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Household composition, income, and food-away-from-home expenditure in urban China

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Abstract:

China has experienced dramatic economic growth and socio-demographic changes in the last three decades including rapid urbanization and an aging society in the coming decades. This paper analyses food-away-from-home (FAFH) consumption in urban China with respect to household composition, income, and other socio-economic variables. The data are from household surveys in six Chinese cities (i.e., Beijing; Nanjing; Chengdu; Xi'an; Shenyang; and Xiamen) collected by the authors. Findings indicate that both household composition and income have significant effects on FAFH participation and expenditures. Projections based upon our results suggest that FAFH expenditures in urban China will continue to increase through 2050. The leading contributor to increased FAFH expenditure is China's strong income growth, followed by the expected rapid urbanization. The aging society, however, will have a negative influence on FAFH consumption.

Key words: Household composition; Income; Food-away-from-home, Demographics

1. Introduction

China, the world's most populous country, is experiencing rapid urbanization, economic growth, and aging of the population. In 2011, for the first time more people in China live in urban areas than in rural ones according to National Bureau of Statistics of China (NBSC) (2012), and urbanization is expected to continue at a fast pace with over 75% of the population living in urban areas by 2050 (United Nations , 2014). The age structure of the country is also changing with fewer births due to the "one child policy" and longer life expectancy. Currently, the population 60 years old and above accounts for 12% of the total population, and the proportion of this group is expected to grow to 17% by 2020 and to 34% by 2050 while the percent of the population under ten years old is expected to decrease from 12% to 8% by 2050 (UN, 2013). At the same time, China's multi-generational families are disappearing with the average urban household size shrinking to 3.1 persons in 2010 from 4.0 in 1995. China's economy, the world's second largest, is also predicted to continue growing at an annual rate of 7.8% over the next 10 years, much higher than the expected growth rate of 2.8% in the United States (US) and 1.7% in Germany (Atsmon and Magni *et al*., 2012), and the economy's structure is expected to change as consumption rather than investment drives China's future growth. By 2020, its gross domestic product (GDP) is expected to account for 19% of the world's economy compared with 9% in 2010 (Atsmon et al., 2012).

While there is much evidence internationally that rising income increases the demand for food away from home (FAFH) (e.g., Prochaska & Schrimper, 1973; Kinsey, 1983; Jensen and Yen, 1996; Nayga, 1996), few studies investigate the effects of household composition and population structure on FAFH consumption. Redman (1980) finds that US families with preschool children and an older woman dine away from home less than other families. Lee and Brown (1986) find US households with members between age four and 14 tend to consume more FAFH than those with people 26 to 50 years. Byrne *et al*. (1996) find that US per capita FAFH expenditure on younger members is less than that on adults, but that expenditures on youth are increasing over time.

Household composition also has varying effects on consumption of particular foods such as cheese (Yen and Jones, 1997) and pork (Su and Yen, 1996). Mutlu and Gracia (2006) investigate Spanish household FAFH expenditure by type of meal and find that household size significantly increases the probability and expenditure of breakfast consumption away from home but negatively affects lunch consumption while the percentage of children aged 0-6 in a household has no significant influence on FAFH consumption for any type of meals. In rural Ghana, however, an additional child three-years old or younger increases fresh vegetable expenditures, but an additional family member above 61 years of age has the opposite effect (Meng *et al*., 2012). Additional studies also indicate that household composition significantly affects FAFH consumption in other countries (Hossain and Jensen, 1994; Meenakshi and Ray, 1999; Mihalopoulos and Demoussis, 2001).

Studies on China's FAFH, however, either use old data or do not address family composition effects on FAFH. For example, Min *et al.* (2004) using Urban Household Income and Expenditure (UHIE) survey data for 1992 and 1998 study the determinants of FAFH expenditure but do not address household composition effects. The only study to do so is by Gould and Villareal (2006) who find that household composition affects the share of FAFH in total food expenditure. The data used in their study, however, are from 2001. A few other studies collect their own household survey data to study FAFH expenditure in China. Ma *et al.* (2006) using their own 1998 household survey data find that young people consume more FAFH, particularly meat, but their study does not address household composition effects on FAFH consumption. Bai *et al*. (2010) using household survey data collected in Beijing find that income and time opportunity cost are primary factors influencing household dining out participation and expenditure decisions, but household composition effects on FAFH are not addressed.

To fill this research gap, we apply a newly surveyed household data in this paper to analyze FAFH expenditure. Particular interests are given to household composition and income effects on FAFH expenditures. To address limitations in available data for the study of FAFH expenditure in urban China, the authors conduct household surveys in

six urban Chinese cities over the years 2007 to 2011. The household surveys are conducted in two parts, the first to collect household-specific information on socio-economic variables and demographics, and the second to collect detailed information on food consumption, both at home and away from home, for an entire week by a diary recording method. The resulting data allow for a much richer and more detailed analysis of FAFH in urban China than previously possible, especially for income and household composition effects. Specifically, we project FAFH expenditures in urban China over the next four decades based upon projected demographic changes, income growth, urbanization, and the estimated elasticities from a double-hurdle model.

Family composition and income effects on FAFH have several important implications. If household composition has significant effects on FAFH expenditure, it is particularly important in China to quantify these effects in order to determine how China's changing population structure will influence demand for FAFH. With future rising income, it is also important to quantify how this will affect future demand for FAFH particularly if FAFH expenditure increases faster than FAH expenditure. The structure of firms servicing FAFH differs considerably from those catering to FAH consumption and will affect resource usage in China. Also, increased dining out has important implications for health. Evidence of a significant association between out of home eating and overweight and obesity are found worldwide, such as among Brazilian (Bezerra and Sichieri, 2009) and European (Naska et al., 2011) populations.

Increases in urban FAFH expenditure have important implications. First, the number and size of FAFH establishments will need to grow to meet the increasing demand, creating opportunities for food service industries. Second, China's food supply chain infrastructure, including its cold chain, transportation, procurement, and distribution systems, will need to expand accordingly to meet the growing demand from the expansion of establishments. Third, there may be food security and import demand implications if domestic food production does not respond in both quantity and quality.

The structure of the paper is as follows. First, the data collection method is presented along with descriptive analyses of the data. This is followed by a brief

discussion of the method of analysis of the paper. Empirical results are presented followed by a discussion of household composition and income effects on future FAFH expenditures that includes a projection of FAFH expenditure through 2050. Finally, we conclude with our major findings.

2. Data

The household data used in this study are collected by surveying 1,340 households in six Chinese cities (Beijing, Nanjing, Chengdu, Xi'an, Shenyang and Xiamen). The survey year and number of households are 2007 and 315 households for Beijing, 2009 and 246 households for Nanjing, 2010 and 208 households for Chengdu, 2011 and 215 for Xi'an, 2011 and 207 for Shenyang, and 2011 and 149 for Xiamen. These cities are geographically dispersed in China, are relatively high income centers in their region, and have populations ranging from 2.52 million for Xiamen to 19.61 million for Beijing in 2010 (NBSC, 2011; Xiamen Economic and Social Development Reports, 2010). The households in our survey are selected by a stratified and random sampling approach from households participating in the UHIE survey in each city[1]. In our survey, selected households record household expenditure on each meal that is consumed away from home for an entire week[2].

FAFH in our survey is defined to include expenditures on all meals that are purchased at restaurants, fast food outlets, cafeterias and other venues such as street vendors. It also includes FAFH meals that are free, hosted by friends or relatives, or are provided by work units. The value of these meals is estimated by the respondents as if they paid. Detailed information on demographics and socio-economics of the household are also collected in the survey.

[1] The UHIE is a national survey, which provides the primary official information on urban consumers' income and expenditures. The data from the UHIE survey have been widely used by scholars for food consumption and expenditure research, including studies on FAFH (e.g., Min *et al*., 2004; Gale and Huang, 2007). The household number in the UHIE survey in each city ranges from 300 to 1,000 households, largely depending on the population of the city.
[2] For further details, see Bai et al. (2010).

Not all households participate in FAFH consumption during the sample period, but the majority does, with 83% of the households participating in the FAFH market. Beijing, the capital of China, has the highest participation rate at 88% while the participation rate in the other cities ranges from 78% (Shenyang) to 84% (Xi'an) (Table 1). The average weekly expenditure for households that participate in the survey is 177 Yuan in 2010 value. Beijing is leading with an average expenditure of 201 Yuan while Xiamen is the lowest at 144 Yuan.

The average household size of our sample is 2.91 persons and may be calculated by summing the means of age groupings reported in column 2 of Table 2 for the full sample. The average number of persons less than or equal to 14 years old is 0.31 while the average number of persons per household age 65 or greater is 0.29. The group with the largest average number of persons is the 50-64 group followed by the 40-49 group.

Dependency ratios may be calculated from our urban sample. The old-age (child) dependency ratio is the number of people 65 years or older (0-14) divided by the number of people that are between 15 and 64. The old-age dependency ratio is 12.8 in our sample, and the child dependency ratio is 13.4. The former is larger than the officially-reported ratio of 11.4 in 2010 for China as a whole, but the latter is smaller than the reported child dependency ratio of 24.7 (World Bank, 2014a, b). These results are not surprising given that our sampled households are from urban areas only.

Compared with countries at similar per capita GDP levels, China is not the most aged society, but has a higher percentage of population 65 years and over than some of the countries having higher income levels. According to the World Bank (2014a, c), China has a per capita GDP of $4,433 (US$) and an old age dependency ratio of 11.4 in 2010. The per capita GDP in Jordan, Kazakhstan, and Namibia in the same year is $4,371, $9,071, and $5,113, respectively, but their old age dependency ratios are all lower than that of China, being 5.5%, 9.7% and 5.9%, respectively. On the other hand, the old-age dependency ratios in the US and Japan in 2010 are 19.5 and 36.0, respectively, both greater than China's. As the per capita GDPs in these two countries are

much higher than China's, about 10 times in the same year, this indicates that China's society is aging rapidly at a lower per capita GDP level than in the US or Japan.

The statistical descriptions of the other variables are also reported in Table 2. Average weekly household disposable income excluding wife's salary is 1,140 Yuan over the entire sample of households and is 1,180 Yuan for those with positive FAFH expenditures. Overall, 45% of the wives work in the labor market (including both full-time and part-time employment), but this number is 4% higher for households consuming FAFH during our survey periods. In terms of wife's education, 35% of wives in the sample have an education level above high school. The average number of non-household members eating with household members away from home during a whole week is 1.14 for the full sample and 1.37 for those reporting FAFH expenditure. The average number of weekend visits is 1.8 for dining out while during the rest of the week it is 7.9.

3. Method

The household decision to consume FAFH can be modeled as a two-step process. First, the household must decide whether or not to consume FAFH. This is considered to be the participation decision. For those household choosing not to dine out, FAFH expenditure will be zero. A second decision must be made by those that choose to dine out, that is, how much to spend or the expenditure decision. In estimating this process, it is important to explicitly model the two-step decision and to account for zero expenditure. Simply applying ordinary least squares to the expenditure equation will result in biased and inconsistent estimates.

To model the two-step decision, we choose a double-hurdle model that takes into account the interaction between the participation and expenditure decisions. The model may be expressed as

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

where y_i is the observed expenditure, and y_{1i}^* and y_{2i}^* are two unobserved latent variables representing the participation hurdle and the expenditure hurdle, respectively. They are specified as linear functions of a set of hurdle regressors, x_{1i}' and x_{2i}'. β_1 and β_2 are parameter vectors to be estimated, the error terms u_{1i} and u_{2i} are distributed as $[u_{1i}, u_{2i}]' \sim \text{BVN}(0, \Sigma)$, $\Sigma = \begin{bmatrix} 1 & \rho\sigma_i \\ \rho\sigma_i & \sigma_i^2 \end{bmatrix}$, and the conditional distribution of the latent variables is bivariate normal. To account for the non-normal errors, a Box-Cox transformation is applied . The Box-Cox transformation is given by

$$(2) \qquad y_i^T = \begin{cases} \frac{y_i^\lambda - 1}{\lambda} & if\ \lambda \neq 0 \\ \log(y_i) & if\ \lambda = 0 \end{cases},$$

where λ is an unknown parameter. The sample likelihood function for the Box-Cox double-hurdle model can be derived from (1) and (2) as

$$(3) \text{L} = \prod_{y_i=0}\left[1 - \Psi\left(x_{1i}'\beta_1, \frac{x_{2i}'\beta_2 + \frac{1}{\lambda}}{\sigma_i}, \rho\right)\right] \cdot \prod_{y_i>0}\left\{\Phi\left[\frac{x_{1i}'\beta_1 + \left(\frac{\rho}{\sigma}\right)\left(y_i^T - x_{2i}'\beta_2\right)}{(1-\rho^2)^{\frac{1}{2}}}\right] y_i^{\lambda-1}\frac{1}{\sigma_i}\phi\left(\frac{y_i^T - x_{2i}'\beta_2}{\sigma_i}\right)\right\}$$

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.

To allow for heteroskedasticity, the standard deviation of errors σ_i is specified as

$$(4) \qquad \sigma_i = w_i'\gamma,$$

where w_i is a vector of exogenous variables, and γ is the parameter vector. In this study, w_i is hypothesized to include total household income excluding wife's income and

household size. Thus, normality, homoscedasticity, and independence of error terms can be statistically tested.

The dependent variable in the participation equation is whether or not the household consumes FAFH during the survey week, and the dependent variable in the expenditure equation is weekly household FAFH expenditures. In terms of explanatory variables, six variables defined as the number of individuals aged between 0-14, 15-29, 30-39, 40-49, 50-64, 65+ in a household are included in both equations to measure the effects of household composition. Household disposable income excluding wife's salary and its quadratic term[3], wife's education, whether the wife works or not, and city dummies are included in both equations (Yen, 1993; Stewart et al., 2004; Ma *et al*., 2006). In addition, following Byrne, Capps, and Saha (1996) and Bai *et al*. (2010), two other variables, the number of FAFH visits on weekends, and the number of non-household members dining out with the household, are included in the expenditure equation[4]. In urban China, dining out with friends and family on weekends is common, and households spend more money on these meals than their regular weekday meals. As part of the social culture, hosted meals between friends or relatives are common in China and play an important role in FAFH expenditure (Bai *et al*. 2010). Therefore, the number of non-household members that had food away from home with the family is used to capture the social network effect.

4. Results

[3] In many studies on FAFH, household wife's labor participation is often used to capture the time opportunity cost of preparing food at home (Kinsey, 1983; Horton and Campbell, 1991; Yen, 1993; Jensen and Yen, 1996; Keng and Lin, 2005). The economic theory behind this specification is that households might substitute time-saving services (e.g. FAFH) for their own time (Becker, 1965). Thus, families with working wives might consume more FAFH than do families with full-time homemakers. However, as "household wife's employment may be endogenous" (Yen, 1993), so may be the household income contributed by an employed wife. To avoid this concern, the exogenous household income excluding wife's wage earnings is often used (Yen, 1993; Jensen and Yen, 1996; Keng and Lin, 2005).

[4] These two variables are not included in the participation equation because, while affecting the expenditure decision, they are the result of the participation decision.

The parameters and associated asymptotic standard errors of the model based on maximization of the likelihood function, equation (3), are reported in Table 3. The Box-Cox parameter lambda (λ) is significantly different from both zero and one at the 0.01 level, indicating that the Box-Cox transformation is appropriate. The estimated rho (ρ) is also significant at the 0.01 level, indicating that the error terms of the participation and expenditure equations are contemporaneously correlated and are not independent. The coefficient on household income excluding wife's income in the sigma equation is statistically significant indicating the existence of heteroskedasticity. Accordingly, the maximum likelihood estimator allows for unequal variances across households and the existence of dependence in the model in order to generate consistent estimates.

The estimated results in Table 3 indicate that the household composition effects on FAFH expenditure differ among age groups and between participation and expenditure decisions. Clearly, both the number of teenagers and the number of adults up to age 39 in households have significant and positive effects on the likelihood of eating out and the conditional expenditures on FAFH. The number of seniors aged 65 years old or above is significantly but negatively related to both FAFH participation and expenditure decisions. This is expected considering that seniors are generally more frugal and diligent than others. Similar results are also found in previous studies by McCracken and Brandt (1987) and Yen (1993). The estimated results in Table 3 also show that having more young children (14 years old or below) in the household has no significant effect on the probability of participating in FAFH, but has a significantly positive effect on expenditures when they dine out. In contrast, the number of household members aged 40-49 has a significant and positive effect on the FAFH participation, but not on FAFH expenditures. No statistically significant effects are found for members in the age group 50-64.

These results indicate that household composition affects FAFH participation and expenditures. Households with young children do not participate much in eating out but spend more when they do eat out. As the children become older, eating out becomes more attractive to the household. Households with teenagers and young adults participate

more frequently and spend more when they eat out. When a household has a member 40 years or older, FAFH participation and expenditures tend to start waning until having a senior member actually lowers participation and expenditures.

This pattern can also be seen from the changing elasticities[5] with respect to household composition variables plotted in Figure 1. Clearly, the group 15-29 has the largest elasticities for participation and group 30-39 has the largest elasticity for expenditure. A 1% increase in the number of members of these two groups in a household will increase FAFH participation and expenditures both by .06%. Age group 30-39 has the second largest participation elasticity while group 15-29 has the second largest expenditure elasticity, and these elasticities are also positive and significant. The opposite is the case for a 1% increase in the number of seniors. The elasticities are negative on both FAFH participation (-.03) and expenditures (-.08).

The estimates for household income are significantly positive for both equations while the parameters of quadratic income are both significantly negative. This indicates that households are more likely to eat out and tend to spend more as income increases, but at a decreasing rate. The expenditure elasticities indicate that a 1% increase in household income will increase the likelihood of FAFH participation by .12% and conditional expenditure by .44%. These results are consistent with findings by Yen (1993), Gould and Villarreal (2006), and Bai *et al*. (2010).

In addition to household composition and income, a number of other variables are also found to be significantly affecting FAFH participation and expenditure. Wife's education affects both FAFH participation and expenditure positively. Also, as expected, FAFH expenditure increases significantly with the number of non-family members present and with the number of times of dining out on weekends. Having the household wife working in the labor market, an indicator of the opportunity cost of time,

[5] The total or unconditional elasticity with respect to an independent variable can be decomposed into the elasticity of the probability of participation and the conditional elasticity of expenditure (McDonald and Moffitt, 1980; Maddala, 1983). These elasticities are calculated and reported in Table 4.

has a significant and positive effect on FAFH expenditure, but does not affect the likelihood of dining out significantly.

Meanwhile, city effects are found to be statistically significant for the expenditure equation but not for the participation equation. Compared to Beijing, the reference city, household expenditure on FAFH in all other cities except Chengdu is significantly lower. When households in Beijing and Chengdu dine out, their FAFH expenditures are not statistically different. The elasticities of selected variables are calculated and reported in Table 4.

5. Discussion

China's rapid economic growth and aging of the population will significantly affect household FAFH expenditure. However, to what degree and by which pattern will these factors contribute to the future dynamics of FAFH expenditure remain unclear. To this purpose, we predict the dynamic change of FAFH expenditure in urban China from 2010 to 2050. Estimated income and household composition effects on FAFH participation and expenditures from the previous section, along with the predicted population structure changes by the UN, are used for the projection. Although we focus only on urban China due to data limitations, this projection can still shed light on China's food industry and market development as well as consumer health and nutrition.

The basic framework for this projection is as follows. Per capita FAFH expenditures in 2010 by age group from our survey are the baseline expenditures. We then make projections of per capita FAFH expenditure growth over five-year intervals from 2010 to 2050 for five scenarios. In the first scenario, we allow household composition to change over the period as projected by the UN (2013) while keeping all other variables unchanged. In scenario two, both household composition and urbanization are allowed to change over the period. In the third scenario, household composition, urbanization, and population are allowed to change over the period. The last two scenarios both allow household composition, urbanization, and population to change as well as per capita income over the period. The difference is that scenario four

assumes a starting income growth of 4% that declines by 0.1% per year while the fifth assumes a starting income growth of 4% that declines by 0.05% per year. By running the five scenarios, we can decompose the growth effects on FAFH expenditure of changing household composition, urbanization, population, and per capita income.

Several essential assumptions are introduced for these projections. First, FAFH consumption patterns are assumed to change as people grow older and join the next age group. This is equivalent to assuming that, when a person ages and moves into the next age group, the person takes on the FAFH consumption patterns of that age group. Second, the estimated elasticities and the per capita expenditures for each age group, based on the six cities in this study, are assumed to be applicable to the entire urban population in China. Third, FAFH for those who newly move to urban areas is assumed to immediately be the same as that of their urban age group. By introducing these assumptions, we understand the potential bias because these cities are relatively large, developed cities which generally have lower income elasticities than those in small and less-developed cities[6].

The population and urbanization data used for the projections are from the UN (2013). According to these projections, China's total population will peak around 2030 reaching 1.45 billion. Meanwhile, urban population continues to grow reaching 68.7% by 2030 and further to over 75% by 2050 (UN, 2014). During the same period, the composition of China's population is also projected to dramatically change. Currently, the age groups 15-29 and 0-14 years are the two largest age groups accounting for 44% of the total urban population (Figure 2), but by 2050 these two age groups will constitute only 30%. The overall population in all groups younger than 50 years old is decreasing over the projection years, while that in groups 50-64 and 65 years and above are growing rapidly during the years 2010-2050.

Forecast results for each scenario are presented in Figure 3. Clearly, while income has a larger effect on future urban FAFH consumption, household composition and

[6] To what extent the potential bias due to the assumption could be is beyond our capacity given our data limitation.

urbanization are contributing factors. The family composition effects on FAFH are projected to cause FAFH expenditure to decline slightly over the next four decades holding other variables unchanged. Adding in the effects of urbanization results in about a 50% increase in FAFH expenditures by 2050. The overall population growth rate, which is assumed to peak in 2030, brings about a small further increase in FAFH expenditures by urban households. Assuming an increasing but slow real income growth rate that declines by 0.1% per year, in addition to demographic, urbanization, and population growth, generates a projected doubling of FAFH expenditure by 2050. Finally, a more rapid rate of real income growth assumption of a 0.05% annual decline results in FAFH expenditure tripling by 2050 compared to 2010, and it is twice the size of that under the pure population growth scenario.

The changing household composition effects on FAFH expenditures under the slow and perhaps more realistic real income growth rate scenario are decomposed by age group in Figure 4. The largest increase in FAFH expenditures occurs in the 65+ age group followed by the 50 to 64 age group. Except for the oldest and the youngest age groups, each of the intermediate age groups demonstrates an increasing FAFH expenditure pattern followed by a decrease as the population ages and the number of people in these age groups declines. While the projections suggest how urban China's FAFH expenditure will change over the next four decades from large changes in the aging of the population, urbanization, population changes, and increasing but slowing income growth, our projections have limitations. One limitation is that our household samples are from China's top- and second-tier cities while our projections are based upon total projected urban population. Nevertheless, FAFH expenditure patterns in these cities represent the frontiers of food markets in urban China. As a result, despite the limitations, our projections provide better clues to understand potential future changes in urban FAFH expenditures. From this point of view, the findings from this study and the associated implications are valuable inputs into understanding China's food market. Another limitation is that our sample does not include migrant workers. Therefore, we simply assume rural migrants immediately adopt their urban counterparts' FAFH expenditure patterns.

6. Conclusion

Using recently conducted household survey data in urban China, we empirically investigated the determinants of FAFH expenditure, with particular interests on the effects of the rapidly aging of the society and income growth on FAFH expenditure. We do so by specifying and estimating a double-hurdle model with both income and a set of family composition variables being independent variables. Family composition, urbanization, population, and income projections and estimated household composition and income elasticities are then used to project the dynamic changes of FAFH expenditure in urban China for the coming four decades.

The major results indicate that urban households in China are more likely to eat out and tend to spend more as income increases, but at a decreasing rate. Moreover, the household age structure in China is found to have significant effects on urban FAFH expenditure. Households with people between the ages of 15 to 39 years dine out more often and spend more when doing so while households with people older than 50 years are less likely to eat away from home, especially those 65 years old and above.

The projection shows that FAFH expenditure in urban China will more than double in the coming four decades. Income and urbanization are the two primary drivers of the growth. In contrast, the aging society will have a negative effect on FAFH expenditure primarily because of the rapidly increasing population of people aged 65 years old or above.

Increases in urban FAFH expenditure have important implications. First, the number and size of FAFH establishments will need to grow to meet the increasing demand, creating opportunities for food service industries. Second, China's food supply chain infrastructure, including its cold chain, transportation, procurement, and distribution systems, will need to expand accordingly to meet the growing demand from the expansion of establishments. Third, there may be food security and import demand implications if domestic food production does not respond in both quantity and quality.

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TABLES

Table 1. Weekly food-away-from-home (FAFH) expenditure by city (2010 Chinese Yuan)

	Full sample		Sample reporting positive FAFH expenditure
City	HH consuming FAFH[a]	HH FAFH expenditure	HH FAFH expenditure
Total	83%	147	177
Beijing	88%	177	201
Nanjing	83%	144	172
Chengdu	82%	158	193
Xi'an	84%	140	167
Shenyang	78%	123	157
Xiamen	80%	115	144

[a]HH represents household.

Note: As our surveys were conducted in different years for different cities, we convert weekly nominal FAFH expenditure into constant 2010 Yuan. Specifically, we use the provincial consumer price indices for food to adjust FAFH expenditure in each city to 2010 Yuan.

Table 2. Summary statistics of variables used in regressions

Variable	Full sample		Sample reporting positive FAFH [C] expenditure	
	Mean	SD	Mean	SD
Age group				
# of HH members 0<=age<=14[b]	0.31	0.49	0.33	0.49
# of HH members 15<=age<=29	0.49	0.57	0.55	0.58
# of HH members 30<=age<=39	0.41	0.70	0.45	0.73
# of HH members 40<=age<=49	0.59	0.80	0.64	0.82
# of HH members 50<=age<=64	0.82	0.90	0.80	0.90
# of HH members age>=65	0.29	0.62	0.22	0.55
Income				
HH total weekly disposable income (1,000 Yuan)	1.35	0.86	1.42	0.87
HH weekly disposable income excluding wife's wage (1,000 Yuan)	1.14	0.82	1.18	0.83
Controls				
Whether wife works in labor market (1=yes)	0.45	0.50	0.49	0.50
Wife's education(1=above high school)	0.35	0.48	0.38	0.49
# of Non-HH members FAFH	1.14	3.91	1.37	4.25
# of FAFH visits on weekends	1.84	2.17	2.22	2.20
Observations	1340		1115	

[a]FAFH represents food away from home.

[b]HH represents household.

Note: As our surveys were conducted in different years for different cities, we convert nominal household income into constant 2010 Yuan. Specifically, we use the provincial consumer price indices for food to adjust household income in each city to 2010 Yuan.

Table 3. Maximum likelihood estimates of the Box-Cox double-hurdle model for FAFH[a].

Participation	Coefficient[b]		ASE[c]
# of HH members 0<=age<=14[d]	0.017		0.105
# of HH members 15<=age<=29	0.424	***	0.092
# of HH members 30<=age<=39	0.348	***	0.099
# of HH members 40<=age<=49	0.165	*	0.090
# of HH members 50<=age<=64	-0.034		0.083
# of HH members age>=65	-0.350	***	0.083
HH weekly disposable income (excluding wife's wages)	0.456	***	0.105
HH weekly disposable income, Squared	-0.044	***	0.012
Whether wife works in labor market (1=yes)	0.175		0.111
Wife's education(1=above high school)	0.182	*	0.102
Nanjing	0.029		0.141
Chengdu	-0.027		0.144
Xi'an	-0.044		0.143
Shenyang	-0.065		0.142
Xiamen	-0.208		0.156
Constant	0.222		0.196
Expenditure			
# of HH members 0<=age<=14	0.331	*	0.194
# of HH members 15<=age<=29	0.507	***	0.169
# of HH members 30<=age<=39	0.655	***	0.191
# of HH members 40<=age<=49	0.225		0.155
# of HH members 50<=age<=64	0.016		0.144
# of HH members age>=65	-0.730	***	0.188
HH weekly disposable income (excluding wife's wages)	1.461	***	0.292
HH weekly disposable income, Squared	-0.109	**	0.052
Whether wife works in labor market (1=yes)	0.749	***	0.204
Wife's education(1=above high school)	0.488	***	0.177
# of Non-HH members FAFH	0.119	***	0.022
# of FAFH visits on weekends	0.533	***	0.066
Nanjing	-0.606	**	0.245
Chengdu	-0.203		0.246
Xi'an	-1.241	***	0.284
Shenyang	-0.665	**	0.267
Xiamen	-1.386	***	0.324
Constant	5.029	***	0.418
Sigma			
HH weekly disposable income (excluding wife's wages)	0.392	***	0.101
Household size	-0.032		0.061
Constant	2.131	***	0.277
Lambda	0.685	***	0.069

Rho	0.489	***	0.058

[a]FAFH represents food away from home.

[b]* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

[c]Asymptotic standard errors.

[d]HH represents household.

Table 4. Elasticities with respect to selected exogenous variables

Variable	Participation	Expenditure	Total
# of HH members 0<=age<=14[a]	0.002	0.031	0.033
# of HH members 15<=age<=29	0.063	0.049	0.112
# of HH members 30<=age<=39	0.043	0.063	0.106
# of HH members 40<=age<=49	0.029	0.028	0.057
# of HH members 50<=age<=6	-0.008	0.008	-0.001
# of HH members age>=65	-0.031	-0.053	-0.084
HH weekly disposable income (excluding wife's wages)	0.122	0.562	0.683
Wife's employment status (1=yes)	0.053	0.262	0.315
Wife's education(1=above high school)	0.054	0.181	0.236
# of Non-HH members FAFH[b]		0.042	0.042
# of FAFH visits on weekends		0.305	0.305

[a]HH represents household.

[b]FAFH represents food away from home. Note: Elasticities with respect to continuous variables are evaluated at the sample means while elasticities with respect to dummy variables are evaluated based on a discrete change of the dummy variable from 0 to 1.

FIGURES

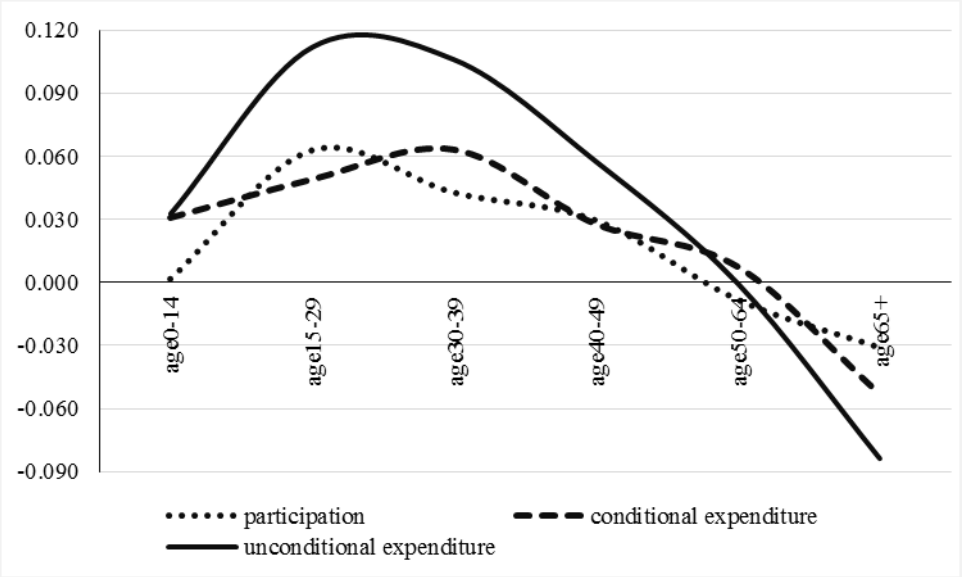

Figure 1. Elasticity estimates with respect to household composition

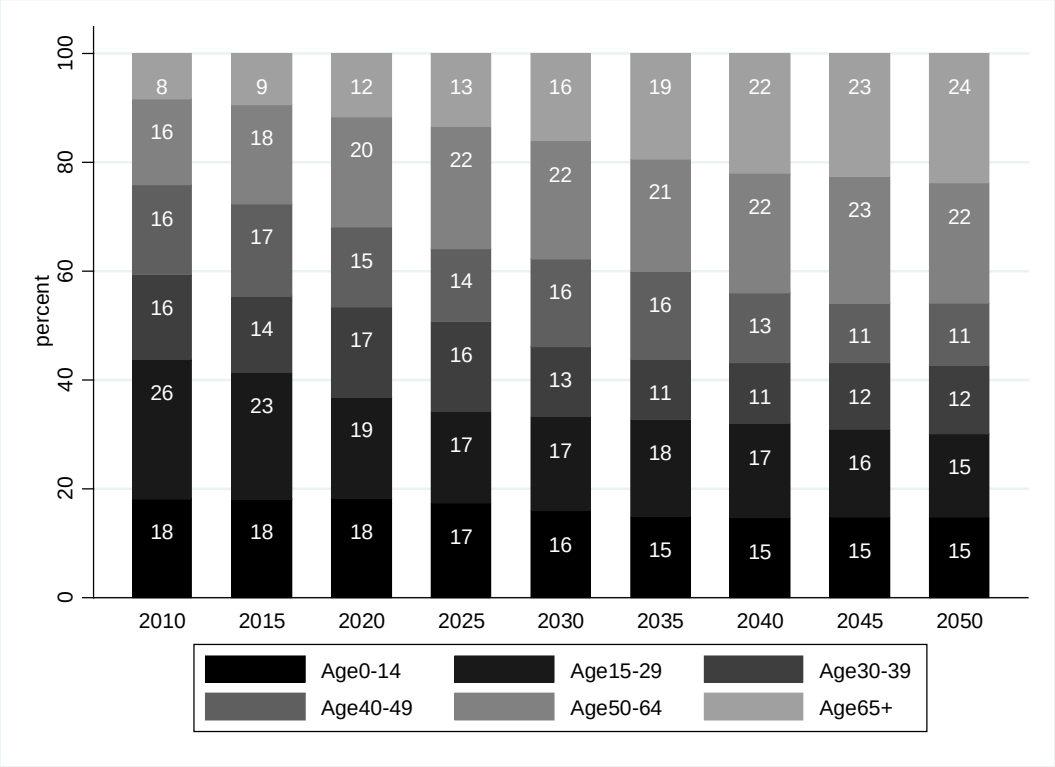

Figure 2. Population projections by age groups in urban China

Source: United Nations, 2013.

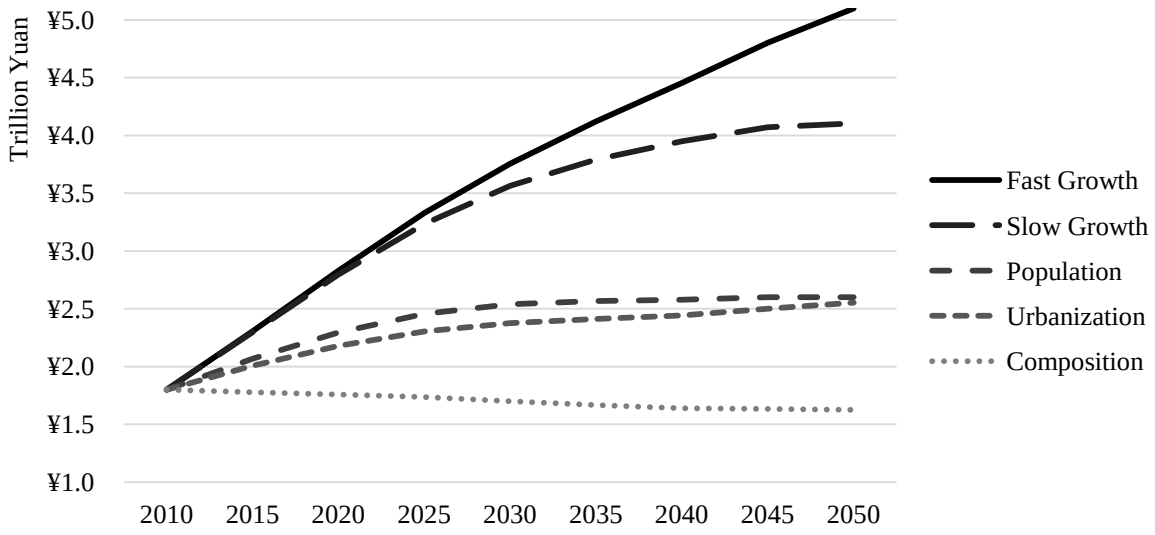

Figure 3. Forecasts of family composition, urbanization, population, and income effects on urban food-away-from-home expenditures

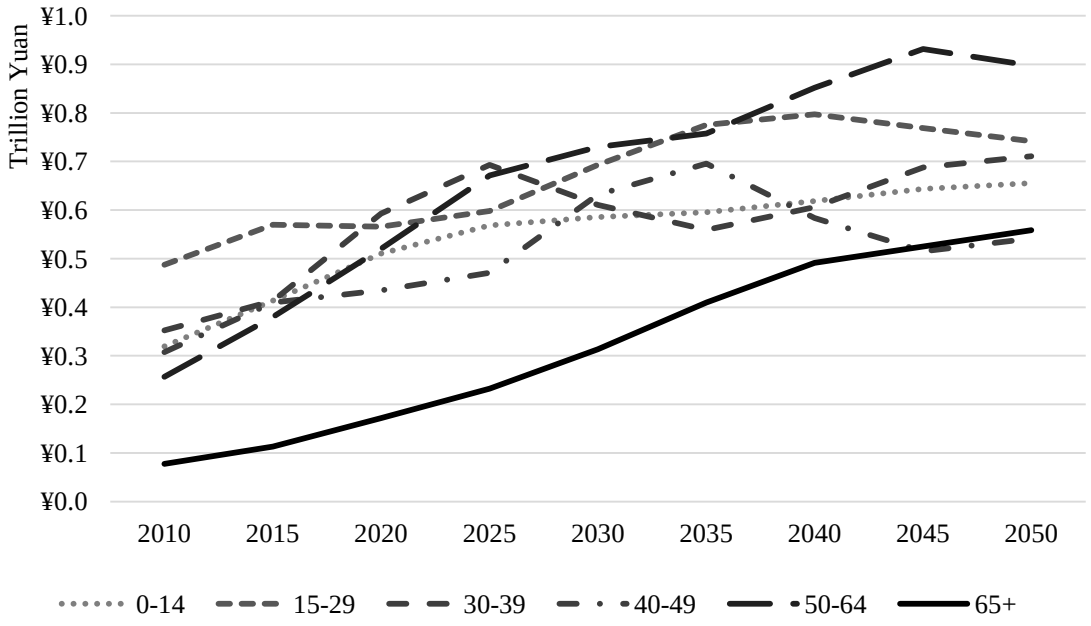

Figure 4. Slow income growth effects on food-away-from-home expenditure by age group.