure and expenditure at restaurant is 0.88.

[11] The income effect is small because the value of subsidized meal only accounts for 3% of weekly disposable income on average for the households receiving a meal subsidy. However, the value of subsidized meals for those receiving a meal subsidy is about 24% (=40.58/168.8) of their total FAFH expenditures on average.

[12] Out of the total 954 FAFH consumptions at other facilities, 712 occurred at cafeterias, and FAFH expenditure at cafeterias accounts for 81.32% of expenditure at others.

probability to eat out at cafeterias. Because most subsidized meals are consumed at cafeterias; households receiving a meal subsidy prefer the one they are most familiar with than other available options. Lastly, households with meal subsidies spend 7.8% less at fast-food outlets than those with no subsidy.

Households with a head that has above a high school education are 8.7% more likely to dine out at restaurants and 17% more likely to dine out at other commercial facilities; the conditional expenditure level is 18% higher at restaurants and 20 % higher at other facilities than those of their counterparts. In terms of head's age, a 10% rise will lead to a 1.9% decrease in participation probability at fast-food outlets and a decrease in the conditional expenditures at restaurants by 2% and at fast-food outlets by 0.1%. Similarly, presence of a senior decreases the participation and expenditure at restaurants and other facilities as well as the participation at fast-food outlets. Double-earner households dine out more often and spend more at all types of facilities except for expenditure at fast-food outlets. As the household size increases, expenditures at restaurants and other commercials go up. There are also positive weekend-dining-out effects in all three disaggregated models. Households living in the south of China participate more and spend more at restaurants than those in the north, and households residing in the largest cities spend significantly more at restaurants than those in smaller cities.

6. Conclusion

In this study, we investigate factors influencing household participation and expenditure decisions for FAFH with a special attention to the effects of employer subsidized meals. Firstly, we estimate a BCDH model for total FAFH expenditure and find that households with at least one member receiving subsidized meals are more likely to participate in the FAFH market, but spend less than their counterparts. After that, we disaggregate total FAFH expenditure by type of

food facilities and re-estimate our BCDH model. The results suggest that households with subsidy are more likely to dine out at restaurants and other facilities than do their counterparts. They also spend more at restaurants, but less at fast-food outlets. Household disposable income, head's education level, head's age, the presence of a senior, double-earner household, household size, the number of FAFH visits on the weekend, city size and region are found to be significantly related to the FAFH participation and expenditure decisions, but their effects vary by type of food facility.

The findings of this study can assist marketing strategies for the FAFH sector. For instance, senior discounts can be applied by all types of food facilities as age reduces the expenditure at restaurants and fast-food outlets, and the presence of a senior in the household lowers both probability and conditional expenditure at all types of FAFH facilities except for expenditure level at fast-food outlets. In addition, fast-food outlets should pay attention to nearby firms who provide subsidized meals to employees and provide coupons or discount to these employees in order to offset the negative effect of receiving subsidized meal on FAFH expenditure at fast-food outlets. Furthermore, promotional campaigns offering quantity discounts (e.g., buy-one-get-one) could be an effective tool for fast-food restaurants to attract large families.

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Tables and Graphs

Figure 1 Sample structure

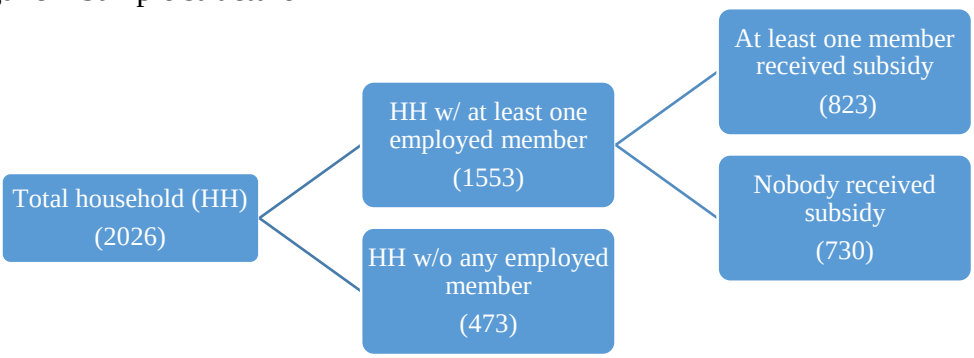

Table 1 Basic Information of Surveyed City

Survey city	Capital city	Household (HH) #	No. of HH member	Survey year	Drop-off date	Population (million)	Region in China
Nanjing	Yes	246	729	2009	14-Oct	8.19	East
Chengdu	Yes	208	622	2010	15-Oct	14.30	Southwest
Xi'an	Yes	215	633	2011	6-Jun	8.59	Northwest
Shenyang	Yes	206	546	2011	23-Jun	8.26	Northeast
Xiamen	No	149	443	2011	9-Jun	3.73	East
Harbin	Yes	212	565	2012	23-Jul	9.95	Northeast
Taiyuan	Yes	202	553	2012	11-Aug	4.28	North
Taizhou	No	190	554	2012	20-Aug	6.04	East
Nanning	Yes	197	578	2012	13-Sep	7.24	Central South
Lanzhou	Yes	201	551	2012	4-Dec	3.64	Northwest
Observation		2026	5774				

Table 2 Prevelance and average value of meal subsidy at household level

City	Number of households with employee	Number of households receiving subsidy	Prevalence rate	Average value of subsidy
Nanjing	182	140	76.92%	56.27
Chengdu	174	100	57.47%	41.54
Xian	179	92	51.40%	26.08
Shenyang	150	113	75.33%	53.97
Xiamen	116	65	56.03%	44.12
Harbin	135	62	45.93%	34.86
Taiyuan	136	49	36.03%	11.77
Taizhou	162	86	53.09%	37.22
Nanning	171	71	41.52%	36.03
Lanzhou	148	45	30.41%	33.44
Total	1553	823	52.99%	40.58

Table 3 Household FAFH expenditure and frequency in the surveyed week by city

City	FAFH market participation	Full sample		Truncated sample	
		FAFH exp. (self-paid)	Number of eatout	FAFH exp. (self-paid)	Number of eatout
Nanjing	87.36%	141.85	10.53	162.37	11.57
Chengdu	83.91%	147.83	8.93	176.18	10.32
Xi'an	84.36%	156.96	10.09	186.06	11.79
Shenyang	84.67%	126.66	10.06	149.60	11.45
Xiamen	83.62%	125.35	8.53	149.90	9.89
Harbin	77.04%	168.97	5.87	219.33	7.37
Taiyuan	72.79%	92.44	3.71	126.99	5.06
Taizhou	91.98%	190.71	7.56	207.34	8.09
Nanning	85.38%	106.22	8.97	124.41	10.36
Lanzhou	81.76%	146.36	6.79	179.02	8.16
Total	83.64%	141.20	8.26	168.80	9.63

Table 4 Disaggregated FAFH expenditure by type of food facility

Type of facility	Full sample		Truncated sample		
	Mean	Std. Dev.	% of uncensored	Mean	Std. Dev.
Restaurant	61.82	144.47	41.53%	148.84	193.19
Fast-food outlet	38.20	61.85	56.92%	67.10	69.15
Cafeteria	24.49	42.52	45.85%	53.42	48.98
Other commercial	16.52	43.95	35.61%	46.40	63.58

Table 5 Summary statistics of independent variables

Description of Varibale	Full sample		Truncated sample	
	Mean	Std. Dev.	Mean	Std. Dev.
Household (HH) disposable income (yuan/wk)	1465.13	967.02	1513.17	1003.77
Predicted HH head's labor supply (hour/wk)	48.91	5.02	48.66	4.94
HH head's education (0-1 dummy: 1=above high school)	0.42	0.49	0.46	0.50
HH head's age (year)	46.35	10.44	45.77	10.30
Presence of senior (age ≥ 60) in the HH (0-1 dummy: 1=yes)	0.19	0.39	0.17	0.38
HH received subsidized meal (0-1 dummy: 1=yes)	0.53	0.50	0.55	0.50
Both husband and wife are earners (0-1 dummy: 1=yes)	0.54	0.50	0.57	0.49
HH size (person)	3.06	0.83	3.06	0.81
Number of FAFH visits on weekends	2.05	2.21	2.39	2.22
City size 1 (0-1 dummy:1=HH lives in cities between 5 and 10 million inhabitants)	0.63	0.48	0.64	0.48
City size 2 (0-1 dummy:1=HH lives in cities between 3 and 5 million inhabitants)	0.26	0.44	0.24	0.43
Region (0-1 dummy: 1=HH resides in south part of China)	0.52	0.50	0.54	0.50
Observations	1553		1299	

Table 6 Estimation results for total expenditure on FAFH, and by type of food facility

Description of variables	Total FAFH Expenditure	Expenditure at restaurant	Expenditure at fast-food	Expenditure at others
Participation				
HH disposable income (yuan/wk)	0.0001 **	0.0002 ***	0.0001 *	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)
Head's labor supply (hour/wk)	0.0098	0.0100	0.0011	0.0057
	(0.010)	(0.010)	(0.008)	(0.008)
Head's education level	0.2910 ***	0.2907 ***	0.0646	0.2840 ***
	(0.106)	(0.107)	(0.086)	(0.088)
Head's age	-0.0061	-0.0063	-0.0062 *	-0.0030
	(0.004)	(0.004)	(0.004)	(0.004)
Presence of senior in HH	-0.2600 **	-0.2538 **	-0.1960 **	-0.2180 **
	(0.113)	(0.113)	(0.099)	(0.101)
HH receives subsidized meal	0.1900 **	0.1749 **	-0.0886	0.3680 ***
	(0.075)	(0.075)	(0.063)	(0.063)
Both husband & wife are earners	0.1470 *	0.1505 *	0.1780 **	0.1450 **
	(0.083)	(0.083)	(0.069)	(0.071)
HH size (person)	0.0474	0.0423	0.0153	0.1310 ***
	(0.048)	(0.048)	(0.042)	(0.042)
Region (1=south)	0.1680 **	0.1720 **	0.2710 ***	0.0396
	(0.077)	(0.077)	(0.063)	(0.064)
constant	0.1130	0.1232	0.1480	-0.6030
	(0.578)	(0.577)	(0.494)	(0.501)
Expenditure				
HH disposable income (yuan/wk)	0.0010 ***	0.0009 ***	0.0003 ***	0.0002 **
	(0.000)	(0.000)	(0.000)	(0.000)
Head's labor supply (hour/wk)	-0.0056	0.0105	0.0039	0.0031
	(0.026)	(0.027)	(0.020)	(0.022)
Head's education level	0.5760 **	0.6096 **	0.2970	0.4620 **
	(0.258)	(0.269)	(0.192)	(0.218)
Head's age	-0.0377 ***	-0.0292 **	-0.0155 *	-0.0124
	(0.011)	(0.011)	(0.008)	(0.009)
Presence of senior in HH	-0.6490 *	-0.8507 ***	0.0958	-0.9070 ***
	(0.297)	(0.314)	(0.222)	(0.269)
HH receives subsidized meal	-0.4740 ***	-0.4290 **	-0.4400 ***	0.1470
	(0.181)	(0.187)	(0.142)	(0.157)
Both husband & wife are earners	0.1750	0.4984 **	0.3060 *	0.3020 *
	(0.196)	(0.210)	(0.158)	(0.168)
# of FAFH visits on weekends	0.5090 ***	1.7467 ***	1.1220 ***	0.5290 ***
	(0.064)	(0.227)	(0.144)	(0.149)
HH size (person)	0.2120 *	0.3541 ***	0.0015	0.4010 ***
	(0.122)	(0.130)	(0.096)	(0.114)
City size 1	-0.6880 **	-0.5989 **	0.1520	-0.3190
	(0.280)	(0.294)	(0.204)	(0.232)
City size 2	-0.9710 ***	-0.9318 **	0.1010	-0.5870 **
	(0.351)	(0.369)	(0.255)	(0.289)
Region (1=south)	-0.6570 ***	-0.5013 **	0.1320	0.2480
	(0.208)	(0.214)	(0.158)	(0.167)
constant	8.2590 ***	7.1930	3.5620 ***	3.6040 **
	(1.690)	(1.742)	(1.267)	(1.396)

Table 6 (continued)

Sigma				
HH disposable income (yuan/wk)	0.0003 ***	0.0003 ***	0.0001	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)
Region (1=south)	-0.2470	-0.1979	-0.0955	-0.1680
	(0.134)	(0.138)	(0.100)	(0.108)
constant	2.7020 ***	2.8431 ***	1.8620 ***	2.2600 ***
	(0.303)	(0.312)	(0.234)	(0.266)
Lambda				
constant	0.7370 ***	0.7634 ***	0.5390 ***	0.5840 ***
	(0.068)	(0.067)	(0.086)	(0.083)
rho				
constant	0.5250 ***	0.4919 ***	0.4700 ***	0.4660 ***
	(0.050)	(0.046)	(0.068)	(0.059)
Observation	1553	1553	1553	1553
Log Likelihood	-8359	-8369	-5474	-5865

Notes: standard errors in parentheses; *p<0.1, **p<0.05, ***p<0.01.

Table 7 Elasticities with respect to exogenous variables.

	Total		Restaurant		Fast food		Other facility	
Description of variables	Participation	Expenditure	Participation	Expenditure	Participation	Expenditure	Participation	Expenditure
HH disposable income (yuan/wk)	0.064 **	0.498 ***	0.067 ***	0.154 ***	0.068 *	0.212 ***	0.028	0.202 **
Head's labor supply (hour/wk)	0.143	0.248	0.146	0.287	0.036	0.020	0.166	0.020
Head's education level	0.087 ***	0.368 **	0.087 ***	0.180 **	0.042	0.049	0.170 ***	0.204 **
Head's age	-0.085	-0.704 ***	-0.088	-0.202 **	-0.190 *	-0.013 *	-0.084	-0.306
Presence of senior in HH	-0.078 **	-0.368 *	-0.076 **	-0.166 ***	-0.128 **	0.188	-0.130 **	-0.484 ***
HH receives subsidized meal	0.057 **	-0.008 ***	0.052 **	0.086 **	-0.058	-0.078 ***	0.220 ***	-0.003
Both husband & wife are earners	0.044 *	0.152	0.045 *	0.098 **	0.117 **	-0.038 *	0.087 **	0.143 *
HH size (person)	0.043	0.289 *	0.039	0.102 ***	0.031	-0.036	0.240 ***	0.629 ***
Region (1= south)	0.051 **	-0.034 ***	0.052 **	0.086 **	0.178 ***	-0.265	0.024	0.046
# of FAFH visits on weekends	-	0.305 ***	-	0.099 ***	-	0.778 ***	-	0.642 ***
City size 1	-	-0.201 **	-	-0.017 **	-	0.051	-	-0.189
City size 2	-	-0.284 ***	-	-0.026 **	-	0.034	-	-0.348 **

Notes: *p<0.10, **p<0.05, ***p<0.01; - means no value.