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An Empirical Analysis of Consumer Behaviors in Chinese Urban Areas

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Abstract *Using the model specification of Deaton-Muelbauer (1980), this empirical study analyzes two data sets, viz., a time series aggregated data on Chinese urban household disposable income and consumption expenditure on eight major items from 1992 to 2012 and a cross-sectional data collected from a questionnaire survey conducted in Beijing, Shanghai, Tianjin and Qingdao (BSTQ) with regard to disposable income and consumption expenditure in eight major items.*

The analytical results of marginal propensity to consume suggest that in order to stimulate domestic private consumption in China, policy interventions in higher income groups, preferably on disposable income less than 67,000RMB are desirable. From the findings, it is interesting to note that notwithstanding that the provision of education is free from primary school to junior high school, the respondents from BSTQ with disposable income higher than 67,000RMB seem to emphasize on the quality of education of their children. In addition, the findings also suggest that policy for the provision of affordable housing in Chinese urban areas will need to focus on disposable income level of less than 67,000RMB. From the empirical evidences, the disposable income level of 26,000-48, 000RMB is not high enough to pay for adequate attention on medical and health services. Although the provision in medical and health services in China but it is a luxury item for the people in lower income group.

Regarding the compensated own-price elasticity of demand in lower income groups, the results show that demand of "food," "clothing" and "medical" is influenced positively by the changes in prices. It is worth noting that the rise in disposable income has a negative influence on "housing" for disposable income below 67,000RMB but it has a positive influenced for higher disposable income that is above 92,000RMB. Similarly, the demand for "medical" and "education and culture" also positively correlated to the rise of disposable income particularly for disposable income above 92,000RMB. Cross-price elasticity of demand of one expenditure item with another changes accordingly with the level of disposable income. A pair of net complementary goods changes to a pair of net substitute goods (e. g., "clothing" and "housing," "housing" and "food"). Additionally this shift is also apparent with the rise of disposable income (e. g., "medical" and "housing"). The reverse, viz., the shift from a pair of net substitute goods to a pair of net complementary goods also occur (e. g., "housing" and "education", "education" and "food") when the disposable income

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increased.

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1. Introduction

Since initiating market reforms in 1978, China has shifted from a centrally planned to a market based economy and experienced rapid economic and social development. It is the world's fastest growing economy, with growth rates averaging 10% over the past three decades[1]. Gross national income per capita in PPP (in current international dollar) grew from $190 in 1978 to $11, 850 in 2013. Especially, after its accession into WTO at end of 2001, China has continuously attracted a high volume of foreign direct investment from advanced counties and neighboring newly industrializing economies. Nowadays China not only serves as "a factory in the world", but also is the world's fastest growing consumer market and second largest importer of goods, which has attracted attention from the entire world.

Recently, lots of analysts argued that China relies too much on investment and export, while the domestic consumption contributes too little to fueling economic growth. For a long time, growth in domestic consumption has lagged far behind the other two economic engines. Especially the household consumption's proportion of GDP was too low and has been declining gradually during the past 25 years. In 1978 the household consumption accounted for 48. 8% of GDP. And in the period of 1980s it fluctuated between 48. 8% and 51. 6%, but after entering into 1990s the share of household consumption has declined and this trend persist to the present days. Consequently it has set a historically low record by taking up 34% of GDP in 2013. However, this structural imbalance in China`s economic growth is reasonable at the present stage (take-off) of economic growth according to the Rostow's Stages of Growth Model[2]. The urbanization-industrialization process leads to a necessity for the corresponding increase in investment. From this perspective, therefore it is consistent with China's current stage of development that the rate of consumption growth is lower than that of investment growth.

Whereas the high-speed economy growth of China relied too much on investment and export in the past decades, Chinese real per capita household consumption expenditure increased about 10 times from 1992 to 2012, growing by

1 Computed from the data base of World Development Indicators. URL: http://databank.worldbank.org/data/ (accessed 15 July 2014).

2 Rostow, Walter W. (1960). "The Five Stages of Growth: A Summary," *The Stages of Economic Growth: A Non-Communist Manifesto*, Cambridge: Cambridge University Press.

more than 7% annually on average, much higher than many other industrialized countries over this period. China's rapidly growing demands for consumer goods such as smartphones, household appliances, cars and the like and Chinese enthusiasm for higher value added services including taking holidays either domestic or abroad testify that China indeed is entering into a mass consumption era. But following the exacerbation of income inequality, the diversification and differential in consumption became more considerable. The consumption gap widened dramatically not only between urban and rural China but also among the different income stratums. In addition some variation and trends have been emerging in the consumer behavior related to durable and nondurable goods, necessity and luxury goods, and services of all kinds. The shift in spending patterns towards progressively more complex goods and services can be seen in the household consumption.

The large size and potential of China's consumer market has been attracting much attention from the economists who conducted researches on China's consumer behavior. But it cannot be denied that there is insufficient empirical study of consumer behavior based on household survey on income and consumption expenditure. Therefore, against the backdrop of urbanization in China, the major objective of this study is to examine the characteristic of consumer preference for eight items of household expenditure in urban China. The datum analyzed in this empirical study is composed of a time-series aggregated data set of household income and expenditures of Chinese urban areas from 1992 to 2012 cited from *China Statistical Yearbook*, and a cross-section data set collected by questionnaire surveys from Beijing, Shanghai, Tianjin and Qingdao.

The rest of this paper is organized as follows. Next session provides a literature review that covers key theoretical foundations of consumer behavior and other existing literature that are associated with the scope of this study. Session 3 provides the analytical framework that explains our data set, model specification and estimation method. Session 4 shows the analytical findings and discussions. Session 5 concludes this paper.

2. Literature review

Empirical works on demand analysis have been accumulated along with the sophistication of methodologies for estimating elasticity of demand in terms of income and price changes. Stone (1954) was the pioneer in formulating a specification in estimating a system of demand equations with respect to real income and real prices consistent with the theory of consumer behavior. That specification is based on a double-log demand function. Expressing in log form, the dependent variable is the demand quantity of commodity x_i while the independent variables comprises disposable income Y and each respective price of x_i. This

specification facilitates the estimation of income elasticity of demand and cross-price elasticity of demand for good i with respect to good j (own-price elasticity of demand for any i=j).

Stone's seminal work has inspired many other forms of model specification in estimating a liner demand system. Barnett (1979) shows that Rotterdam Model is of relevancy in addressing demand aggregation in the framework of general equilibrium analysis. Deaton and Muellbauer (1980) develop a model known as Almost Ideal Demand System (AIDS) which essentially is represented by transforming independent variables (real disposable income and prices of each good) into logarithm form. This model allows estimation of income elasticity of demand (or expenditure elasticity of demand) and cross-price elasticity of demand for good i and good j (own-price elasticity for any i=j) for a given set of expenditure shares. This model satisfies two important properties of a demand function viz. homogeneity and additive. In addition, this model also holds the property of symmetry with regard to the coefficients to be estimated. In order to derive a direct estimation of compensated elasticity, Alston, Chalfant and Poggott (2002) show that by using a double-log demand model instead of AIDS (which is specified in a single-equation form), it is able to estimate compensated elasticity of demand directly by deflating income using Stone's price index. By doing so, the right hand side of this modified model is the same as that in AIDS.

Anita Regmi and James L. Seale (2010) conducted a cross country analysis to investigate how the price fluctuation in one good affects the demand for other goods varies across goods and countries through estimating cross-price elasticity of demand across 114 counties for 9 major consumption categories of household expenditure. The estimation is conducted respectively by the model of compensated Slutsky elasticity and uncompensated Cournot elasticity. Their estimated results for the former are categorized into three major points. Firstly, the increase in price of one good triggers the rise of demand for the other eight goods but their demand increases are not the same magnitudes. The findings show that among the eight goods, demand for a luxury good such as recreation is greater than the demand for a necessity goods such as food or clothing. Secondly, the empirical results show that when the price increase in a necessity good caused the increase in demand for other eight goods but the changes are the greatest in low income countries. Thirdly when the price of a non-necessity goods has increased, it caused the rise in demand for the other eight goods (except for food) but that change was smaller in low income countries than in high income countries. The estimated results of Cournot elasticity are summarized into two broad features. Firstly, price increase in a necessity good reduced the demand for all the other goods. Secondly, price increase in a non-necessity good caused different changes in the demand based on the country's income level. The findings of this study reveal that the income level influences the cross-price elasticity of demand.

Umar Farooq, Trevor Young, and Muhammad Iqbal (1999) made an analysis on a farm household consumption using the AIDS model based on the consumption data of paddy and wheat growing farm households. Their data set was pertained to consumption expenditures during 1995. Their estimated results show that all the own-price elasticities were negative and most of them were statistically significant. Paddy and wheat were found to be gross substitutes. Dairy products and meat were regarded as luxuries by the sample farm household size. Significant quantitative dietary impacts were found associated with change in the age composition of farm households. This empirical study contributed positively to enhancing the understanding of issues concerning consumption patterns of farm household in Pakistan, Notwithstanding that most farmers have dual roles as producer and consumer of paddy and wheat, their income generated through the farming of the two crops have also brought about a certain special impact on the consumption of these two crops.

Tianyu Yang (2009) used his estimated consumption function to highlight the features of marginal propensity to consume of the low-income stratum, the middle-income stratum and the high-income stratum in China. His analysis produced an income distribution that showed the marginal propensity to consume of the three stratums is in an inverse-U shape. Furthermore, his empirical inquiry also extended to cover investigation of income gap in light of the expansion of household consumption in China. From his empirical evidence, he alleged that income disparity in urban areas and between urban and rural areas can be mitigated by government interventions in enlarging the population of the middle-income stratum. This implication is quite unclear because even within urban areas there are different income groups in terms of consumption expenditure. Additionally asset ownerships differ between urban-rural and asset gaps exist inside urban and rural areas. Vanthana and Lau (2014) show that inequality can be mitigated if government targets its interventions at within-group inequality for narrowing inequality gap in consumption expenditure but for the case of inequality in assets the measures would have to focus on between-group inequality.

Catherine Halbrendt Francis Tuan, Conrado Gempesaw, and Dimphna Dolk-Etz (2011) analysed the Guandong's food consumption in rural area using the consumption expenditure survey data of 1990 which covered 2, 560 households. The expenditure data comprised nine expenditure items. The system of expenditure share equations is made up from nine commodities were estimated using an extended AIDS model. This empirical analysis derived three distinct results. First, own-price elasticities are inelastic, as one would expect when a large percentage of the household budget is spent on food items. Second, except for grains, there is very little commodity substitution when relative prices have changed. Third, the commodities most responsive to expenditure fluctuations are meats, poultry, fruits,

sweets, "other foods," and durable goods. Although this analysis revealed the trend of the food consumption in rural province of Guangdong but it is difficult to verify whether the analytical results reflect the general consumption behaviour of the whole China. The main reason for this reservation is that in the data set used in this study, the average household consisted of five people, including three children, which is quite deviated from the general situation in other provinces.

Lu and Lau (2014) examine the consumer behavior in Changchun City, China. They analyzed a time series cross sectional panel data from 300-household survey responses collected from January 2009 to December 2011 using AIDS model. The empirical results show that "food" and "education, culture and recreation" are necessity goods for the people in Changchun. Both groups of goods comprise 44 percent of total expenditure share in that data set. At the same time, these two items are Giffen goods because their expenditure shares increase even with the rise in their prices. Similarly, that findings suggest that "housing" is a luxury good but it is also a Giffen good. From these perspectives, it is argued that the growth of real income across China in general and in Changchun in particular has been lagging behind the rise in prices of these three expenditure items. Furthermore, the estimated compensated cross-price elasticities of demand indicate that the theoretical assumption of a diminishing marginal rate of substitution did not hold for that data set. Based on that evidence, they contend that for the consumption expenditure shares in net substitute goods, whereas consuming one good reduces its own marginal utility, it increases the marginal utility of its substitute good. The empirical evidence shows that the expenditure share in "medical" is not influenced by the change in disposable income. Neither is expenditure item affected by the change in its own price nor prices of other goods. Thus, consumers' demand in "medical" is not being influenced by its price and their disposable income.

Indeed, the aforementioned studies have given out some positive discussions which are of relevancy to discerning the understanding of the consumer behavior in China or in other developing countries. Particularly, regarding the eight items of the household consumption (such as food, clothing and footwear, housing utensils and so on), two important questions may be asked regarding the consumer behaviour in China. How prices have affected the consumer's preference among different goods? And how does the income level affect the consumer behaviour of each stratum? Both of these problems have not been adequately explored. In order to compensate this lack of information, this empirical study will first reveal the consumption pattern in urban China. In view of this, we choose Shanghai, Beijing, Tianjin, and Qingdao, the major cities of China, as its subjects to analyse the household consumption, using the data from survey questionnaires collected in 2010. In addition, a comparison will be made with the analysis based on the time-series aggregated data of Chinese urban household income and expenditures between 1992 and 2012.

3. Analytical Framework

3-1. Data

This empirical study analyzes two sets of data. The first set is a time series aggregated data of disposable income and consumption expenditure of Chinese urban areas from 1992 to 2012. Consumption expenditure comprises eight major expenditure items, viz., "food," "clothing," "housing utensils," "housing," "medical," "transportation and communication," "education and culture," and "other expenditure." This data set is compiled from various issues of *Chinese Statistical Yearbook* published by the Chinese National Bureau of Statistics.

The second set is a data set collected from a questionnaire survey of income and consumption expenditure conducted in Beijing, Shanghai, Tianjin and Qingdao (BSTQ). This survey was conducted from 5 August to 20 September 2010. These four cities were selected because Beijing, Shanghai and Tianjin are direct-controlled municipal under the national government and their living standards are of the highest level in China, whereas Qingdao is a city administered at the sub-provincial level and it represents an average income level of Chinese urban areas. Essentially, this survey asked three sets of questions. The first set pertained to basic information of a respondent such as sex, age, education background, number of family members. The second set was related to the amount of disposable income in previous year, i. e., 2009. The third set comprised questions regarding the amount of consumption expenditure and the breakdown of that expenditure in eight major expenditure items.

The survey was conducted with the help of residents' committees through the placement method of questionnaire survey. In other words, residents' committees facilitated the distribution and collection of questionnaires in their designated residential areas in targeted cities. These targeted cities were Chaoyang District, Haidian District, Fengtai District and Dongcheng District in Beijing; Hongkou District, Jingan District and Yangpu District in Shanghai; Heping District, Hedong District, Hebei District and Jinnan District in Tianjing; Sinan District, Sibei District and Sifang District in Qingdao. Totally, 1, 600 questionnaires were distributed through residents' committees and 1, 485 responses were collected. The effective recovery rate was 93%. The composition of the respondents was 499, 387, 312, 287 for Beijing, Shanghai, Tianjin and Qingdao, respectively. There was a slight difference in the city in terms of the respondents' gender, 791 respondents (about 53. 3%) were men, whereas 694 respondents were women (46. 7%). The respondents' mean age was 38. 3 years old, the lowest age was 26 and the highest was 62 years old. It should be noted that unemployed and retirees were not included in this survey.

The analyses of this cross sectional data set cover two parts: the whole questionnaire survey respondents' sample (QSR) and five categories of disposable

income quintile. The disposable income of the first quintile ranged from 26, 000RMB to 48, 000RMB. The second quintile to the fifth is 49, 000–66, 000RMB, 67, 000–91, 000RMB, 92, 000–128, 000RMB, 129, 000–980, 000RMB, respectively.

3–2. Specification and analytical method

This study conducts three stages of analysis. Firstly, based on the time series aggregated data, the study examines the relationship of total consumption expenditure and disposal income of urban areas in China from 1992 to 2012. This analysis uses geometric means of the prices from eight major consumption expenditure items (viz., "food," "clothing," "housing utensils," "housing," "medical," "transportation and communication," "education and culture," and "other expenditure") to deflate consumption expenditure and disposable income. In addition, taking into consideration of the effects of enhanced integration of the Chinese economy into the world economy with her accession to the WTO in December 2001, the regression analysis incorporated a dummy variable in order to differentiate any influence attributed to this structural change[1]. Essentially, this relationship is specified by the following equation.

$$C_t = cons + \alpha_1 Y_t + \alpha_2 dwto_t \qquad [1]$$

C denotes real total consumption expenditure, cons. is the intercept, Y is the real disposable income, and t is from 1992 to 2012, and dwto is the dummy variable (it carries a value of 0 from 1992 to 2001, but a value of 1 from 2002 to 2012). The parameters that are to be estimated from [1] are cons. α_1 and α_2.

The second stage of this empirical inquiry is to estimate the consumer behaviors of Chinese urban areas based on AIDS. This estimation is conducted using data pertain to disposable income, total consumption expenditure, and eight categories of consumption expenditure items, viz., "food," "clothing," "housing utensils," "housing," "medical," "transportation and communication," "education and culture," and "other expenditure." AIDS' model is shown in Equation 2. The estimation of Equation [2] for QSR data set used the mean age of the respondents as the weight.

$$w_i = cons + \varepsilon_i \log\left(\frac{x}{p}\right) + \sum_j \gamma_{ij}^c \log\left(P_j\right) \qquad [2]$$

ε_i is the value of income elasticity of demand with respect to good i, in which a negative value means a necessity goods whereas the opposite refers to a luxury goods. γ_{ij}^c is the value of compensated cross-price elasticity of demand between goods i and goods i. If i=j, then the estimated coefficient is the value of compensated

1 The value of dwto is 0 from 1992 to 2001 and it is 1 after from 2002 to 2012.

own-price elasticity of demand of good i. A positive value of compensated cross-price elasticity of demand means a pair of goods is a net substitute, whereas a negative value means a net complementary[2]. Furthermore, this model is subjected to the following conditions. Total expenditure (i. e., $\sum_{i=1}^{8} w_i$) is the sum of each individual share of consumption expenditure which is equal to one. The sum of income elasticity for each respective share of consumption expenditure is one. Equation [2] is homogeneous of degree zero in prices and total expenditure, all parameters satisfy Slutsky equation, and compensated cross price elasticity of each item of consumption is in symmetry. These conditions are expressed as follows.

$$\sum_{i=1}^{n} cons=1,\ \sum_{i=1}^{n} \varepsilon_i=0,\ \sum_{i=1}^{n} \gamma_{ij}=0 \qquad [3]$$

$$\sum_j \gamma_{ij}^c=0 \qquad [4]$$

$$\gamma_{ij}^c=\gamma_{ji}^c,\ \forall\, i,j \qquad [5]$$

For the time series aggregated data of Chinese urban areas, this analysis used "seemingly unrelated regression (SUR)" method for estimating Equation [2]. However, for the cross sectional data set of QSR and the estimation of its quintiles, the estimation were based on multivariate regression analyses[3].

4. Analytical Result and Discussion

4-1. Descriptive Statistics

Table 1 shows the descriptive statistics of the QSR. Among 1, 485 respondents, the highest disposable income is 980, 000 Renminbi (RMB) and the lowest is 26, 000 RMB, while the mean is 95, 646 RMB. For the consumption expenditure, the maximum amount is 132, 200 RMB and the minimum is 17, 100RMB and the mean is 55, 520RMB. Regarding the share of consumption expenditure item, "food" is the highest at 32. 4% and follow by "education and culture" at 15. 8%, "transportation and communication" at 12. 8%, "clothing" at 9. 8%, "housing" at 7. 9%, "household utensils" at 7. 2% and "other expenditure" at 4. 6%. Table 2 shows the descriptive statistics of QSR's age.

2 Compensated elasticity of demand is also known as Hicksian elasticity of demand. Essentially, it is the elasticity that is influenced by the change in disposable income resulted from the change in relative prices by holding utility constant which is derived from Slutsky Equation.

3 For the cross-sectional data, SUR encounters the problem of omitted variables due to collinearity of prices among the eight expenditure items. To overcome this limitation, multivariate regression method is used.

Table 1　Descriptive statistics of questionnaire survey sample

	Obs	Mean	Std. dev	Min	Max
Income	1, 485	95, 646	66, 902	26, 000	980, 000
Consumption expenditure	1, 485	55, 520	22, 796	17, 100	132, 200
Food	1, 485	16, 968	5, 327	1, 000	112, 000
Clothing	1, 485	5, 589	3, 069	1, 000	33, 000
Housing utensils	1, 485	4, 164	2, 154	1, 250	10, 000
Housing	1, 485	5, 106	2, 055	500	11, 000
Medical	1, 485	4, 278	1, 971	1, 600	11, 000
Transportation and communication	1, 485	7, 584	4, 723	850	28, 000
Education and culture	1, 485	9, 076	4, 873	1, 250	29, 500
Other expenditure	1, 485	2, 755	1, 979	500	21, 001
Share in consumption expenditure					
Food	1, 485	0. 324	0. 066	0. 053	0. 847
Clothing	1, 485	0. 098	0. 026	0. 011	0. 580
Housing utensils	1, 485	0. 072	0. 015	0. 015	0. 133
Housing	1, 485	0. 094	0. 023	0. 009	0. 170
Medical	1, 485	0. 079	0. 024	0. 024	0. 179
Transport. and comm.	1, 485	0. 128	0. 029	0. 015	0. 234
Education and culture	1, 485	0. 158	0. 027	0. 024	0. 244
Other expenditure	1, 485	0. 046	0. 017	0. 008	0. 278

Table 2　Descriptive statistics of age for questionnaire survey respondents（years）

	Obs	Mean	Std. dev.	Min	Max
Whole sample	1, 485	38. 3	6. 5	26	62
Quintile 1	298	36. 6	6. 0	27	52
Quintile 2	303	38. 0	6. 9	28	62
Quintile 3	290	37. 5	6. 6	26	61
Quintile 4	308	38. 5	6. 3	29	56
Quintile 5	286	40. 7	6. 1	29	61

Table 3 provides the descriptive statistics of each targeted city. The range between the lowest and the highest disposable income was 36, 000–520, 000RMB, 31, 000–290, 000RMB, 28, 000–980, 000RMB, 26, 000–200, 000RMB in Beijing, Shanghai, Tianjin and Qingdao, respectively. In terms of consumption expenditure, the range in the respective city was 18, 800–132, 200RMB, 27, 700–128, 700RMB, 17, 100–980, 000RMB, 26, 000–200, 000RMB. These four cities shared a common trend, i. e., consumption expenditure share in "food" and "education and culture" was respectively ranked the first and second highest.

Table 4 tabulates the descriptive statistics of each quintile of QSR. The minimum and maximum disposable incomes in each quintile were 26, 000–48, 000 RMB, 49, 000–66, 000RMB, 67, 000–91, 000RMB, 92, 000–128, 000RMB, 129, 000–980, 000RMB, respectively. Regarding the consumption expenditure, the lowest and the highest amounts in each quintile were 17, 000–56, 000RMB, 27, 900–50, 900RMB, 38, 100–65, 900RMB, 52, 000–82, 100RMB, 59, 600–132, 200RMB, respectively. Similar to the whole sample of respondents, the combined expenditures in "food" and "education and culture" ranged from about 43. 5% to about 53% in each quintile. It is

Table 3 Descriptive statistics of questionnaire survey respondents

	Obs	Mean	Std. dev	Min	Max		Obs	Mean	Std. dev	Min	Max
Beijing						Tianjin					
Disposable income	499	122, 421	68, 249	36, 000	520, 000	Disposable income	312	79, 106	83, 356	28, 000	980, 000
Consumption expenditure	499	63, 178	24, 321	18, 800	132, 200	Consumption expenditure	312	45, 771	18, 151	17, 100	91, 200
Food	499	17, 294	5, 620	1, 000	112, 000	Food	312	13, 657	3, 282	1, 050	20, 500
Clothing	499	7, 297	3, 406	1, 000	33, 000	Clothing	312	4, 244	2, 064	1, 900	9, 800
Housing utensils	499	4, 836	1, 985	1, 500	10, 000	Housing utensils	312	3, 556	2, 265	1, 250	9, 500
Housing	499	4, 707	1, 826	500	9, 000	Housing	312	5, 831	2, 249	2, 500	11, 000
Medical	499	5, 212	1, 802	1, 900	11, 000	Medical	312	4, 402	1, 373	2, 850	8, 500
Transport. and comm.	499	8, 575	4, 640	850	22, 000	Transport. and comm.	312	5, 364	2, 746	2, 210	12, 600
Education and culture	499	12, 020	5, 785	1, 250	29, 500	Education and culture	312	6, 277	2, 921	2, 700	15, 000
Other expenditure	499	3, 236	2, 424	500	21, 001	Other expenditure	312	2, 441	1, 775	750	8, 000
Share in con. expenditure						Share in con. expenditure					
Food	499	0. 290	0. 057	0. 053	0. 847	Food	312	0. 315	0. 052	0. 061	0. 393
Clothing	499	0. 115	0. 026	0. 011	0. 580	Clothing	312	0. 090	0. 009	0. 072	0. 122
Housing utensils	499	0. 076	0. 009	0. 015	0. 126	Housing utensils	312	0. 071	0. 018	0. 047	0. 128
Housing	499	0. 075	0. 009	0. 009	0. 114	Housing	312	0. 127	0. 011	0. 093	0. 170
Medical	499	0. 085	0. 015	0. 024	0. 179	Medical	312	0. 100	0. 014	0. 072	0. 173
Transport. and comm.	499	0. 128	0. 025	0. 016	0. 195	Transport. and comm.	312	0. 112	0. 016	0. 079	0. 142
Education and culture	499	0. 184	0. 029	0. 024	0. 244	Education and culture	312	0. 135	0. 012	0. 098	0. 201
Other expenditure	499	0. 047	0. 020	0. 008	0. 278	Other expenditure	312	0. 048	0. 021	0. 029	0. 233
Shanghai						Qingdao					
Disposable income	387	85, 062	52, 501	31, 000	290, 000	I Disposable income	287	81, 348	43, 954	26, 000	200, 000
Con. expenditure	387	58, 121	22, 869	27, 700	128, 700	Con. expenditure	287	49, 296	18, 663	22, 650	95, 000
Food	387	21, 009	4, 775	12, 000	34, 500	Food	287	14, 553	3, 107	4, 300	21, 000
Clothing	387	4, 693	2, 699	1, 450	14, 500	Clothing	287	5, 286	2, 439	2, 200	33, 000
Housing utensils	387	3, 811	1, 945	1, 300	9, 500	Housing utensils	287	4, 134	2, 272	1, 300	9, 600
Housing	387	5, 054	1, 537	2, 300	9, 000	Housing	287	5, 085	2, 561	1, 750	10, 500
Medical	387	2, 608	867	1, 600	6, 000	Medical	287	4, 770	2, 426	1, 700	9, 700
Transport. and comm.	387	9, 198	5, 976	2, 900	28, 000	Transport. and comm.	287	6, 095	3, 001	1, 000	14, 500
Education and culture	387	8, 782	3, 924	4, 250	24, 500	Education and culture	287	7, 398	2, 878	2, 800	19, 000
Other expenditure	387	2, 966	1, 683	800	9, 500	Other expenditure	287	1, 974	1, 290	600	5, 500
Share in con. expenditure						Share in con. expenditure					
Food	387	0. 381	0. 053	0. 263	0. 473	Food	287	0. 315	0. 058	0. 128	0. 442
Clothing	387	0. 077	0. 012	0. 039	0. 128	Clothing	287	0. 109	0. 030	0. 080	0. 580
Housing utensils	387	0. 063	0. 011	0. 040	0. 080	Housing utensils	287	0. 079	0. 017	0. 032	0. 133
Housing	387	0. 089	0. 012	0. 063	0. 111	Housing	287	0. 099	0. 016	0. 039	0. 143
Medical	387	0. 046	0. 005	0. 036	0. 064	Medical	287	0. 092	0. 017	0. 049	0. 149
Transport. and comm.	387	0. 146	0. 035	0. 102	0. 234	Transport. and comm.	287	0. 119	0. 023	0. 015	0. 200
Education and culture	387	0. 150	0. 009	0. 131	0. 205	Education and culture	287	0. 151	0. 016	0. 070	0. 221
Other expenditure	387	0. 048	0. 009	0. 026	0. 079	Other expenditure	287	0. 037	0. 010	0. 018	0. 074

Table 4　Descriptive statistics of questionnaire survey respondents in quintile

	Obs	Mean	Std. dev	Min	Max	Obs	Mean	Std. dev	Min	Max
	Quintile 1 (26,000–48,000 RMB)					**Quintile 2 (49,000–66,000 RMB)**				
Income	298	38, 977	5, 806	26, 000	48, 000	303	56, 990	5, 333	49, 000	66, 000
Con. expenditure	298	30, 647	4, 506	17, 100	56, 900	303	39, 967	5, 041	27, 900	50, 900
Food	298	11, 766	2, 399	1, 000	17, 500	303	14, 528	3, 102	4, 300	20, 600
Clothing	298	2, 904	2, 569	1, 450	33, 000	303	3, 709	650	2, 500	5, 000
Housing utensils	298	1, 810	428	1, 250	3, 300	303	2, 573	402	1, 750	3, 800
Housing	298	3, 040	682	1, 750	4, 700	303	3, 965	1, 060	1, 600	5, 700
Medical	298	2, 560	680	1, 600	3, 900	303	3, 180	885	1, 690	8, 500
Transport. and comm.	298	3, 085	691	2, 000	4, 800	303	4, 583	1, 033	2, 000	7, 080
Education and culture	298	4, 372	852	2, 700	6, 000	303	5, 867	878	3, 500	7, 800
Other expenditure	298	1, 110	622	500	8, 000	303	1, 563	836	850	14, 001
Share in Con. Expenditure										
Food	298	0. 383	0. 054	0. 053	0. 473	303	0. 361	0. 046	0. 128	0. 453
Clothing	298	0. 093	0. 046	0. 039	0. 580	303	0. 094	0. 021	0. 063	0. 161
Housing utensils	298	0. 060	0. 014	0. 032	0. 115	303	0. 065	0. 010	0. 045	0. 103
Housing	298	0. 100	0. 021	0. 039	0. 170	303	0. 099	0. 022	0. 052	0. 143
Medical	298	0. 086	0. 026	0. 042	0. 173	303	0. 081	0. 026	0. 044	0. 179
Transport. and comm.	298	0. 100	0. 013	0. 044	0. 142	303	0. 114	0. 016	0. 072	0. 200
Education and culture	298	0. 143	0. 019	0. 070	0. 213	303	0. 147	0. 017	0. 109	0. 205
Other expenditure	298	0. 036	0. 017	0. 018	0. 233	303	0. 038	0. 016	0. 024	0. 278
	Quintile 3 (67,000–91,000 RMB)					**Quintile 4 (92,000–128,000 RMB)**				
Income	290	79, 207	7, 374	67, 000	91, 000	308	108, 656	11, 215	92, 000	128, 000
Con. expenditure	290	52, 166	5, 960	38, 100	65, 900	308	64, 438	6, 647	52, 000	82, 100
Food	290	17, 886	2, 972	12, 500	24, 500	308	18, 544	2, 789	13, 000	26, 000
Clothing	290	4, 776	578	3, 500	6, 500	308	6, 527	878	4, 500	9, 000
Housing utensils	290	3, 760	587	2, 500	4, 950	308	5, 271	864	3, 200	7, 800
Housing	290	4, 811	1, 226	2, 800	7, 600	308	6, 120	1, 727	500	9, 500
Medical	290	3, 613	1, 002	2, 200	6, 500	308	5, 197	1, 397	2, 900	8, 300
Transport. and comm.	290	6, 905	1, 770	3, 200	11, 500	308	9, 036	2, 407	850	16, 500
Education and culture	290	8, 064	1, 198	5, 400	13, 000	308	10, 612	1, 810	1, 250	15, 500
Other expenditure	290	2, 350	654	1, 200	4, 000	308	3, 129	1, 345	1, 400	21, 001
Share in Con. Expenditure										
Food	290	0. 342	0. 032	0. 266	0. 402	308	0. 288	0. 027	0. 227	0. 354
Clothing	290	0. 093	0. 014	0. 072	0. 129	308	0. 102	0. 015	0. 076	0. 145
Housing utensils	290	0. 072	0. 008	0. 054	0. 096	308	0. 082	0. 011	0. 058	0. 133
Housing	290	0. 092	0. 021	0. 057	0. 146	308	0. 095	0. 024	0. 009	0. 153
Medical	290	0. 071	0. 023	0. 039	0. 121	308	0. 082	0. 023	0. 039	0. 126
Transport. and comm.	290	0. 131	0. 020	0. 078	0. 175	308	0. 139	0. 024	0. 016	0. 201
Education and culture	290	0. 155	0. 021	0. 115	0. 244	308	0. 166	0. 030	0. 024	0. 240
Other expenditure	290	0. 045	0. 010	0. 026	0. 083	308	0. 048	0. 016	0. 025	0. 264
	Quintile 5 (129,000–980,000)									
Income	286	198, 308	84, 077	129, 000	980, 000					
Con. expenditure	286	91, 713	16, 071	59, 600	132, 200					
Food	286	22, 346	6, 857	14, 000	112, 000					
Clothing	286	10, 189	2, 525	1, 000	16, 000					
Housing utensils	286	7, 521	1, 166	2, 000	10, 000					
Housing	286	7, 677	1, 375	2, 000	11, 000					
Medical	286	6, 916	1, 756	2, 500	11, 000					
Transport. and comm.	286	14, 573	4, 754	1, 000	28, 000					
Education and culture	286	16, 751	4, 507	5, 000	29, 500					
Other expenditure	286	5, 740	1, 808	1, 000	12, 000					
Share in Con. Expenditure										
Food	286	0. 244	0. 046	0. 190	0. 847					
Clothing	286	0. 111	0. 016	0. 011	0. 176					
Housing utensils	286	0. 083	0. 013	0. 015	0. 128					
Housing	286	0. 086	0. 021	0. 015	0. 150					
Medical	286	0. 077	0. 021	0. 024	0. 149					
Transport. and comm.	286	0. 156	0. 031	0. 015	0. 234					
Education and culture	286	0. 181	0. 029	0. 038	0. 239					
Other expenditure	286	0. 062	0. 013	0. 008	0. 115					

also worth noting that the respondents in each quintile spent a relatively high expenditure share in "transportation and communication." Also, the expenditure share in this item was higher as the disposable income is higher.

4-2. Average and marginal propensities to consume

The average propensity to consume (APC) or the ratio of consumption expenditure and disposal income for the time series aggregated data of Chinese urban areas is 76. 7%. On the other hand, the mean APC of the questionnaire respondents from Beijing, Shanghai, Tianjin and Qingdao is about 65%. In terms of income category, viz., from quintile 1 to 5, the respondents' APC is 79%, 70%, 66%, 60% and 49%, respectively (Table 5). In this data set, the value of APC is smaller as the disposable income rises. Additionally it is reasonable to explain that the disposable income in the lowest quintile in QSR data set is lower than national average of aggregated disposable income.

Table 5 Estimated APC and MPC of Chinese urban areas and QSR

	Obs.	APC	Std. dev.	Min	Max
Urban areas					
Average propensity to consume (APC)	21	0. 767	0. 047	0. 679	0. 825
Questionnaire survey respondents		Mean APC			
Whole sample	1, 485	0. 6485	0. 1235	0. 1273	1. 3233+
Quintile 1	298	0. 7921	0. 0896	0. 4273	1. 3233+
Quintile 2	303	0. 7017	0. 0623	0. 5319	0. 8400
Quintile 3	290	0. 6596	0. 0573	0. 5412	0. 7604
Quintile 4	308	0. 5964	0. 0652	0. 4230	0. 7550
Quintile 5	281	0. 4871	0. 0775	0. 0629	0. 6531
Marginal propensity to consume (MPC)	Obs.	Coef.	Std. err.	t	P > |t|
Urban areas	20	0. 5925	0. 0259	22. 88	0. 000
Questionnaire survey respondents					
Whole sample	1485	0. 1965	0. 1965	37. 8	0. 000
Quintile 1	298	0. 5295	0. 0330	16. 07	0. 000
Quintile 2	303	0. 6551	0. 0401	16. 33	0. 000
Quintile 3	290	0. 5558	0. 0352	15. 77	0. 000
Quintile 4	308	0. 2224	0. 0278	7. 9	0. 000
Quintile 5	286	0. 0281	0. 0071	3. 95	0. 000

Note 1: For Chinese urban areas, MPC is estimated by Prais-Winsten AR (1) after conducting an Augmented Dickely-Fuller unit root test. Adjusted R-squared is 0. 9672 and the DW (transformed) is at 1. 9427.

Note 2: Adjusted R-squared for whole sample and from Quintile 1 to Quintile 5 is 0. 4902, 0. 4659, 0. 4681, 0. 4616, 0. 1728, 0. 0488, respectively.

Note 3: dummy variable *dwto* (Equation [1]) is not statistically significant.

Note +: the value is more than 1 because consumption is greater than disposable income.

The marginal propensity to consume (MPC) of Chinese urban areas for the period of 1992 and 2012 is 0. 59, whereas the MPC of QRS is about 0. 20. The former means for every 100RMB increase of disposable income, a Chinese urban consumer spends additional 59RMB. The latter implies that in QSR for every additional

disposable income 100RMB, the respondents will spend extra 20RMB in consumption expenditure. Among the sample, the MPC of each quintile is 0. 53, 0. 66, 0. 56, 0. 22, 0. 03, respectively. The highest MPC is the second quintile which implies that for additional 100RMB of disposable income, the respondents will spend another 66RMB. The lowest MPC is the fifth quintile which suggests that if a respondent's disposable income rises by 100RMB, it induces 3RMB of additional consumption expenditure. Furthermore, the value of MPC becomes smaller if a respondent's disposable income was higher than 66, 000 RMB.

4-3. Fitness of specification: RMSE, adjusted R-squared, F-statistics

Table 6 and Table 7 show the analytical results in root mean squared deviation (RMSE), adjusted R-squared, F-statistics and the probability (P) of F-statistics. For the time series aggregated data of Chinese urban areas, each dependent variable in SUR (i. e., each respective share of expenditure equation the specified demand system) has a high explanatory power and its respective F-statistics also confirmed the data fit quite well with the model specification denoted by Equation [2].

With regard to the multivariate regress analysis of QSR, expenditure shares "food," "housing utensils," "medical," "transportation and communication" show reasonably high adjusted R-squared ranged between 0. 51 and 0. 78, whereas "clothing," "education and culture" and "other expenditure" respectively has a value between 0. 34 and 0. 38, and "housing" has the lowest adjusted R-squared. Their F-statistics and P for F-statistics confirmed that the QSR data set also fit well with the model specification (Table 6).

Table 6 RMSE, Adjusted R-squared, F-statistics and P-statistics

Dependent variable	Obs.	RMSE	R-sq.	F-Stat	P > F
Seemingly Unrelated Regression (SUR) for Chinese urban areas					
Food	21	0. 0088	0. 9893	113. 30	0. 000
Clothing	21	0. 0019	0. 9927	165. 55	0. 000
Housing utensils	21	0. 0036	0. 9427	20. 09	0. 000
Housing utensils	21	0. 0040	0. 9288	15. 96	0. 000
Medical	21	0. 0020	0. 9851	81. 02	0. 000
Transport. and comm.	21	0. 0056	0. 9768	51. 57	0. 000
Education and culture	21	0. 0032	0. 9715	41. 63	0. 000
Other expenditure	21	0. 0025	0. 8724	8. 36	0. 000
Multivariate regression for QSR					
(Expenditure share in)					
Food	1, 485	0. 0312	0. 7761	568. 12	0. 000
Clothing	1, 485	0. 0209	0. 3792	100. 12	0. 000
Household utensils	1, 485	0. 0102	0. 5145	173. 70	0. 000
Housing	1, 485	0. 0212	0. 1205	22. 46	0. 000
Medical	1, 485	0. 0140	0. 6758	341. 65	0. 000
Transport. and comm.	1, 485	0. 0168	0. 6627	321. 96	0. 000
Education and culture	1, 485	0. 0220	0. 3606	92. 42	0. 000
Other expenditure	1, 485	0. 0139	0. 3452	86. 40	0. 000

Table 7 RMSE, Adjusted R-squared, F-statistics and P-statistics of QSR in quintiles

	Obs.	RMSE	R-sq	F-stats	P
Dependent variable: share of in consumption expenditure					
Quintile 1	298	0.0395	0.4824	29.82	0.000
Quintile 2	303	0.0222	0.7695	108.65	0.000
Quintile 3	290	0.0175	0.7171	78.86	0.000
Quintile 4	308	0.0180	0.5656	43.12	0.000
Quintile 5	286	0.0369	0.3914	19.72	0.000
Dependent variable: share of clothing in consumption expenditure					
Quintile 1	298	0.0386	0.3276	15.59	0.000
Quintile 2	303	0.0098	0.7937	125.29	0.000
Quintile 3	290	0.0058	0.8312	153.17	0.000
Quintile 4	308	0.0089	0.6426	59.52	0.000
Quintile 5	286	0.0130	0.3653	17.65	0.000
Dependent variable: share of housing utensils in consumption expenditure					
Quintile 1	298	0.0114	0.3473	17.02	0.000
Quintile 2	303	0.0077	0.4675	28.584	0.000
Quintile 3	290	0.0065	0.3595	17.46	0.000
Quintile 4	308	0.0083	0.4568	27.85	0.000
Quintile 5	286	0.0088	0.5404	36.06	0.000
Dependent variable: share of housing in consumption expenditure					
Quintile 1	298	0.0126	0.6502	59.47	0.000
Quintile 2	303	0.0198	0.2284	9.64	0.000
Quintile 3	290	0.0191	0.2001	7.78	0.000
Quintile 4	308	0.0186	0.4391	25.92	0.000
Quintile 5	286	0.0129	0.6285	51.88	0.000
Dependent variable: share of medical in consumption expenditure					
Quintile 1	298	0.0118	0.8039	131.22	0.000
Quintile 2	303	0.0093	0.8715	220.81	0.000
Quintile 3	290	0.0100	0.9220	367.58	0.000
Quintile 4	308	0.0083	0.8741	229.95	0.000
Quintile 5	286	0.0096	0.8040	125.83	0.000
Dependent variable: share of transport. and comm. in consumption expenditure					
Quintile 1	298	0.0081	0.6041	48.82	0.000
Quintile 2	303	0.0123	0.4436	25.96	0.000
Quintile 3	290	0.0127	0.6207	50.91	0.000
Quintile 4	308	0.0112	0.7815	118.44	0.000
Quintile 5	286	0.0183	0.6554	58.32	0.000
Dependent variable: share of education and culture in consumption expenditure					
Quintile 1	298	0.0155	0.3301	15.77	0.000
Quintile 2	303	0.0152	0.2131	8.82	0.000
Quintile 3	290	0.0187	0.2395	9.80	0.000
Quintile 4	308	0.0209	0.5294	37.25	0.000
Quintile 5	286	0.0189	0.5947	44.99	0.000
Dependent variable: share of other expenditure in consumption expenditure					
Quintile 1	298	0.0168	0.0880	3.09	0.002
Quintile 2	303	0.0147	0.1314	4.93	0.000
Quintile 3	290	0.0067	0.5599	39.58	0.000
Quintile 4	308	0.0154	0.1429	5.52	0.000
Quintile 5	286	0.0101	0.3837	19.09	0.000

Table 7 shows the results of QSR in quintiles. By and large, the statistical results from the estimation of Equation [2] by multivariate regression explained reasonably well between the dependent variables and independent variables of the demand equations. However, it is worth noting that for the values of adjusted R-squared for the expenditure share in "other expenditure" were very low for Quintiles 1, 2 and 3, in which their disposable income is below 92, 000RMB.

4-4. Income elasticity of demand

Table 8 shows the estimated income elasticity of demand for two sets of data. For the Chinese urban areas, the time series aggregated data indicate that "food," "clothing," "education and culture and "other expenditure" are necessity goods, whereas "transportation and communication" is a luxury good. "Housing utensils," "housing," "medical" and "other expenditure" are not statistically significant in this analysis. The income elasticity of demand with respect to "food" suggests that a 1% rise in income reduces 0. 07% of food expenditure share in total consumption expenditure. Similarly, each respective estimated coefficient for "clothing," "education and culture" and "other expenditure" suggests that every 1% increase in income reduces 0. 01%, 0. 01% and 0. 004% of its respective expenditure share[4]. On the other hand, 1% increase of income causes 0. 03% rise in the expenditure share of "transportation and communication."

For the QRS, the results indicate that "food," "housing" and "medical" are necessity goods for the respondents in BSTQ, whereas "clothing" is a luxury goods in these four cities. "Housing utensils," "transportation and communication," "education and culture" and "other expenditure" are not statistically significant. The estimate results suggest that if the disposable income is increased by 1% then expenditure share in "food" will reduce 0. 08%. The estimated coefficient for "housing" and "medical" suggest that every 1% increase in income respectively reduces 0. 01% of its expenditure share. Similarly 1% increase of income causes 0. 01% growth in the expenditure share of "clothing."

Among the QSR, for Quintile 1, "food" is necessity good but other items such as "clothing," "housing utensils," "housing," "medical," "transportation and communication" and "other expenditure" are luxury goods. "Education and culture" is not statistically significant. 1% rise of income in this quintile reduces 0. 07% of food expenditure share, but it causes 0. 03%, 0. 01%, 0. 01%, 0. 01%, 0. 02% and 0. 02% rise in expenditure share for "clothing," "housing utensils," "housing," "medical," "transportation and communication" and "other expenditure, respectively."

For Quintile 2, "food," "clothing" and "medical" are necessity good, whereas "housing," "transportation and communication" and "other expenditure" are luxury

4 Expenditure share means the amount of expenditure in total consumption expenditure, same expressions are used in the rest of this paper.

goods. Similar to Quintile 1, "education and culture" is not statistically significant. 1% increase of disposable income brings down 0. 07%, 0. 02%, 0. 02% in expenditure share of "food," "clothing" and "medical," respectively. On the other hand, a similar change in disposable income pushes up the expenditure share by 0. 03%, 0. 06% and 0. 02% in "housing," "transportation and communication" and "other expenditure," respectively.

For Quintile 3, "food" and "housing" are necessity goods, whereas "housing utensils," "transportation and communication" and "education and culture" are luxury goods. "Clothing," "medical" and "other expenditure" are not statistically significant. 1% increase in disposable income reduces 0. 13% and 0. 14% of expenditure share in "food" and "housing," respectively. On the other hand, the same situation causes 0. 04%, 0. 11% and 0. 28% increase of expenditure share in "housing utensils," "transportation and communication" and "education and culture," respectively.

For Quintile 4, "food" and "medical" are necessity goods, whereas "clothing," "housing utensils" and "transportation and communication" are luxury goods. "Housing," "education and culture" and "other expenditure" are not statistically significant. A reduction of 0. 04% and 0. 01% of expenditure share in "food" and "medical" will be caused by 1% growth in disposable income. The same condition causes 0. 01% reduction of expenditure share in each item like "clothing," "housing utensils" and "transportation and communication."

For Quintile 5, "food" and "housing" are necessity goods, whereas "clothing," "transportation and communication," "education and culture" and "other expenditure" are luxury goods. "Housing utensils" and "medical" are not statistically significant. 1% rise of disposable income reduces 0. 06% and 0. 01% of expenditure share in "food" and "housing," respectively. But, the same situation causes 0. 01% increase of expenditure share in "clothing" on the one hand, and 0. 02% for each item like "transportation and communication," "education and culture" and "other expenditure" on the other hand.

Table 8 Estimated income elasticity of demand of the questionnaire respondents

	CUA	Whole	Q1	Q2	Q3	Q4	Q5
Food	−0. 0718*	−0. 0804*	−0. 0673*	−0. 0673*	−0. 1272*	−0. 0428*	−0. 0581*
Clothing	−0. 0127*	0. 0112*	0. 0320**	−0. 0190*	0. 0041	0. 0089*	0. 0128*
Housing utensils	−0. 0023	0. 014	0. 0140*	0. 0034	0. 0361*	0. 0088*	−0. 0018
Housing	0. 0033	−0111*	0. 0145*	0. 0252**	−0. 1438*	0. 0066	−0. 0067**
Medical	−0. 0007	−0. 0117*	0. 0081***	−0. 0218	−0. 0058	−0. 0065**	0. 0030
Transport. and Comm.	0. 0281*	0. 0392	0. 0153*	0. 0599*	0. 1147*	0. 0109**	0. 0176*
Education and culture	−0. 0089*	0. 0232	0. 0063	0. 0033	0. 283**	0. 0059	0. 0226*
Other	−0. 0044**	0. 0155	0. 0164***	0. 0164***	−0. 0065	0. 0082	0. 0165*

Note 1: CUA (Chinese urban areas)
Note 2: *=statistical significant at 0 %, **=statistical significant at 5 %, ***=statistical significant at 5 %

4-5. Compensated own-price elasticity of demand

(1) Chinese urban areas (time series between 1992 and 2012)

For the time series aggregated data set of Chinese urban areas, compensated own-price elasticity of demand is statistically significant for "food," "clothing" and "medical." Each of its own-price elasticity of demand is 0.3253, 0.1085, and −0.2842, respectively. More specifically, if the price of each respective item increased 1%, then it raises 0.33%, 0.11% and 0.28% in its respective share of consumption expenditure (Table 9)

(2) QSR

Table 10 compiles the own-price elasticity of demand for eight types of expenditure item for the whole sample of QSR and its respective quintile. For "food," 1% increase in its price raises its own demand by 3.1% for the whole sample, whereas 7.2%, 4.3%, 1.5%, 0.7% and 1.5% for each respective quintile. Thus "food" is quite sensitive to the change of its own price, particularly in the lower income groups.

The estimated coefficient for "clothing" is not statistically significant in high income groups of Quintile 4 and 5, but 1% increase in the price of "clothing" brings up its own demand by 2.5% (whole sample), and 0.5%, 0.3% and 0.6% in lower income groups of Quintile 1, 2 and 3. The demand of "clothing" is quite inelastic to its price.

The elasticity of "housing utensils" is statistically significant across whole sample and each respective quintile. 1% increase of the price in "housing utensils" reduces its demand by 0.5%, 0.6%, 0.2%, 0.5% and 0.6% for the whole sample and for Quintile 1, 3, 4 and 5, respectively, Conversely, similar magnitude increases its own demand by 0.6% for Quintile 2.

1% increase of the price in "housing" reduces its own demand by 0.4% for the whole sample but its own demand rises by 2.0% and 2.1% for Quintile 4 and 5, respectively. The estimated results for Quintile 1, 2 and 3 are not statistically significant. The own-price elasticity of demand for "housing" is quite elastic in high income categories.

1% increase of the price in "medical" causes the rise of its own demand by 0.5%, 0.4%, 1.1% and 1.4% in Quintile 1, 3, 4, 5, respectively. But, the estimated elasticity of "medical" is not significant for the whole sample and for Quintile 2. Similar to "housing," The own-price elasticity of demand for "medical" becomes elastic in higher income groups.

The demand "transportation and communication" is inelastic to the change in its own price. 1% increase in the price in this item liftsits own demand by 0.4% and 0.7% for the whole sample and Quintile 3, respectively. The estimated coefficients in other quintiles are not statistically significant.

1% increase in the price of "education and culture" causes its own demand to rise by 0.9%, 3.7% and 5.7% for Quintile 3, 4, 5, respectively. The own-price

Table 9 Estimated compensated elasticity of demand in Chinese urban areas (Dependent variable: share of consumption expenditure)

	j=	1	2	3	4	5	6	7	8	dwto	cons
γ^c_{1j}		0.3253**	0.4797*	0.0772	0.0862	0.6167*	−0.1527	0.0236	−1.0395*	−0.0035	−1.2950*
γ^c_{2j}		0.0186	0.1085*	0.0012	0.0195	0.2858*	0.0335	0.0168	−0.1896**	0.0033**	−1.2195*
γ^c_{3j}		−0.0896	0.0218	−0.0486	−0.0487***	0.0365	−0.0095	−0.0376***	0.2024	−0.0102*	−0.0544
γ^c_{4j}		−0.1565**	−0.1967*	−0.0079	−0.0174	−0.3204*	−0.1384*	0.0372***	0.4767*	−0.0054	1.5498*
γ^c_{5j}		−0.0456	−0.0985*	0.0878**	−0.0022	−0.2842*	−0.1168*	0.0359*	0.1655**	0.0077*	1.2325*
γ^c_{6j}		−0.2065**	−0.1897**	−0.1107	−0.0422	−0.1935*	−0.0091	0.0096	0.6207**	0.0186*	0.4969**
γ^c_{7j}		−0.0325	−0.0107	−0.0725	0.0437***	−0.4686*	0.0123	−0.0026	0.1300	0.0060**	1.9830*
γ^c_{8j}		0.0520	0.0443	0.0848***	0.0137	0.0696**	−0.0078	−0.0087	−0.1959	−0.0043***	−0.1870***

Note 1: 1 =food, 2 =clothing, 3 =household utensils, 4 =housing, 5 =medical, 6 =transportation and communication, 7 =education and culture, 8 =other expenditure

Note 2: *=statistical significant at 0 %, **=statistical significant at 5 %, ***=statistical significant at 10%

Table 10 Estimated compensated own-price elasticity of demand for QSR (whole sample, dependent variable: share of consumption expenditure)

	γ^c_{11}	γ^c_{22}	γ^c_{33}	γ^c_{44}	γ^c_{55}	γ^c_{66}	γ^c_{77}	γ^c_{88}
Whole sample	3.0724*	2.4934*	−0.5025*	−0.4230*	0.0355	0.4385**	0.1855	−0.1331
Quintile 1	7.1897*	0.5219**	−0.5539*	−0.8436*	0.5128*	0.7984	−0.2288	−3.1534*
Quintile 2	4.3111*	0.2889*	0.6018*	−0.4790	0.2436	−0.1827	−0.0101	0.−0711
Quintile 3	1.5160*	0.6116*	−0.2388*	0.0531	0.3952*	0.6877*	0.9469***	2.0770*
Quintile 4	0.7105*	0.2007	−0.4505*	2.0153*	1.1074*	0.4522	3.7366*	5.3070**
Quintile 5	1.5438*	−0.1835	−0.6279*	2.0192*	1.3806*	−0.0982	5.7255*	4.3802*

Note 1: 1 =food, 2 =clothing, 3 =household utensils, 4 =housing, 5 =medical, 6 =transportation and communication, 7 =education and culture, 8 =other expenditure

Note 2: *=statistical significant at 0 %, **=statistical significant at 5 %, ***=statistical significant at 10%

elasticity of demand is elastic in these three quintiles. But they are not statistically significant in the whole sample, Quintile 1 and 2.

The demand of "other expenditure" is also sensitive to the change of its own prices. The estimated results show that 1% increase in its price reduces 3. 2% of it demand in Quintile 1 but it raises its own demand by 2. 1%, 5. 3% and 4. 4% in Quintile 3, 4 and 5, respectively.

4-6. Compensated cross-price elasticity of demand

(1) Chinese urban areas

Table 9 shows that the compensated cross-price elasticities of demand between "food" and "clothing" and between "food" and "medical" are statistically significant, and each value is at 0. 4797 and 0. 6167, respectively. If the price of clothing increased 1% then the demand in terms of the share of consumption expenditure in food will rise by 0. 48%. Similarly, if the price of "medical" increased 1% then it will cause 0. 62% increase in the share of consumption expenditure in food. Additionally, these two pairs of expenditure items are net substitute goods[5]. On the other hand, the estimated coefficient for the pair "food" and "other expenditure" is −1. 0395, which means this pair is a net complement. 1% increase in the price of "other expenditure" causes the demand in terms of the share of food consumption expenditure to decrease by 1. 04%.

Compensated cross-price elasticity of clothing with "medical" is 0. 2858 and thus "clothing" and "medical" are net substitute goods. One percent increase in "medical" causes 0. 3% rise in demand of "clothing." Conversely, "clothing" and "other expenditure" are net complementary goods and their elasticity is −0. 1896. Thus, the demand of "clothing" decreases 0. 2% with 1% increase in the price of "other expenditure."

"Housing utensils" and "housing" are net complementary goods. The estimated elasticity of this pair of goods indicates that one percent increase in the price of "housing" causes 0. 05% decrease of the demand in "housing utensils." Similarly, "housing utensils" and "education and culture" is also a pair of net complementary goods. One percent rise in the price of "education and culture" reduces 0. 04% of the demand in "housing utensils).

"Housing" is net complementary goods with "food," "medical," and "transportation and communication," respectively, in which 1% increase in the price of each respective item reduces the demand of "housing" by 0. 16%, 0. 32% and 0. 14%. On the contrary, "housing" is net substitute goods with "education and culture" and

5 A negative value of compensated cross-price elasticity of demand means goods i and goods j are net complements, whereas a positive means they are net substitutes. A pair of net complementary goods means if the price of one of the two goods (e. g., goods j) increased then the demand of another goods (i. e., goods i) will decrease (the reverse also holds). Conversely, a pair of net substitute goods means if the price of one of the two goods (e. g., goods j) increased then the demand of another goods (i. e., goods i) will increase (the reverse also holds).

"other expenditure," in which 1% increase in the price of each respective goods raises the demand of "housing" by 0. 04% and 0. 5%.

"Medical," "clothing" and "transportation and communication" are net complementary goods, whereas "medical" and "education and culture" are net substitute goods. 1% increase of the price in "clothing" and "transportation and communication," respectively, causes the demand of "medical" to reduce by 0. 1%, but similar magnitude of price increase in "education and culture" increases the demand of "medical" by 0. 04%.

"Transportation and communication" is net complementary goods with "food," "clothing" and "medical," but it is a net substitute with "other expenditure." 1% increase in "food," "clothing" and "medical," respectively, reduces the demand of "transportation and communication" by 0. 2%. However, similar magnitude in "other expenditure" also raises the demand of "transportation and communication" by 0. 2%.

"Education and culture" is net complementary with "medical." 1% increase in the latter brings up the demand of the former by 0. 5%. Conversely, "education and culture" and "housing utensils" are net substitute goods, in which one percent of price increase in the latter causes the demand of the former to rise by 0. 04%.

"Other expenditure," "housing" and "medical" are net substitute goods, in which 1% increase in the price of "housing" and "medical," respectively, raises the demand of "other expenditure" by 0. 08% and 0. 07%.

The dummy variable dwto for each dependent variable is statistically significant except with respect to "food" and "housing," whereas cons. are also statistically significant for all dependent variables except with respect to "housing utensils." These results indicate that China's accession to the WTO has influenced the people's behavior in terms of their expenditure share in Chinese urban areas.

(2) QSR: whole sample

The estimated compensated cross-price elasticity of demand in the data set collected from BSTQ are tabulated in Table 11. "Food" is a net substitute with "clothing" and "medical," respectively, but it is a net complement with "other expenditure." 1% increase in the price of "clothing" and "medical," respectively, causes the demand of "food" to increase by 0. 5% and 0. 6%, but the same magnitude reduces the demand of "food" by 1. 04%.

"Clothing" is net substitute with "housing" and "other expenditure," respectively, in which one percent increase in the second item of each pair induces the rise of the demand of "clothing" by 0. 8% and 2. 2%. On the other hand, it is a net complement with "food" and "housing utensils," respectively, in which 1% increase in each item causes the demand of "clothing" to shrink by 1. 0% and 1. 3%.

"Housing utensils" and "education and culture" are net complementary goods. 1% increase in the price of the latter reduces the demand of the former by 0. 9%.

Conversely, "housing utensils," "clothing," "medical," "transportation and communication" and "other expenditure" are net substitute goods. 1% increase of the prices in "clothing," "medical," "transportation and communication" and "other expenditure," respectively, raises the demand of "housing utensils" by 0.5%, 0.3%, 0.2% and 0.4%. These pairs of net substitute goods are not price elastic.

"Housing" and "education and culture" are net complementary goods, in which 1% increase in the price of the latter reduces the demand of the former by 0.5%. On the other hand, "housing," "clothing" and "medical" are net substitute goods. 1% increase in the price of "clothing" and "medical," respectively, causes the demand of "housing" to increase by 0.6% and 0.3%. Neither net complementary pair nor net substitute pairs are price elastic.

"Food," "housing utensils" and "housing" are net complementary goods with "medical," in which 1% increase in price of each respective item causes the demand of "medical" to shrink by 2.4%, 1.7% and 0.8%. Conversely, "clothing," "transportation and culture" and "other expenditure" are net substitute goods with "medical." 1% increase in each of the respective goods raises the demand of "medical" by 0.6%, 0.6% and 4.1%.

"Transportation and communication," "medical" and "other expenditure" are net complementary goods. 1% increase in "medical" and "other expenditure," respectively, causes the decrease of the demand in "transportation and communication" by 0.3% and 3.1%, respectively. On the contrary, "transportation and communication" is net substitute with "food," "housing utensils" and "education and culture," in which 1% increase of the price in each item respectively increases the demand of "transportation and communication" by 2.0%, 1.1% and 0.5%.

"Food," "housing utensils" and "housing" are net complementary goods with "education and culture." 1% increase of the price in each respective item reduces the demand of "education and culture" by 2.4%, 1.7% and 0.8%. Conversely, "education and culture," "clothing," "transportation and communication" and "other expenditure" are net substitute goods. 1% increase of each respective item raises the demand of "education and culture" by 0.6%, 0.6% and 4.1%.

"Other expenditure" and "food" are net complementary goods. 1% increase of the price in the latter reduces the demand of the former by 0.2%. On the other hand, "other expenditure," "housing utensils" and "medical" are net substitute goods. 1% increase of the price in each respective item increases the demand of "other expenditure" by 0.3% and 0.2%, respectively.

(3) QSR in quintiles

Table 12 shows the estimated results of the compensated cross-price elasticity of demand of QSR in quintiles. For all the five quintiles, "food" and "housing utensils" are net complementary goods. The demand of "food" is sensitive to the change of the price in "housing utensils." More specifically, 1% increase in the price of

Table 11 Estimated compensated elasticity of demand for QSR (whole sample, dependent variable: share of consumption expenditure)

j=	1	2	3	4	5	6	7	8	cons
γ^c_{1j}	3.0724*	−0.2903	2.5810*	0.4158***	−0.1210	−0.2862	0.0670	−5.5834*	−11.04052*
γ^c_{2j}	−1.0006*	−0.3376**	−1.2561*	0.7595*	−0.0717	−0.0875	−0.2935	2.2183*	5.8055*
γ^c_{3j}	0.1078	0.5396*	−0.5025*	0.0878	0.2724*	0.1962***	−0.8980*	0.3826*	2.2701*
γ^c_{4j}	−0.0531	0.6116*	−0.0725	−0.4230*	0.2603***	−0.2378	−0.5456**	0.1691	0.4904**
γ^c_{5j}	−2.3825*	0.5708*	−1.7272*	−0.8238*	0.0355	0.6063*	0.1855	4.1449*	8.1271*
γ^c_{6j}	1.9721*	−0.1487	1.1053*	−0.0999	−0.2951**	0.4385**	0.51044*	−3.1356*	−5.2159*
γ^c_{7j}	−2.3825*	0.5708*	−1.7272*	−0.8238*	0.0355	0.6063*	0.1855	4.1449*	8.1271*
γ^c_{8j}	−0.2222**	−0.0820	0.3456*	0.0538	0.1833***	0.1455	−0.1471	−0.1331	−1.6551*

Note 1: 1 =food, 2 =clothing, 3 =household utensils, 4 =housing, 5 =medical, 6 =transportation and communication, 7 =education and culture, 8 =other expenditure

Note 2: *=statistical significant at 0 %, **=statistical significant at 5 %, ***=statistical significant at 10%

"housing utensils" causes the demand of "food" to increase by 3.1%, 3.5%, 2.1%, 1.9% and 2.1% in each correspondent quintile.The relationship between "food" and "housing," "food" and "medical" is respectively statistically significant only in Quintile 4. The two pairs are net substitute goods, in which 1% increase of the price in "housing" and "medical" reduces the demand of food by 1.4%, 1.8%, respectively. "Food" and "transportation and communication" are net substitute goods in Quintile 5 but not in other income groups. 1% increase of the price of "transportation and communication" reduces the demand of "food" in Quintile 1 by 1.8%. The relationship between "food" and "education and culture" is statistically significant in Quintile 3 and 4 whereby they are a pair of net substitute good. Additionally, the demand of "food" is quite elastic to the change of the price in "education and culture." 1% hike in the price of "education and culture" raises the demand of "food" by 0.8% and 3.7% in Quintile 3 and 4, respectively. "Food" and "other expenditure" are net substitute goods in Quintile 1 but the pair is net complementary goods in Quintile 4.

"Clothing" and "food" is a pair of complementary good except in Quintile 1. Furthermore, "clothing" is quite elastic to the change in the price of "food." 1% increase of the price in "food" reduces the demand in "clothing" by 0.9%, 0.8%, 1.8% and 1.6% in Quintile 2, 3, 4 and 5, respectively. "Clothing" and "housing utensils" are net complementary goods across all income groups. 1% increase of the price in "housing utensils" reduces the demand of "clothing" by 1.8%, 1.5%, 0.9%, 0.8% and 0.5% in each respective income group. It is worth noting that its cross-price elasticity of demand become less elastic as the disposable income raises. "Clothing" and "housing" are net substitute goods in Quintile 1 and 2 whereby 1% increase in the price of "housing" raises the demand of "clothing" by 1.2% and 0.6%, respectively. The same pair of goods are net complementary goods in Quintile 5, whereby 1% increase in the price of "housing" reduces the demand of "clothing" by 0.6%. "Clothing" and "medical" are net complementary goods in Quintile 3, 4 and 5. 1% increase in the price of "medical" in these three income groups reduces the demand of "clothing" by 0.5%, 0.7% and 0.8%, respectively. "Clothing" and "education and culture" are net complementary goods in Quintile 1 and 2, whereby 1% increase of "education and culture" reduces the demand of "clothing" by 2.8% and 1.3%, respectively. Conversely, the same pair of goods are net substitute goods in Quintile 3 and 4, whereby 1% increase of "education and culture" increases the demand of "clothing" by 0.8% and 1.6%, respectively. "Clothing" and "other expenditure" are complementary goods across all income groups. 1% increase of the price in "other expenditure" reduces the demand of "clothing" by 10.2%, 7.6%, 3.5%, 2.6% and 3.6% in each respective income group. Furthermore, the cross-price elasticity of demand for this pair of goods are highly sensitive to changes in price of "other expenditure."

"Housing utensils" and "food" are net complementary goods in Quintile 1, 2 and

Table 12 Estimated compensated elasticity of demand for QSR by quintiles (dependent variable: share of consumption expenditure item)

		j=	1	2	3	4	5	6	7	8	Cons
Quintile 1	γ^c_{1j}		7.1897*	0.3822	3.0573*	0.0801	0.0441	5.0330	−0.6339	10.1714*	13.310*
	γ^c_{2j}		−0.0350	2.4934*	−1.7890*	1.2378**	−0.9065	−4.3697	−2.7623*	−10.17*	−13.310*
	γ^c_{3j}		−0.4808**	0.8794*	−0.5539*	0.3875**	−0.2126	0.3450	−1.101*	1.7071**	8.0727*
	γ^c_{4j}		−4.1479*	−2.8429*	0.6666*	−0.8436	1.0420*	0.0220	2.6948*	4.8740*	3.1635*
	γ^c_{5j}		−5.9010*	−1.3566*	−1.6562*	−0.4385***	0.5128*	0.1765	1.3229*	7.6109*	−0.7282
	γ^c_{6j}		1.1682*	0.0046	0.9091*	0.0314	−0.1644	0.7984	0.1064	−2.0950*	7.8142*
	γ^c_{7j}		2.6966*	0.3813	0.4516*	−0.1886	−0.0271	−0.2303	−0.2288	−3.1534*	−4.1801*
	γ^c_{8j}		−0.4808*	0.0587	0.2477**	−0.2661	−0.2882	−1.7309	0.6021***	0.2350	−1.9845*
Quintile 2	γ^c_{1j}		4.3111*	−0.0064	3.4979*	0.4386	0.1989	−0.2341	−0.5024	0.2349	−1.0823**
	γ^c_{2j}		−0.8507*	0.5219**	−1.5418*	0.6488*	0.1771	0.1395	−1.2995*	−7.7574*	−15.3651*
	γ^c_{3j}		−0.4377*	0.2114	−0.6018*	−0.1011	0.0696	0.0077	−0.1433	2.3947*	7.2870*
	γ^c_{4j}		−1.6575*	−0.2857	0.1529	−0.4790	−0.5029	0.0854	1.0727**	1.0372*	2.8139*
	γ^c_{5j}		−3.8976*	−0.313**	−1.7173*	−0.4080**	0.2436	0.7098*	0.4411***	5.6578*	−0.7282
	γ^c_{6j}		2.29580*	0.1744	0.3005*	−0.2912	−0.0508	−0.1827	0.1657	−2.654*	8.1550*
	γ^c_{7j}		0.5286**	−0.1972	−0.4590*	0.2250	0.0493	−1.0380*	−0.0101	−0.0711	−1.6475*
	γ^c_{8j}		−0.2920	−0.1054	0.3695*	−0.0332	−0.1847	0.5125***	0.2756	0.0930	2.2455*
Quintile 3	γ^c_{1j}		1.516*	−0.4646	2.1168*	0.1826	−0.4959	−0.2907	0.8425***	−0.0930	−1.7605*
	γ^c_{2j}		−0.8217*	0.2889**	−0.8663*	0.0630	−0.5038*	−0.0935	0.1695	−3.5275*	−8.5600*
	γ^c_{3j}		−0.1945***	0.3742**	−0.2388*	−0.0149	0.0728	0.0906	−0.4304**	1.6586*	4.0658*
	γ^c_{4j}		0.5326***	−0.0004	0.3328*	−0.0531	0.6528***	−0.3770	−0.6394	0.3970*	0.9219*
	γ^c_{5j}		−2.2527*	−0.0726	−1.7961*	−0.0380	0.3952*	0.0668	−0.2635	4.0728**	−1.1682**
	γ^c_{6j}		2.6426*	0.2610	0.4520*	−0.5198***	−0.3085	0.6877**	0.4951	−3.216*	8.3908*
	γ^c_{7j}		−1.546*	−0.2178	−0.5756*	−0.1863	−0.5462***	−0.1234	0.9469***	2.0770*	−2.7036*
	γ^c_{8j}		0.1237	−0.1687	0.5751*	0.5665*	0.7335*	0.0394	−1.1207*	−0.6785*	2.6503*
Quintile 4	γ^c_{1j}		0.7105**	−0.4379	1.8730*	−1.3940*	−1.7769*	−0.8944	3.6767*	−0.6785*	−2.59696*
	γ^c_{2j}		−1.7544*	0.2007	−0.8843*	−0.2170	−0.7160*	0.5358	0.7773*	−2.5667*	−7.9436*
	γ^c_{3j}		0.8441*	0.1726	−0.4505*	0.6576*	0.7808*	−0.2509	−1.6403*	2.5982*	4.1354*
	γ^c_{4j}		2.3058*	0.0714	−0.3478**	2.0153*	2.2787*	0.9326	−4.5885*	−0.3840**	2.0513*

	γ^c_{5j}	0.2589**	−0.2462	−2.1842*	0.4959*	1.1074*	−0.5135	−1.396*	−1.9659*	1.5272**
	γ^c_{6j}	2.4258*	0.2775	2.2480*	−0.6072**	−0.7988*	0.4522	1.1594*	−4.7112*	10.1538*
	γ^c_{7j}	−4.6942*	0.0421	−0.6615*	−1.7978*	−1.7990*	−0.2364	3.7366*	5.3070*	−10.26*
	γ^c_{8j}	−0.0966	−0.0802	0.4074*	0.8471**	0.9238*	−0.0254	−1.7249*	0.3032	3.2733*
Quintile 5	γ^c_{1j}	1.5438**	0.6024	2.0835*	−0.2799	−0.9675	−1.7528*	0.9738	−0.3032	−1.9334
	γ^c_{2j}	−1.579*	−0.1835	−0.5130*	−0.5686**	−0.8608*	−0.4289	1.6246*	−3.6189*	−8.8969*
	γ^c_{3j}	0.7335*	0.2160	−0.6279*	1.2272*	1.4686*	0.1736	−2.9701*	2.0634*	2.4242*
	γ^c_{4j}	1.7180*	0.5461**	−0.8199*	2.0192*	2.7584*	0.5259***	−5.4601*	−0.0697	2.9080*
	γ^c_{5j}	−0.1373	0.2118	−1.8197*	0.4574**	1.3806*	0.7948*	−2.1682*	2.0094*	3.7641*
	γ^c_{6j}	1.7629*	−0.6163	2.2716*	−1.1846*	−2.0530*	−0.0982	3.9536*	−4.1194	8.4246*
	γ^c_{7j}	−3.7758*	−0.7641***	−0.6569*	−2.1943*	−2.8383*	−0.0735	5.7255*	4.3802*	−10.3331*
	γ^c_{8j}	−0.2659	−0.0124	0.0825	0.5236**	1.1121*	0.8592*	−1.6791*	0.1824	3.1990*

Note 1: 1 =food, 2 =clothing, 3 =household utensils, 4 =housing, 5 =medical, 6 =transportation and communication, 7 =education and culture, 8 =other expenditure

Note 2: *=statistical significant at 0 %, **=statistical significant at 5 %, ***=statistical significant at 10%

3 but the pair is net complementary goods in Quintile 4 and 5. 1% increase of the price in "food" reduces the demand of "housing utensils" by 0. 5%, 0. 4% and 0. 2% in Quintile 1, 2 and 3, respectively. Conversely, similar magnitude increases the demand by 0. 8% and 0. 7% in Quintile 4 and 5, respectively. "Housing utensils" and "clothing" are net substitute goods in Quintile 1 and 3, whereby 1% increase of latter increases the demand of the former by 0. 9% and 0. 4%, respectively. "Housing utensils" and "housing" is a pair of net substitute goods in Quintile 1, 4 and 5, whereby 1% increase of the price in "housing" causes the rise of the demand in "housing utensils" by 0. 4%, 0. 7% and 1. 2%. The cross-price elasticity increases as disposable income rises. "Housing utensils" and "medical" is also a pair of net substitute goods in Quintile 4 and 5. 1% increase of the price in "medical" cause the rise in the demand of "housing utensils" by 0. 8% and 1. 5% in each respective income group. "Housing utensils" and "education and culture" is a pair of complementary goods in all income groups except Quintile 2. 1% increase of the price in "education and culture" reduces the demand of "housing utensils" by 1. 1%, 0. 4%, 1. 6% and 3. 0% in Quintile 1, 3, 4 and 5. Moreover, the cross-price elasticity becomes more elastic as the disposable income increases. "Housing utensils" and "other expenditure" is a pair of substitute goods across all income groups. 1% increase of the price in "other expenditure" increases the demand of "housing utensils" by 1. 7%, 2. 4%, 1. 7%, 2. 6% and 2. 1% in each respective income group.

"Housing" and "food" is a pair of net complementary goods in Quintile 1 and 2 but they are net substitute goods in Quintile 3, 4 and 5. 1% increase of the price in "food" reduces the demand of "housing" by 1. 7% and 4. 1% in Quintile 1 and 2, respectively, but it increases the demand by 0. 5%, 2. 3% and 1. 7% for the higher income groups. "Housing" and "clothing" is a pair of net complementary goods in Quintile 1 but it is a net substitute goods in Quintile 5. 1% increase of the price in "clothing" reduces the demand of "housing" by 2. 8% in Quintile 1 but it raises the demand of "housing" by 0. 5%. "Housing" and "housing utensils" is a pair of net substitute goods in Quintile 1 and 3 but they are net complementary goods in Quintile 4 and 5. For the former, 1% increase in "housing utensils" raises the demand of "housing" by 0. 3% and 0. 7% in Quintile 1 and 3, respectively. Conversely, for the latter, it reduces the demand by 0. 3% and 0. 8%, respectively, for the latter. "Housing" and "medical" is a pair of substitute goods in Quintile 1, 3, 4 and 5. 1% of price hike in "medical" raises the demand of "housing" by 1. 0%, 0. 7%, 2. 3% and 2. 8%, respectively. "Housing" and "transportation and communication" is a pair of net substitute goods in Quintile 5, whereby 1% increase of the price in "transportation and communicated" increases the demand of "housing" by 0. 5%. "Housing" and "education and culture" is a pair of net substitute goods in Quintile 1 and 2 but they are net complementary goods in Quintile 4 and 5. 1% increase of the price in "education and culture" raises 4. 1% and 1. 1% in Quintile 1 and 2, respectively, but it reduces by 4. 6% and 5. 5% in Quintile 4 and 5, respectively.

"Housing" and "other expenditure" is a pair of net substitute goods in Quintile 1, 2 and 3 but they are net complementary goods in Quintile 4 and 5. 1% increase of the price in "other expenditure" raises the demand of "housing" by 3. 2%, 1. 0% and 0. 4% in Quintile 1, 2 and 3, respectively. Conversely, similar magnitude of price change in "other expenditure" causes the demand of "housing" to reduce by 0. 4% and 0. 1% in Quintile 4 and 5, respectively.

"Medical" and "food" is a pair of net complementary goods in Quintile 1, 2 , 3 and 5 but they are net substitute goods in Quintile 4. 1% increase of the price in "food" decreases the demand of "medical" by 5. 9%, 3. 9%, 3. 3% and 0. 1% in Quintile 1, 2, 3 and 5, respectively. Conversely, similar magnitude causes the demand of "medical" to increase by 2. 4% in Quintile 4. "Medical" and "clothing" is a pair of net complementary goods in Quintile 1 and 2. 1% increase of the price in "clothing" reduces the demand of "medical" by 1. 4% and 0. 3%, respectively. "Medical" and "housing utensils" is a pair of net complementary goods for all income groups. 1% increase of the price in "housing utensils" reduces the demand of "medical" by 1. 7%, 1. 7%, 1. 8%, 2. 2% and 1. 8% in each quintile, respectively. "Medical" and "housing" is a pair of net complementary goods in Quintile 1 and 2 but they are net substitute goods in Quintile 4 and 5. 1% increase of the price in "housing" decreases the demand of "medical" by 0. 4% in Quintile 1 and 2. On the contrary, the demand of "medical" increases by 0. 5% in Quintile 4 and 5. "Medical" and "transportation and communication" is a pair of substitute goods in Quintile 2 and 5. 1% increase of the price in "transportation and communication" raises the demand of "medical" by 0. 7% and 0. 8% in each correspondent quintile. "Medical" and "education and culture" is a pair of net substitute goods in Quintile 1 and 2, whereby 1% increase in the price of "education and culture" raises the demand of "medical" by 1. 3% and 0. 4%. Conversely, the pair is net complementary goods in Quintile 4 and 5, whereby the demand of "medical" reduces by 1. 4% and 2. 2% in each respective quintile by 1% increase in "education and culture." "Medical" and "other expenditure" is a pair of net substitute goods across all income groups. 1% increase in the price of "other expenditure" reduces the demand of "medical" by 7. 6%, 5. 7%, 4. 1%, 2. 0% and 2. 0% in the respective income group. It is worth noting that the cross-price elasticity of this pair of goods decreases as the disposable income increases.

"Transportation and communication" and "food" is a pair of net substitute goods across all income groups. Moreover, the cross-price elasticity of this pair of goods is highly elastics. 1% increase of "food" raises the demand of "transportation and communication" by 1. 2%, 2. 3%, 2. 6%, 2. 4% and 1. 8% in each respective quintile. Similarly, "transportation and communication" and "housing utensils" is also a pair of net substitute goods, but their cross-price elasticity is not elastic in lower income groups. 1% increase of "housing utensils" raises the demand of "transportation and communication" by 0. 9%, 0. 3%, 0. 4%, 2. 2% and 2. 3% in the respective quintile. "Transportation and communication" and "housing" is a pair of

net complementary goods in Quintile 3, 4 and 5. 1% increase in the price of "housing" causes the demand in "transportation and communication" to shrink by 0. 5%, 0. 6% and 1. 2% in each correspondent quintile. " Transportation and communication" and "medical" is a pair of net complement goods in Quintile 4 and 5. 1% increase in the price of "medical" reduces the demand of "transportation and communication" by 0. 8% and 2. 1% in those two income groups. "Transportation and communication" and "education and culture" is a pair of net substitute goods in Quintile 4 and 5. 1% increase of "education and culture" raises the demand of "transportation and communication" by 1. 6% and 4. 0% in those two income groups. " Transportation and communication" and "other expenditure" is a pair of net complementary goods in Quintile 1, 2, 4 and 5. In each income group, 1% increase of "other expenditure" reduces the demand of "transportation and communication" by 2. 1%, 2. 7%, 4. 7% and 4. 1%. Conversely, the pair is a net substitute goods in Quintile 3, whereby similar price change increases the demand by 4. 1%. In either cases, their elasticities are high.

"Education" and "food" is a pair of net substitute goods in Quintile 1 and 2 but they are net complementary goods in Quintile 3, 4 and 5. 1% increase in "food" raises the demand of "education and culture" by 2. 7% and 0. 5% in Quintile 1 and 2, respectively., Conversely, similar price change causes the demand of "education and culture" to shrink by 1. 5%, 4. 7% and 3. 8% in other respective income groups. "Education and culture" and "clothing" is a pair of complementary goods in Quintile 5, whereby 1% increase of "clothing" reduces the demand of "education and culture" by 0. 8%. "Education and culture" and "housing utensils" is a pair of net substitute goods in Quintile 1 but they are net complementary goods in other income groups. 1% increase of "housing utensils" raises the demand of "education and culture" by 0. 5%, whereas similar price change causes the demand to shrink by 0. 5%, 0. 6%, 0. 6% and 0. 7% in each correspondent income group. "Education and culture" and "housing" is a pair of net complementary goods in Quintile 1, 4 and 5. 1% increase in the price of "housing" reduces the demand of "education and culture" by 0. 2%, 1. 8% and 0. 7% in each respective quintile. "Education and culture" and "medical" is a pair of net complementary goods, whereby 1% increase in the price of "medical" reduces the demand of "education and culture" by 0. 5%, 1. 8% and 2. 8% in each correspondent income group. " Education and culture" and " transportation and communication" is a pair of net complementary goods in Quintile 2 and 5, whereby 1% increase in the price of "transportation and communication" reduces the demand of " "education and culture" by 1. 0% and 0. 1% in each correspondent income group. "Education and culture" and "other expenditure" is a pair of net complementary goods in Quintile 1 but they are net substitute goods in Quintile 3, 4 and 5. 1% increase in "other expenditure" reduces the demand of "education and culture" by 3. 1% in Quintile 1. Conversely, similar change of prices raises the demand by 2. 1%, 5. 3% and 4. 3% in each correspondent income group. In any one of these pairs, the

cross-price elasticity is high.

"Other expenditure" and "food" is a pair of net complementary goods in Quintile 1, whereby 1% increase in the price of "food" reduces the demand of "other expenditure" by 0. 5%. "Other expenditure" and "housing utensils" is a pair of net substitute goods in Quintile 1, 2. 3 and 4, whereby 1% increase in the price of "housing utensils" raises the demand of "other expenditure" by 0. 3%, 0. 4%, 0. 6% and 0. 4% in each correspondent income group. "Other expenditure" and "housing" is a pair of net substitute goods in Quintile 3, 4 and 5, whereby 1% increase in the price of "housing" raises the demand of "other expenditure" by 0. 6%, 0. 8% and 0. 5% in each correspondent income group. "Other expenditure" and "medical" is a pair of net substitute goods in Quintile 3, 4 and 5, whereby 1% increase in the price of "medical" raises the demand of "other expenditure" by 0. 8%, 0. 9% and 1. 1% in each correspondent income group. "Other expenditure" and "transportation and communication" is a pair of net substitute goods in Quintile 2 and 5, whereby 1% increase in the price of "transportation and communication" raises the demand of "other expenditure" by 0. 5% and 0. 9% in each correspondent income group. "Other expenditure" and "education and culture" is a pair of net substitute goods in Quintile 1 and 2, but they are net complementary goods in Quintile 3, 4 and 5. 1% increase in "education and culture" raises the demand of "other expenditure" by 0. 6% and 0. 3%, whereas similar price changes reduces the demand by 1. 1%, 1. 7% and 1. 7% in each correspondent income group.

5. Conclusion

This empirical analysis has focused on three aspects of consumption expenditure in Chinese urban areas. Firstly, the study has estimated the time series aggregated data on household disposable income and consumption expenditure on eight major items from 1992 to 2012. Secondly, the study used a cross-sectional data collected from a questionnaire survey conducted in BSTQwith regard to disposable income and consumption expenditure in eight major items. This data set is made of 1, 485 respondents from these four cities. Thirdly, the empirical analysis was extended to five income groups created from QSR. The estimations were conducted by three methods. Using ordinary least squared method, this study estimated the MPC for the time series aggregated data and cross-sectional QSR both for the whole sample and in five income groups (quintile). APC for these two data sets were also computed. This study conducted an analysis on "seemingly unrelated regression (SUR)" for the time series aggregated data based on the model specification of Deaton-Muelbauer (1980). Finally, a multivariate regression analysis was extended to QSR both for the whole sample and its quintiles. The analytical findings reveal the following characteristics regarding the consumer behaviors in Chinese urban areas in general and the respondents in the four major cities vis-à-vis their stratum

of disposable income in particular.

The APC in Chinese urban areas is about 77% which is about 12% higher than the mean APC among the respondents from BSTQ. The second quintile of the QSR is about 80% which is about 3% higher than that of the urban areas. Furthermore, that value becomes smaller in higher income groups of the QSR. It is reasonable to explain that the respondents in Quintile 1 have a lower disposal income than the average Chinese city dwellers. From the estimated MPC, its value in Chinese urban areas is about 0. 59, whereas that of QSR is about 0. 20. Among the income groups of QSR, Quintile 2 has the highest MPC of 0. 66. Also, the estimated value of MPC becomes smaller as the disposable income rises in QSR. In this regard, in order to stimulate domestic private consumption in China, policy interventions in higher income groups, preferably targeting at disposable income higher than 67, 000RMB are desirable.

The estimated results of income elasticity of demand reveal that "food," "clothing," "housing utensils," "education and culture" and "other expenditure" are necessity goods in Chinese urban areas. On the other hand, "food," "housing" and "medical" are necessity goods in BSTQ. Although "transportation and communication" is a luxury good in Chinese urban areas, "clothing," "housing utensils," transportation and communication," "education and culture" and "other expenditure" are luxury goods in BSTQ. Also, it is interesting to note that "transportation and communication" is a luxury goods across all income groups in QSR. "Education and culture" is a necessity good in Chinese urban areas but it is a luxury good in Quintile 3 and 5 in QSR. Notwithstanding that the provision of education is free from primary school to junior high school level, the respondents with disposable income higher than 67, 000RMB in QSR seem to emphasize on the quality of education of their children (mean age of QSR is 38. 3). "Housing" is a necessity good in QSR as a whole and in Quintile 3 and 5 but it is a luxury good for Quintile 1 and 2. The difference can be alluded to the affordability based on the level of disposable income. In this regard, policy for the provision of affordable housing in Chinese urban areas will need to focus on disposable income level of less than 67, 000RMB. "Medical" is a necessity group for Chinese urban areas and BSTQ. However, with regard to income groups in QSR, it is a luxury good for respondents in Quintile 1. It is plausible to explain the reason for this stark difference is that the disposable income level of 26, 000-48, 000RMB is not high enough to pay for adequate attention on medical and health services. Although the provision in medical and health services in China but it remains as a luxury item for the people in lower income group.

Regarding the compensated own-price elasticity of demand in lower income groups, the results show that demand of "food," "clothing" and "medical" is influenced positively by the changes in prices. It is worth noting that the rise in disposable income has a negative influence on "housing" in QSR as a whole and in Quintile 1 and 2 but it has a positive influenced for higher disposable income in

Quintile 4 and 5. Similarly to the latter, the demand for "medical" and "education and culture" also positively correlated to the rise of disposable income particularly for disposable income above 92, 000RMB. Cross-price elasticity of demand of one expenditure item with another changes accordingly with the level of disposable income. A pair of net complementary goods changes to a pair of net substitute goods (e. g., "clothing and "housing," "housing" and "food"). Additionally this shift is also apparent with the rise of disposable income (e. g., "medical" and "housing"). The reverse, viz., the shift from a pair of net substitute goods to a pair of net complementary goods also occur (e. g., "housing" and "education, "education" and "food) when the disposable income increased.

The study has confined its analysis to compensated elasticity of demand in terms of net complementary and net substitute goods among the expenditure items with respect to the changes in their prices. The estimations could have been extended to examine the Marshallian elasticity of demand by using Slustky equation and t-tests for the computed results. It is expected that this extension helps to categorize the expenditure items into types of goods such as normal goods, inferior goods or Giffen goods by comparing the substitution effect and income effect of the Slustky Equation. We would like to take this aspect into the analytical consideration in our future study on similar subject.

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