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An Empirical Research of Consumer Behavior in Urban China

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DEDICATION

To my parents, Reitaku University, and to all the taxpayers of Japan

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Chapter 1 Introduction

1-1. Defining the problem

Since initiating market reforms in 1978, China has shifted from a centrally planned to a market based economy that consequently has brought about rapid economic and social development. From 1978 to 2013, the gross domestic product (GDP) growth rate of 10% a year has elevated China to the world's second largest economy in a nominal term, and the world's largest economy by purchasing power parity according to the International Monetary Fund (IMF). For more than 30 years the gross national income per capita in PPP (in current international dollar) has grown from $190 in 1978 to $11,850 in 2013. Equally impressive, the long-term economic growth has lifted more than 500 million people out of poverty. It is also worth noting that the social and economic progress caused tremendous changes in people`s consuming lives.

At the same time, China’s rapid urbanization has also gone hand-in-hand with its extraordinary economic development. As a result, a large scale of population moved from countryside to cities in the last three decades. Rural-urban migration and urbanization have caused changes in consumption patterns in China. The total population in China was last recorded at 1,367.8 million people in 2014 from 552.0 million in 1950, a rise of 1.5 times during the last 50 years. And along with the population’s growth, China’s urbanization over the last three decades has undergone an unprecedented expansion, and as a consequence, 250 million people have migrated to cities from rural areas. By the end of 2014, 54.7% of the total population lived in urban areas, a rate that rose from 26% in 1990. In the aggregate term in 2010 prices, household consumption expenditures in urban areas increased from 1,596 billion

RMB in 1990 to 22,880 billion RMB in 2013, expanded more than 14 times in less than 25 years. Such phenomenon suggests the rise of urban population has indeed stimulated the growth of private consumption. China's economy will continue to expand but at a relatively lower growth rate over the next few years. However, this slowdown will not affect the ongoing urbanization, instead the potential to stimulate more private consumption and investment demand is quite high. Moreover, China's urbanization rate is still lower than those in developed nations, e.g., 82% in U.S. and 91.3% in Japan. China plans to achieve a 67% rate by 2030, which means urban population will increase by 280 million people in the next 15 years. With the rising trend of urbanization rate, the living standard of urban people in terms of disposal income and level of household consumption expenditure will continue to rise and hence the share of middle class citizens in total population will certainly expand. The rise of living standards in urban areas will undoubtedly influence the transformation of socioeconomic landscapes, which as a consequence further fuel private consumption or personal consumption expenditure.

In aggregate level, the scale of household consumption expenditures has grown remarkably in China over the past two decades. It grew around 8% a year in 2000s and it has risen to around 10% in the past few years. In 2013, it amounted to about USD3.3 trillion, which is almost as large as Germany`s GDP. Equally noteworthy, the pace of expansion of private consumption expenditures is faster than most other countries, with China’s real annual household consumption expenditure growth on average 3% higher than other emerging economies in Asia and 6% higher than the advanced countries in average. Even during the period of recovery from world financial crisis triggered by Lehman Shock, China has maintained a strong momentum in household demand due to the economic stimulus package worth 4 trillion RMB in 2008-09. From 2008 to 2012, China sustained real private consumption growth averaging more than 9%, while India turned in 7% and Brazil was less

than 5%, according to the data from the Economist Intelligence Unit and the World Bank. While the developed economies, including the United States and Japan, just grew near 1%. Between 2008 and 2012, China was one of the few countries that has achieved higher consumption growth rate than its average growth rate in 2003-12. Notwithstanding, the extraordinary huge stimulus package also has exerted negative impact on the economy. The most notable adverse results were property or real estate bubbles and rising food prices.

Despite the persistent growth, the share of household consumption expenditure in China's GDP has declined. For many years this trend was fairly gradual, with the household consumption expenditure ratio falling from 52% of GDP in the early 1980s to 46% of GDP by the end of the 1990s. However, the pace of the decline picked up noticeably in the 2000s, with the household consumption expenditure ratio measured at 34.1% of GDP in 2013, according to the World Bank. In contrast, the household consumption expenditure ratio in other emerging Asian economies has typically remained at around 55-60% of GDP. This unbalanced economic phenomenon of relatively low-household consumption expenditure led to frequent criticism from economists. However, some observers contend that China's low proportion of household consumption expenditure is reasonable. Their claim is based on the fact that two crucial drivers of economic growth, viz., investment and net exports, grew more rapidly in the past. This gap between private final consumption and that of all other spending has caused the reduction in the household consumption expenditure ratio. At the same time, low private final consumption rate implies high national saving rate, which has caused an unusual distorted balance between saving and investment. For this reason, many critics are insisting that Chinese government ought to stimulate more private consumption to drive growth instead of continuously pushing growth with unproductive investments.

Undeniably, there is an abundance of opportunities for stimulating a higher level of private consumption in China. Since its economic take off, China's saving rate also escalated

dramatically. Presently, China has a higher national saving rate than developed countries and many middle-income countries. Especially Chinese household savings have elevated from 15% of household disposal income in 1990 to 31% in 2014, about 7 times higher than that of the US and 4.5 times of Korea. Even comparing with other emerging countries, e.g. India, it is about 22% higher in 2013. Against this backdrop, in the same view as its critics, Chinese government has embarked on a plan to promote a “long-term mechanism for increasing consumer demand” as one of the key strategies to shift from investment- and export-led growth to domestic consumption-led growth model.

By the way, the private consumption market of China has attracted serious attention from a wide spectrum of international enterprises that provide products or services ranging from low value-added to luxurious brands. Following the long period of successive economic growth China has become “a factory in the world" because of its low-wage costs. However, China is transforming to become the world largest consumption market because of its enormous mass of middle-class consumers. China has undoubtedly shifted to the fifth stage—"age of high mass consumption”—according to the Rostow’s (1962) theory of "five stages of growth.” In the observed reality, some new variations and trends have been emerging in the pattern of consumer buying behaviors related to durable and nondurable goods, necessity and luxury goods, and services. In addition, the rise of disposable income per capita and the influence of the vibrant social economic environment have caused the diversification in people’s interests in consumption.

In order to penetrate into the masses of middle-class consumers, many companies both foreign and domestic have undertaken a variety of marketing researches. Most studies have attempted to explain the consumer`s buying behaviors through analyzing product marketing strategies that cover the elements from psychology, sociology, social anthropology, and to a lesser extend economics. Some studies attempt to understand how emotions influence the

decision-making processes of buyers, both individually and as groups. Some studies characterize consumers in various demographics and behavioral variables in order to understand people's desire to buy. There are studies that focus on how an individual's buying behaviors exert influences to social economy. They also try to assess influences on groups such as families, friends, reference groups, and the society in general. In addition, some analyses highlight how the relationship among consumption, production, investment, income and saving deposits affect the national economy. Notwithstanding the bulk of well documented survey reports, there is limited literature on empirical analysis of consumer behavior based on microeconomics perspectives of consumer demand theory, by which income elasticity of demand, own-price elasticity of demand, cross-price elasticity of demand could be estimated in order to discern income effect and the substitution effect to explain how a household or an individual spends his or her income on goods and services that satisfies his or her needs.

1-2. Research objective

In the context of the aforementioned research background, this empirical study aims to analyze how the consumer in Chinese urban areas behave in response to changes in prices of goods and services as well as changes in his or her disposal income. For this purpose, this empirical analysis focus on eight categories of goods and services—as determined by the formal household survey conducted by National Bureau of Statistics of China—that constitute household (or individual) consumption expenditure in urban China. Moreover, the econometric analyses of this inquiry focus on the estimation of income elasticity of demand, own-price elasticity of demand and cross-price elasticity of demand for each category of household consumption expenditures. From the empirical findings, this study intends to provide explanations on household's or individual's preferences on different consumption

expenditure items. Furthermore, from the perspective of consumer demand theory, the findings can help to shed light on how to influence the consumer behavior in the future when income and prices changes. Overall, this study expects to reveal characteristic trends of choices and preferences in household or individual consumption expenditure, and expound the economic reasons and other relevant factors causing these trends in China.

1-3. Definition of urban China

According to National Bureau of Statistics of China, the government specifies the administrative areas into the following categories: "firstly, the whole country is divided into provinces, autonomous regions and municipalities directly under the Central Government (Beijing, Chongqing, Shanghai and Tianjin); secondly, provinces and autonomous regions are further divided into autonomous prefectures, counties, autonomous counties and cities; thirdly autonomous prefectures are further divided into counties, autonomous counties and cities; fourthly, counties and autonomous counties are further divided into township, ethnic townships and towns; and finally, municipalities directly under the Central Government and large cities are divided into districts and counties."

Accordingly, in 2013, the number of divisions that is defined as urban China by the administrative law in China is as follow. There are 332 regions at prefecture level constituting 286 cities at prefecture level. Additionally, there are 2,853 regions at county level where there are further divided into 872 districts under the jurisdiction of cities, 368 cities at country level, 1,442 counties, and 177 autonomous counties. This study uses this definition as its coverage for urban China. On the other hand, rural areas in China comprise 40,497 regions at townships level, whereby there are made up of 19,683 towns and 13,587 townlets[1]. As of 2013, there are

[1] Town in Chinese pinyin is *zhen* whereas townlet is *xiang*.

about 731 million (53.7%) inhabitants in urban China but approximately 630 million people live in rural China (46.3%).

1-4. Research method

The analytical framework of this empirical inquiry is based on the Almost Ideal Demand System (AIDS) promoted by Deaton and Muellbauer (1980). Chapter 4 discusses the formulation of the analytical framework. Essentially this study conducts three types of econometric analysis for estimating income elasticity of demand, own-price elasticity of demand, and cross-price elasticity of demand. Firstly, the study conducts a "seemingly unrelated regression (SUR)" method for estimating a time series aggregated data of disposable income and household consumption expenditure of Chinese urban areas from 1992 to 2012. Secondly, the study used a multivariate regression method for estimating a data set of individual disposal income and individual consumption expenditure collected from a questionnaire survey conducted in Beijing, Shanghai, Tianjin and Qingdao (BSTQ). Thirdly, the study estimates a time series cross sectional panel data set comprises household disposal income and household consumption expenditure in Changchun city. This estimation is based on the first-order autoregressive model [AR(1)] for panel data with fixed effects. Each econometric analysis focuses on household or individual disposal income and eight categories of household or individual consumption expenditure comprises eight major expenditure items, viz., "food," "clothing," "housing utensils," "housing," "medical," "transportation and communication," "education and culture," and "other expenditures.[2]"

[2] Throughout this dissertation, the term "medical" includes health related goods/services, and the term "education, culture and recreation" is also expressed as "education" or "education and culture."

1-5. Thesis structure

This thesis is made up of seven chapters. Chapter 1 defines the problem, objective and research method. Chapter 2 provides a concise review of the relevant literature pertains to this empirical inquiry. Chapter 3 conducts a general study on the expansion of household consumption expenditure in China based on a viewpoint of the aggregate economy, the income differentials and the consequent consumption disparities between urban and rural areas in China. Chapter 4 explains the formulation of the analytical framework. Chapter 5 discusses the analyses of a time series aggregate data set of Chinses urban area from 1992 to 2012, and questionnaire survey data from BSTQ. Chapter 6 carries out a panel data analysis of Changchun's household survey data set from January 2009 to December 2012. The last chapter discusses the conclusion derived from the empirical findings.

Chapter 2 Literature Review

In microeconomics, the purpose of analyzing consumer behavior is to discern how an individual, under a budget constraint, maximizes his/her utility in purchasing goods or services with a given set of preferences, the price of the good to be purchased, and prices of related goods that would affect his/her decision making of purchasing that good. In a simplified form, given a set of preferences, an individual faces two choices of good, viz. x_1 and x_2, and the price of each respective good is p_1 and p_2. The budget constraint is $Y = p_x x_1 + p_2 x_2$, and the utility function is $U = U(x_1, x_2)$. Under these conditions, the consumer's optimization behavior is to maximizing *U* subject to the budget constraint of *Y*. In this formulation, the concern is focused on how changes in p_1 and p_2 affect the changes of demand in (x_1, x_2). Put differently, the underlying interest in the consumer demand theory is to examine how a consumer makes choices from a variety of goods or services that maximizes his or her utility within the limit of his or her disposable income.

The study of consumer demand theory was formalized in the middle of 19th Century. The microeconomic theoretical analysis of the consumer behavior is rooted in the concept of utility. Marginalism pioneered by Jevons (1871), Menger and Walras established the theoretical foundation for the development of consumer demand theory (Moscati 2007). Their seminal works had stimulated a huge volume of studies in improving the analytical framework for consumer demand theory. Edgeworth expanded the basic framework formulated by Jevons and others in his attempt to create the general utility function, and consequently he invented the indifference curve (Newman 2003). Later on, Marshall (1890) formulates the demand theory without adapting a general utility function. He also introduces the concept of Giffen goods

(Marshall 2014). Hicks developed a demand function that postulates how a consumer minimizes his or her expenditure while maintaining a fixed level of utility (Hicks 1975). Subsequently, Slutsky developed the framework that explains the change in demand for a good caused by a price change is the result of a substitution effect and an income effect, which eloquently incorporated Marshall's and Hick's theory of demand (Moscati, 2007).

Later on, because of the advancement in computing power, a huge volume of literature based on empirical analyses of consumer demand theory has been documented. The empirical studies have, on one hand, helped to enhance the prediction power of the theoretical framework of consumer demand theory, and on the other hand, they have also strengthened the understanding of how the consumers maximize their utilities by choosing their goods and services with respect to the changes in prices and income.

In the macroeconomics front, the analysis of private consumption is also an important subject. This subject focuses on the aggregated consumption expenditure function, initially propounded by Keynes, which explains the consumer spending (Keynes 2013). Keynes hypothesizes the consumer spending based on absolute income. This hypothesis asserts that consumption is solely influenced by current disposable income. Notwithstanding its simplicity and power, the absolute income hypothesis was questionable for consumption over a long period of time. Dussenbery (1947) argues that long run consumption is not based on the absolute income but rather it is affected by other individual's income. This is known as relative income hypothesis. However, Friedman (1957) refutes Dussenbery's theory and he asserts that individual's consumption is neither based on the absolute nor the relative income. Instead, he shows that consumption—short term and long term—is determined by the expected future income. He demonstrates that an individual's total income is made up from permanent income and transitory income. The former is the mean income derives from the long-term expected future income, whereas the latter is an income earns from an unexpected source. As such, he

expounds that individual's consumption fundamentally relies on the permanent income. These economics theories of consumption have established the foundation for other theories such as life cycle hypothesis, random walk model of consumption, which have stimulated a large bulk of empirical studies.

The purpose of this chapter is to review literature pertain to the analysis of consumer behaviors. The review is organized as follows. Section 1 discusses the role of utility and two typical functions, viz., cardinal utility and ordinal utility. Section 2 and Section 3 examines Engle curve and Slutsky equation, respectively, in order to understand consumer responses to changes in income. Section 4 illustrates the difference between Marshallian and Hicksian demand functions. Section 5 reviews the demand system from their empirical analytical perspectives. For this purpose, four major models, viz., Stone model, Geary-Stone utility function and the linear expenditure system, the Rotterdam demand system and Almost Ideal Demand System (AIDS) are discussed. Section 6 attempts to highlight the strengths and witnesses of several theories that postulate consumption behaviors at aggregate level. Section 7 provides a concise assessment of other relevant studies that bear relevancy to this empirical inquiry. The last section summarizes this chapter.

2-1. Utility, indifference curves and consumer equilibrium

The consumer demand theory postulates that a rational consumer make choices from a variety of goods or services that maximizes his or her utility within the limit of disposable income. In the early stage of this theory, the pioneers maintain that a commodity (or a good/service) carries an economic value that is derived from the marginal utility of the consumers (Jevons 1871). Built upon Jevons' concept of utility, Edgeworth formulated the concept of indifference curves (Newman 2003).

Take two commodities, x_1 and x_2 as an example, an indifference curve demonstrates that any combination of these two commodities along the curve gives similar utility to the consumer. Furthermore, a higher indifference curves gives a higher utility and thus any combination of the two commodities (i.e., x_1 and x_2) in a higher indifference curve give a higher utility than any combination in a lower curve. Consumer equilibrium is achieved when a consumer's indifference curve (i.e., utility) is tangent to his or her income (or budget) line that is the total cost of consuming the commodities. In the case of two commodities the income line is in the form of $Y = p_1x_1 + p_2x_2$.

Using the concept of indifference curves, Edgeworth attempted to establish a general utility function but he did not succeed with more than two commodities. This is because the general utility function contradicted the law of demand[3], i.e., it can turn out to be an upward sloping curve instead of a downward sloping one with respect to price and quantity. As such, the indifference curve can either be convex or concave[4]. But in reality the consumer buys a commodity or a set of commodities only in positive quantities. In this manner, the consumer can achieve a higher utility by moving to a higher indifference curve. Hence the concave indifference curve has to be discarded in this kind of constrained optimization. Also, the condition for the utility function has to be convex in order to satisfy the first order derivative[5]. This also implies that the consumer has a diminishing marginal rate of substitution, which is the trade off between commodity X and commodity Y at the same level of utility. By and large, an utility function can be treated as either cardinal or ordinal, depending on whether they are interpreted as providing more information (such as information on the strength of preferences)

[3] Additive separable function, as introduced by Jevons (1871), warrants a downward sloping demand curve that is consistent with the law of demand because its first derivative is positive whereas its second derivative is negative. A general utility function losses these conditions.

[4] A convex indifference curve is a shape curving inwards to the origin, whereas a concave is curving outwards from the origin.

[5] This limitation was rectified by the introduction of the concept of ordinal utility.

than simply rank the order of preferences over bundles of goods. These are discussed in subsequent sections.

(1) Cardinal utility

In economics, utility is a measure of preferences over some sets of goods and services. The concept is one of the important underpinnings of *homo economics*. Jevons (1871) explained that utility is a cardinal function of the quantity being consumed, and the marginal utility is derived by the differentiation of utility function with respect to the commodity being consumed. Moreover, they assume that marginal utility (i.e., the first order derivative) is a positive but the second order derivative is a decreasing function. Equally importantly, the utility function is assumed to be additively separable[6] so that the marginal utility of a commodity depends on the quantity that has been consumed but it also assumes that marginal utility diminishes if the quantity consumed increases.

Since Jevons and others had introduced the concept, cardinal utility had been widely used to explain the consumer's demand for a product based on its price. The law of demand—the inverse relationship between the quantity demanded and its prices—was established from this concept. Cardinal utility defines that utility is measurable and quantifiable. Hence a consumer can express the utility receives from a good in cardinal term. More specifically, a consumer can rank the level of utility of different goods. For instance, if the utility received from good A is one unit but the utility from good B is two units, then the utility from good B is higher than that from good A. In other words, if good B is preferred to good A then the utility derives from good B is higher than that of good A. As such, cardinal utility provides information regarding preferences among a set of goods.

[6] Additive separable function is expressed as: $U(x_{1,}\, x_2) = U_1(x_1) + U_2(x_2)$

Cardinal utility function or scale is a utility index that preserves preference orderings uniquely up to positive affine transformations. Two utility indices are related by an affine transformation if for the value $u(x_i)$ of one index u, occurring at any quantity x_i of the goods bundle being evaluated, the corresponding value $v(x_i)$ of the other index v satisfies a relationship of the form as shown in equation (2-1) , where "b" is a constant .

$$v(x_i) = au(x_i) + b \tag{2-1}$$

Thus the utility function is generally being presented by equation (2-2).

$$v(x) = au(x) + b \tag{2-2}$$

Because of the assumption of measurable and quantifiable, cardinal utility can be expressed in cardinal numbers such as 1, 2, 3, 4 and so on. However, in observed reality, utility is neither measurable nor quantifiable in such a way. Instead, utility itself is a subjective scale that can not be quantified. More critically, in the words of Moscati (2007): "*It is not at all clear what the values that the function u(x) associates to the commodity quantities x mean, how these values could be measured or least of all, what the unit of measure of utility is.*" This limitation has encouraged studies that led to the adoption of ordinal utility concept.

(2) Ordinal utility

Ordinal utility theory states that while the utility of a particular good or a service cannot be measured using a numerical scale bearing economic meaning in and of itself, pairs of alternative bundles (combinations) of goods can be in the orderly manner such that one preference is considered by an individual to be worse than, equal to, or better than the other. The ordinal utility concept was first introduced by Pareto in 1906 (Wood and McLure 1999). Pareto introduced cardinal utility using an index function. Specifically, let (x, y, z,…) be the set of quantities consumed. Then the indifference curves can be expressed in the form of $g = g(x, y, z, \ldots\ldots)$. Then g is defined by the consumption pattern $(x_2, y_2, z_2 \ldots)$ is preferred

to $(x_1, y_1, z_1 \ldots)$ so that $g_2 > g_1$. Under this specification, any increasing function of g, which can be defined as $F = F(g)$ also satifies this condition, hence g is ordinal utility. Furthermore, the partial derivatives of this function are positive if the consumer prefers more quantities[7]. Notwithstanding the importance of ordinal utility concept, Pareto contradicted himself of his criticisms on cardinal utility when he considered marginal utility is diminishing (i.e, the derivative of marginal utility is negative) with more quantity consumed. This problem was later resolved by Eugene Slutsky.

2-2. Engel curve

The slope of the demand function is negative, and this property establishes the law of demand. This law states that the rise in relative prices of all kinds of commodities causes the consumption quantity to decrease, *ceteris paribus*. Furthermore, the law of demand provides a crucial relationship between income and total consumption expenditure. In other words, changes in income inevitably cause total consumption expenditure in all commodities to change in the same magnitude as the change in income. Engel curve explains the relationship between consumption and income. This relationship postulates a consistent pattern of consumption expenditure, viz., when the disposable income increases then the share of disposable income spent on food decreases whereas the share of luxurious goods increases (Cai and Moneta 2010).

Graphically, the Engel curve is represented in the first-quadrant of the Cartesian coordinate system. Income is shown on the Y-axis and the quantity demanded for the selected good or service is shown on the X-axis. The shapes of Engel curves depend on many demographic variables and other consumer characteristics. For any given commodity, the Engel curve reflects its income elasticity and indicates whether the good is an inferior, normal,

[7] F is a monotonically increasing utility function.

or luxury good. Empirical Engel curves are close to linear for some goods, and highly nonlinear for others. For normal goods, the Engel curve has a positive gradient. That is, as income increases, the quantity demanded increases. Amongst normal goods, there are two possibilities. Although the Engel curve remains upward sloping in both cases, it bends toward the Y-axis for necessities and towards the X-axis for luxury goods. For inferior goods, the Engel curve has a negative gradient. That means as the consumer has more income, he/she will buy less of the inferior good because he/she are able to purchase better goods. Many Engel curves feature saturation properties in that their slope tends toward infinity at high income levels, which suggests that there exists an absolute limit on how much expenditure on a good will rise as household income increases. This saturation property has been linked to slowdowns in the growth of demand for some sectors in the economy, causing major changes in an economy's sectoral composition to take place.

The empirical estimation of Engel curves can be performed in many ways. Prais and Houthakker (1971) wrote a comprehensive review and performed estimations of the following forms; linear, hyperbolic, semi logarithmic, double logarithmic, and logarithmic reciprocal. All these forms were shown to have some advantages over the other forms for some of the goods or for part of the range of the relationship. A major concern in the estimation of Engel curves is that the functional form used should be consistent with observed consumer behavior. Prais and Houthakker (1971) concluded that the widely used double logarithmic and the semi-logarithmic forms performed better than the others in terms of goodness of fit (e.g., the latter is expressed as $q_i = a + b\,log\ y_i$).

The choice of the functional form should not only be based on practical criteria of goodness of fit, but also on principles of demand theory. One of these principles in particular, the adding-up condition is violated by all the forms listed above including the semi-logarithmic. Adding-up requires that consumers do not spend more than their income.

This principle places some restrictions on the demand elasticity of each goods, known as Engel's and Cournot's equations. Simply put, these equations state that changes in income and prices cause changes in the composition of the budget constraint but leave its value unchanged.

One functional form that satisfies adding-up, and that is able to the consumer behavior closely. This idea was originally proposed by Working (1943), but later elaborated by Leser (1963), and popularized by Deaton and Muellbauer (1980). This form is known as the Working-Leser function, and relates the commodity budget shares to the logarithm of per capita expenditure, i.e., $w_i = a + b_i \ln y_i$ .This form satisfies the adding-up condition if the sum of the parameters w_i estimated over all commodities in the household budget was equal to one, and that the sum of the parameters b_i was equal to zero. It allows for luxury, necessity and inferior goods, and for elasticities to vary with income. Finally, the form is linear in the logarithm of expenditure, and is easily estimated by ordinary least square (OLS) equation by equation, with the adding-up restrictions being automatically satisfied.

One disadvantage of the Working-Leser Engel equation is that necessities and luxuries are represented by different curves, which means that the same good, for example, food, cannot be a luxury for some households and a necessity for others. Each commodity can only have an elasticity that is either above or below one. A second shortcoming of this form is that although it allows for varying elasticities, these are always bound to vary in the same direction. Hence elasticities can only decrease as income increases.

It should be noted that the concept of Engel curve contributed to the formulation of demand systems in which prices are incorporated into the analysis of consumer behavior. Specifically, the "almost ideal demand system (AIDS)" propounded by Deaton and Muelbauer (1980) is constructed based on expenditure-share defined by Engel curves that are linear in the logarithm of total expenditure. The formulation of AIDS is discussed later.

2-3. Marshallian and Hicksian demand functions

By expanding the works of Jevons, Edgeworth and others, Alfred Marshall applies the cardinal utility function to formulate a demand function, which is widely known as Marshallian demand function. This demand function postulates the maximization problem of the utility function constrained by the disposable income. Mathematically, it is expressed as $\max_{x,y} U(x, y)$ s.t. $Y = p_x x + p_y y$. U denotes the utility function, x and y denote good x and good y, respectively, p_x and p_y represents price of x and y, respectively.

The solutions of this maximization problem give the following Marshallian demand function expressed in generalized form as shown in equation (2-3), where m_i denotes quantity of demand, Y is the disposable income, p is the vector of prices (p=$p_1, p_2, \ldots., p_n$). Moreover, m_i is function of homogeneity 0 and it satisfies additive condition.

$$Y = \sum_n p_n m_n = \sum_n p_n m_n(Y, p). \tag{2-3}$$

$$m_i = m_i(Y, p), \text{ i=1, 2,….,n}$$

From equation (2-3), Marshall postulated income elasticity of demand, own-price elasticity of demand and cross-price elasticity of demand is the partial derivative of income, its own price and price in another good, respectively. Mathematically, there are expressed as follows.

$$\text{income elasticity of demand: } \varepsilon_{ij}^{m} = \frac{\delta \log m_i(Y,\ p)}{\delta \log y} \tag{2-4}$$

$$\text{own-price elasticity of demand: } \varepsilon_{ij}^{m} = \frac{\delta \log m_i(Y,\ p)}{\delta \log p_i} \tag{2-5}$$

$$\text{cross-price elasticity of demand: } \varepsilon_{ij}^{m} = \frac{\delta \log m_i(Y,\ p)}{\delta \log p_j}, \quad (i, j = 1, \ldots, n, i \neq j) \tag{2-6}$$

In the nutshell, Marshallian demand function analyzes how a change in price affects

changes in demand when the disposable income has not changed. From equation (2-4), a normal good has a positive income elasticity (i.e., the demand of a good rises if income increased), it is an inferior good for a negative income elasticity (i.e., the demand of a good reduces if income increased). From equation (2-5) and (2-6), the estimated results are interpreted as follow: a positive value implies two goods x_1 and x_2 are gross substitute if an increase in the price of x_2 caused to an increase in the demand of x_1; a negative value means they are gross complements if an increase in the price of x_2 caused a decrease in the demand of x_1.

Marshall assumes that a consumer's decision in choosing goods is influenced by the utility gained from consuming those goods. He also assumes the cardinal utility function satisfies the property of additive separable. In other words, total utility is the sum of utlity gained from consuming each good. From such a construction, Marshall contributed to the introduction of the concept of elasticity in analyzing consumer behaviors. However, in the formation of this theory, Marshall did not consider the possibility of substitution nor complementarity between different goods when prices change because he assumed that the marginal utility of money is constant and hence a change in an individual's income (i.e., money income) does not influence its marginal rate of substitution with a good. In other words, there is no relationship between the demand of a good and income. This aspect is the weakness of Marshallian demand function in analyzing consumer behaviors (Hicks 1975, Wood 1982).

Hicks (1975) argues that individual's income changes over time when prices of goods are given. In this situation, Hicks formulated a demand function that based on the assumption that an individual's choice of selecting a good is to minimize expenditure in consuming a set of goods but keeping utility constant. Put differently, Hicksian demand function is derived by

minimizing the expenditure function by maintaining a constant level of utility[8]. This formulation is expressed as $\min_{x,y} Y = p_x x + p_y y$ s.t. $U(x, y) \geq \bar{U}$, which is a dual problem of Marshallian's utility maximization. Generally, Hicksian demand function is expressed as shown in equation (2-7), where q_i denotes quantity of demand, U is utility level, p is the vector of prices $(p_1, p_{2,\ldots,} p_n)$, n is the number of goods, h_i is a homogeneity zero and additive condition is valid for this function[9].

$$h_i = q_i(U, p), \text{ i=1, 2,\ldots,n} \tag{2-7}$$

The derivatives of equation (2-7) become the income elasticity of demand, own-price elasticity of demand, and cross-price elasticity of demand, respectively, which are expressed from equation (2-8) to (2-10). Hicksian demand function measures changes in demand when utility is held constant. It measures the total or net effect of a change in price.

$$\text{income elasticity of demand: } \varepsilon_i^h = \frac{\delta \log h_i(U,\ p)}{\delta \log y} \tag{2-8}$$

$$\text{own-price elasticity of demand: } \varepsilon_{ii}^h = \frac{\delta \log h_i(U,\ p)}{\delta \log p_i} \tag{2-9}$$

$$\text{cross-price elasticity of demand: } \varepsilon_{ij}^h = \frac{\delta \log h_i(U,\ p)}{\delta \log p_j}, \quad (i, j = 1, \ldots, n, i \neq j) \tag{2-10}$$

Cross-price elasticity of demand is explained as follow. Two goods x_1 and x_2 are net substitutes if an increase in the price of x_2 caused an increase in the compensated demand (or utility constant) for x_1. They are net complements if an increase in the price of x_2 caused a decrease in the compensated (or utility constant) for x_1. As such, Hicksian demand function reinforces the understanding of the consumer behavior by providing a robust method to account for the substitution effect when utility is held constant.

[8] Hicksian demand function is also known as utility constant demand function or compensated demand function.

[9] $x = \sum_n p_n h_n(U, p) = \sum_n p_n q_n(Y, p)$

2-4. Slutsky equation

As discussed earlier, Pareto did not explicitly resolved the conflict between cardinal and ordinal utility functions for the following reasons: firstly, the convexity warrants a negative sloping indifference curve; secondly, marginal utility is decreasing but the utility is the highest when marginal utility is zero whereas utility decreases when the derivative of marginal utility is negative. This problem, which was resolved by the work of Eugen Slutsky, is expressed in an eloquent equation known as Slutsky equation. Equally, this equation incorporates the properties of Marshallian and Hicksian demand functions, which were discussed in the preceding sections.

Essentially, Slutsky provides a method for decomposing total effects that are caused by the law of demand, i.e., demand increases when the price decreases. Slutsky demonstrates that total effect is the sum of two components, viz., income effect and substitution effect. The former explains the rise in an individual's disposable income causes the increase in his or her purchasing power, which in turn causes the demanded commodity to be less expensive. The latter shows as the disposable income rises, an individual can choose a relatively cheaper commodity in order to avoid buying relatively more expensive commodities.

This approach is by solving the constraint Langragian dual problem of the expenditure function subject to the utility function. Mathematically, it is expressed as $\min_{x,y} p_x x + p_y y$ s.t. $u(x,y) \geq u^*$, where p_x, p_y, u^* is the price of commodities x, y and maximum utility with respect to consuming the two commodities, respectively[10]. This approach is similar to the formulation of Hicksian demand function discussed in the earlier session. Furthermore, using the envelope theorem in this constraint Langragian problem leads to the establishment of

[10] The Langragian problem is $L=p_x x+p_y+\lambda(u^*-u(x, y)$. The first order condition is $\lambda=\frac{p_x}{u_x}=\frac{p_y}{uy}$. Because expenditure function is the function of $p_x, p_y, and u$, the partial derivative of $\mathcal{L}$ with respect to p_x is $\frac{\delta L}{\delta p_x}=x+(p_x \frac{\delta x}{\delta p_x}-\lambda u_x \frac{\delta x}{\delta p_x})+(p_y \frac{\delta y}{\delta p_x}-\lambda u_y \frac{\delta y}{\delta p_x})$. From $\lambda=\frac{p_x}{u_x}=\frac{p_y}{uy}$, then $\frac{\delta L}{\delta p_x}=x$.

Shepard's Lemma, which postulates that because x and y are optimally chosen—by holding utility constant, a small change in p_x, p_y does not affect the quantity consumed of either x or y[11]. As a result, the Slutsky equation decomposes the change in demand for good x in response to a change in the price of good y, holding income and utility constant.

Put differently, Slutsky equation (or Slutsky identity) relates changes in Marshallian (uncompensated) demand to changes in Hicksian (compensated) demand. The decomposition of the Slutsky equation is shown in equation (2-11), which means Hicksian (compensented) own-price (and cross-price) demand response—i.e., substitution effect—is the sum of Marshallian (uncompensated or ordinary) own-price response (i.e., total effect) and income demand response (i.e., income effect). Equation (2-11) can be expressed in term of elasticities as shown in equation (2-12), where compensated own-price elasticity of demand for good x (ε_{x,p_x}^{h}) is the sum of uncompensated own-price elasticity of demand for good x (ε_{x,p_x}^{m}) and the product of share of expenditure for good x (w_x) and income elasticity of demand (π)[12].

$$\frac{\delta x^h}{\delta p_x} = \frac{\delta x}{\delta p_x} + x\frac{\delta x}{\delta Y} \tag{2-11}$$

$$\varepsilon_{x,p_x}^{h} = \varepsilon_{x,p_x}^{m} + \pi_x \Phi \tag{2-12}$$

2-5. Demand systems

(1) Stone model

Based on the theoretical works of Engel, Marshall, Hicks, Slutsky and others, economists

[11] Envelope theorem transforms the constraint minimization problem for expenditure into $Y^* = p_z x^* + p_y y^*$ for $u(x^*, y^*) = u^*$. Thus, from $\frac{\delta L}{\delta p_x} = x$, then $\frac{\delta Y}{\delta p_x} = \frac{\delta L}{\delta p_x} = x$.

[12] The elasticities are derived by multiplying $\frac{p_x}{x}$ on both side of equation (2-11).

have attempted to build empirical frameworks to substantiate the theory of demand systems. Stone (1954) expounded a double-logarithm demand function for the estimation of elasticity of demand. The uniqueness of this model specification is the inclusion of additive, symmetry and homogeneity as the constraints of the demand systems. Stone's demand function is express in equation (2-13), where q_i denotes quantity of demand, y is the income, ε_i refers to income elasticity of demand, $\varepsilon_{i\,k}$ is the cross-price elasticity of good i with respect to the price of good k, p_k is the price of good k.

$$\log q_i = \alpha_i + \varepsilon_i \log y + \sum_k \varepsilon_{ik}\, p_k \qquad (2\text{-}13)$$

Substituting the Slutsky equation (2-12) into equation (2-13) and then incorporating $\sum_k w_k \log p_k = \log P$ and the homogeneity 0 condition, it is transformed as follows.

$$\log q_i = \alpha_i + \varepsilon_i \log \left(\frac{y}{P}\right) + \sum_k \varepsilon_{ik}^c \log \left(\frac{p_k}{P}\right) \qquad (2\text{-}14)$$

Equation (2-14) is the Stone model that facilitates the estimation of α_i, ε_i and $\varepsilon_{i\,k}^c$. This model not only is robust in theory but its specification also resolves econometric problems such as stationarity of time series data and incorporation of time trend factors, *a priori* elimination of a pair of goods that is neither substitute nor complement (i.e., $\varepsilon_{i\,k}^c = 0$) in a cross-section data-set[13]. As such, Stone model provides robustness in both theoretical and estimation aspects. Therefore, Stone model has enhanced the understanding of consumer behaviour comprehensively through estimation of the income effect and substitute effect. Base on this framework, many other form of models were developed in response to practical problems in interpreting data of the demand systems.

It should be noted that Stone (1954) raised his concerned of the limitation of equation (2-13) if the estimation of demand systems was approached from a generalized linearity. The

[13] Inverse matrix does not exist because of unit matrix and hence it is necessary to omit one of the $e_{i\,k}^c$ but it does not affect the estimation because $\sum_i e_{i\,k}^c = 0$.

generalized linear equation not only has to satisfy additive, symmetry and homogeneity conditions, the model's expenditure function must also be a concave function. These conditions actually constrain utility maximizing behaviors. In other words, Stone claims that these conditions impose a strict constrain in determining if a good is an inferior one or otherwise. An inferior good requires that income inelasticity of demand is always a negative value, but this condition causes the expenditure function to lose its concavity[14]. Furthermore, if cross-price elasticity of demand was positive, then it implies that all pairs of goods are substitutes. Thus the estimation of the demand systems would have to assume that all goods are substitutes, which is not a realistic assumption.

(2) Geary-Stone Utility Function and the Linear Expenditure Systems

Stone's (1954) seminal work contributed to the progress of methodologies in enhancing the empirical works on demand systems. As explained in the preceding section, Stone realized his model's limitation in examining demand systems in a generalized linear form of expenditure function. R. C. Geary suggested a hyperbolic form of utility function as shown in equation (2-15), where U is utility, q_i denotes the consumption of good i, β and γ is are elasticities. Geary-Stone utility function satifies the following conditions: monotonic in which marginal utility is positive; concavity in which marginal utility is decreasing; strongly additive in which marginal utility of good i is independent of good j; non homothetic preference that implies utility does not rise proportionally with a scalar because of a fixed component of consumption defined byΥ_i. If Υ_i=0, then Geary-Stone utility function transform into the Cobb-Douglas utility function, which has a homothetic preference. Equation (2-15-a) is transformed into linear form as shown in (2-15-b).

[14] The model specification of a generalized linear function is $p_i q_i = \varepsilon_i x_i + \sum_k \varepsilon_{ik} p_k$.

$$U = \prod (q_i - \gamma_i)^{\beta_i} \tag{2-15-a}$$

$$log U = \beta \sum log(q_i - \gamma_i) \tag{2-15-b}$$

The formulation of Stone–Geary utility function gives rise to the linear expenditure system as shown in equation (2-16) because expenditure is linear in prices and income. In this equation, y and p_i is total expendtiure and price of good i, respectively.

$$q_i = \gamma_i + \frac{\beta_i}{p_i}(y - \sum_i \gamma_i p_i) \tag{2-16}$$

This form of linear expenditure function provides a generalized linear equation for estimating demand systems. Equation (2-16) has the advantages of imposing all the restrictions for maintaining linearity, which are required for the utility maximization. Also, this model has a lesser number of parameters to be estimated that derived from a well-defined utility function.

(3) The Rotterdam demand system

On the basis of Stone model, Theil (1965) and Barten (1968) approached the formulation of demand systems without specifying the functional form of the utility function. Rotterdam model is derived by total differentiating the double-logarithm demand function propounded by Stone (1954, i.e., equation (2-13))[15], and then the Slutsky equation is applied to the formulation[16]. Consequently, the Rotterdam model is expressed in equation (2-17).

$$w_i d\log q_i = w_i \varepsilon_i (d\log x - \sum_j w_j d\log p_j) + \sum_j w_i \varepsilon_{ij}^c d\log p_j) \tag{2-17}$$

[15] The model developed by Theil (1965) and Barten (1968) is named the Rotterdam model because both scholars resided in Rotterdam.

[16] Substituting the Slutsky equation into a totally differentiated equation (2-13), it becomes $d\log q_i = \varepsilon_i (d\log x - \sum_j w_j d\log p_j) + \sum_j \varepsilon_{ij}^c d\log p_j$, and then multiply it by w_i (the expenditure share).

(i, j =1, 2, …., n)

In this model, $w_i \varepsilon_i$ is the marginal propensity to spend on good i, $w_i \varepsilon_{ij}^c$ is the net effect of a price change. Although model formulation does not require a specific form of utility function, this model is linear in terms of its parameters and thus it satisfies the following conditions, viz., additive (i.e., $\sum_i w_i \varepsilon_i = 1$), homogeneous ($\sum_i w_i \varepsilon_{ij}^c = 0$) and symmetry (i.e., $\varepsilon_{ij}^c = \varepsilon_{ji}^c$).

In empirical analysis, because of its simplicity in not specifying explicitly a well-behaved utility function, unlike Stone and other linear expenditure systems, Rotterdam model is widespread because it is less restrictive for estimations. Moreover, the estimation can reduce the parameters in the Rotterdam model if additive condition is further strengthened (Johnson, Hassan, and Green 1984). Nonetheless, Goldberger (1969) and Yoshihara (1969) assert that the Rotterdam demand system can be derived from the Cobb-Douglas utility function (e.g., $U = \sum_i \beta_i \log q_i$), thus the sum of income elasticities are equal to unity, all own-price elasticities are added up to -1, and the total value of cross-price elasticities become 0. These situations contradict the consumer demand preferences in reality. Therefore, these aspects are the serious deficiencies in the Rotterdam model.

(4) The Almost Ideal demand System (AIDS)

Empirical studies of the consumer demand behaviors focus on the estimation of elasticities of demand. The model specification in this field of empirical inquiry depends on the functional form of the demand systems. Almost Ideal Demand System (AIDS) was developed by Deaton and Muellbauer (1980a). Based on the utility function c(u, p), Deaton and Muellbauer define the expenditure function system as follows.

$$\log c(u, p) = (1 - u) \log \{a(p)\} + u \log b(p) \qquad (2\text{-}18)$$

$$\log a(p) = \alpha_0 + \sum_k \alpha_k \log p_k + \frac{1}{2}\sum_k \sum_j \gamma^*_{i\,j} \log p_k \log p_j \tag{2-19}$$

$$\log b(p) = \log a(p) + \beta_o \prod_k p_k^{\beta_k} \tag{2-20}$$

Substituting (2-19) and (2-20) into (2-18), it yields equation (2-21) that satisfies conditions denote from equation (2-22) to (2-24)[17]. Furthermore, equation (2-21) incorporates total expenditure ($\sum_{i=1}^{n} w_i = 1$) is homogenous of degree 0, it satisfies the Slutsky symmetry, and it uses $\log P = \sum_i w_i \log p_i$ to approximate the price index. According to this formation, AIDS model as shown in equation (2-21) is in a linear form.

$$w_i = \alpha_i + \beta_i \log\left(\frac{x}{P}\right) + \sum_j \gamma_{i\,j} \log p_j \tag{2-21}$$

$$\sum_{i=1}^{n} \alpha_i = 1,\ \sum_{i=1}^{n} \gamma_{i\,j} = 0,\ \sum_{i=1}^{n} \beta_i = 0 \ \text{(additive)} \tag{2-21a}$$

$$\sum_j \gamma_{i\,j} = 0 \ \text{(homogeneous of degree 0)} \tag{2-21b}$$

$$\gamma_{i\,j} = \gamma_{j\,i} \ \text{(symmetry)} \tag{2-21c}$$

In equation (2-21), w_i denotes expenditure share in total consumption of good i, whereas $\frac{x}{P}$ represents real disposable income and p_j is the price of good j. Deaton-Muellebauer (1980a) model is a flexible functional form for explaining the demand systems, which are derived from utility maximization. In addition, parameters β_i and $\gamma_{i\,j}$ postulate changes in the expenditure shares caused by changes in real expenditure and prices. Particularly, if $\beta_i > 0$ then good i is a luxury goods, whereas if $\beta_i < 0$ then good i is a necessity good. The simplicity of AIDS has motivated a large volume of empirical analyses for estimating income elasticity of demand, own-price elasticity of demand and cross-price

[17] $\log(u, p) = \alpha_0 + \sum_j \gamma_{i\,j} \log p_j + \frac{1}{2}\sum_k \sum_j \gamma^*_{i\,j} \log p_k \log p_j + u\beta_0 \prod p_k^{\beta_k}$, thus partial differentiate it by p_i and then multiply it by $\frac{p_i}{c(u,p)}$, it yields $\frac{\delta c(u,P)}{\delta p_i} \times \frac{p_i}{c(u,p)} = \frac{p_i q_i}{c(u,p)} = w_i$ $(\frac{\delta c(u,P)}{\delta p_i} = q_i)$.

elasticity of demand.

2-6. Consumption functions in aggregate level

The preceding sections have provided a concise review of consumer demand theory from two broad perspectives. Firstly, the review of underlying microeconomic theories that were established to postulate consumer behaviour. Secondly, the review of the econometric specifications that have been used for estimating elasticities of demand in order to examine how the demand of goods and services of individuals or household respond to changes in prices and income. These two aspects link the relationship between theoretical framework and appropriate econometric estimation technique. This relationship is crucial for the verification of microeconomic theory on consumer behaviour from empirical evidences at micro level.

However, at the aggregate or macro level, the theoretical prediction of the consumer optimizing behaviour might not hold even they are valid at the micro level (Blundell 1988). Macroeconomic theory presents several schools of thought in hypothesizing consumption expenditure at aggregate level. This area of study mainly focuses on the use of aggregated consumption function as the theoretical and empirical analytical tool. Essentially, the aggregate consumption expenditure is influenced by the economy's income level. Keynes (2013) was the pioneer in explaining the relationship between aggregate consumption expenditure and income. Inspired from Keynes' absolute income hypothesis, several macroeconomic theories about consumption function were subsequently established to enhance the explanatory power of how aggregate consumption expenditure influences the real economy from theoretical and empirical perspectives. This section aims to make a succinct review of Keynes' absolute income hypothesis, Duesenberry's relative income theory of consumption, Friedman's permanent income theory of consumption, and Modigliani's life

cycle theory of consumption.

(1) Absolute income hypothesis

The absolute income hypothesis is theory of consumption expenditure propounded by Keynes (2013) in *The General Theory of Employment, Interest and Money*, and it was refined extensively by Tobin (1951). Keynes established the relationship between income and consumption as a key macroeconomic relationship. Keynes asserted that real consumption expenditure is a function of real disposable income (i.e., total income after tax).

The absolute income hypothesis (AIH) explains that as the disposal income rises, the consumption expenditure also increases but not necessarily at the same rate as income rises because part of that increment in disposable income is saved. He argued that when this hypothesis is applied to a cross section of a population, rich people are expected to consume a smaller share of their disposable income than poor people. From this viewpoint, Keynes introduced the concept of marginal propensity to consume (MPC) as the core of his theory of consumption expenditures. MPC determines by what amount consumption changes in response to a change in disposable income. In addition, the additional consumption through MPC becomes other people's income and the cycle repeats itself. This transmission of additional consumption expenditures by MPC creates the multiplier effect, which in turn promotes short term economic growth.

Based on Keynesian consumption function, the AIH shows that aggregate consumption is a stable but not necessarily a linear function of disposable income. A linear Keynesian consumption function is shown in equation (2-22), where C_t and Y_t denote the (real values of) consumption expenditure and disposable income, respectively at time t. β is the MPC. MPC

$$C_t = \alpha + \beta Y_t \quad (2\text{-}22)$$

is positive but less than unity because the increment of disposable income is higher than the increment of consumption expenditure resulted from the rise of income. The constant term α is the autonomous component of consumption and it is assumed to be small but positive. AIH is characterized by the followings. First, the consumption expenditure changes with the change in income but not proportionally. This non-proportional consumption function implies that in the short run average propensity to consume (APC, i.e., the share of consumption in disposable income) is greater than the MPC. Second, if the disposable income changed, the partial derivative of APC is negative (i.e., $\frac{\delta APC}{\delta Y} < 0$), and consequently the income elasticity of consumption falls below unity (i.e., $\frac{Y}{C}\frac{\delta C}{\delta Y} = \frac{MPC}{APC}$). Third, consumption function is stable both in the short run and long run.

While the AIH succeeded in postulating consumption behavior in the short term, its explanatory power diminishes over a longer time frame. Hence it receives severe criticism in terms of its relevancy in explaining the relationship between aggregate consumption expenditures and national income, particularly with respect to how aggregate consumption can stimulate growth in national income. Notwithstanding its shortfall, Keynesian theory of aggregate consumption function inspired the development of alternative consumption theories that strengthen the theoretical framework and econometric specification for discerning the relationship between consumption expenditure, income and savings (Parker 2010).

(2) The relative income hypothesis

Duesenberry (1949) advocated the relative income hypothesis (RIH). He observed that, in spite of Keynes' AIH, there was a different pattern of aggregate saving. Keynes made observation from the empirical cross-sectional consumption data that, at a given point of time,

the rich in the population saved more of their income than the poor[18]. On the contrary, Duesenberry observed that saving rate did not grow over time as aggregate income grew. This empirical evidence contradicted Keynes'. Therefore, Duesenberry hypothesized that relative income could have accounted for both the cross-sectional and time series evidences. Duesenberry claimed that an individual's utility index depends on the ratio of his or her consumption to a weighted average of other people's consumption. For this reason, he drew two conclusions: first, aggregate saving rate is independent of aggregate income, which is consistent with observed time series evidences; second, an individual's propensity to save is an increasing function of his or her percentile position in the income distribution, which is consistent with the observed cross-sectional evidences. The basic model of RIH is shown in equation (2-22), where i subscript denotes the individual and t represents time, U is utility, which serves as a proxy for such as self-reported happiness or life satisfaction, y and y^{τ} is own income and relative income (the income of the reference group), respectively. x is a set of k conditioning variables and ε is the error term. Hence the main parameter of interest in this model is γ.

$$U_{i\,t} = \alpha + \beta y_{i\,t} + \gamma y^{\tau}_{i\,t} + \sum_{k} \theta_k x_{k,i\,t} + \varepsilon_{i\,t} \tag{2-23}$$

Despite its straight forward exposition with empirical persuasion, Duesenberry's RIH has not found wide acceptance until Easterlin (1974) thesis on "self-reported happiness of individuals varies directly with income at a given point in time but average wellbeing tends to be highly stable over time despite tremendous income growth." Easterlin argued that these patterns are consistent with the claim that an individual's wellbeing depends mostly on relative income rather than absolute income. Subsequent studies such as Oswald (1997) have contributed to the accumulation of empirical evidences in support of Easterlin's claim.

[18] As discussed in 2-6-(1), AIH claims that increment of consumption expenditure—caused by the increase in disposable income—is less than the increment of disposable income. This outcome is related to additional saving caused by the rise of disposable income.

(3) Permanent income hypothesis

Keynesian consumption function is elegant in explaining how the stimulus of aggregate consumption expenditures (i.e., the aggregate demand) influences national income positively in a short term. The concept of MPC underpins the multiplier effect from increased consumption expenditure but it fails to explain why saving rates remain constant in spite of the rise in disposable income. Friedman was particularly critical to Keynes' AIH, and thus instead he put forward the permanent income hypothesis (PIH). In the nutshell, Friedman (1957) asserts that people's decision to consume is based on their expected long-term future income—which incorporates future rise in expected income, prices and taxes—instead of present disposable income claimed by Keynes' AIH. The feature of future income is expressed in the PIH. Put differently, Friedman claims that the change in expected long-term future income (i.e., permanent income), rather than changes in temporary income (i.e., present disposable income), is the major influential factor that support the changes in aggregate consumption expenditure patterns.

In constructing his model, Friedman (1957) assumes that a representative individual's or household's consumption expenditure depends on the present value of his or her long-term expected average income instead of present disposable income. This present value (PV) is expressed in equation (2-24), where Ey_t is the individual's or household's expected income at time t, and r is the discount rate.

$$\mathrm{PV} = \sum_{\mathrm{t}=0}^{\infty} \frac{\mathrm{Ey_t}}{((1+\mathrm{r})^{\mathrm{t}}} \tag{2-24}$$

Furthermore, Friedman claims that the individual's or household's permanent income y^p is the constant level, if he or she received with certainty in each period t, has the same PV as the individual's or household's income direction. Hence, in this situation, permanent income

y^p has to satisty the condition as shown in equation (2-25), which the result can then be expressed as equation (2-27) when an individual's or a household's consumption at t=0[19].

$$\sum_{t=o}^{\infty} \frac{y^p}{(1+r)^t} = PV = \sum_{t=0}^{\infty} \frac{Ey_t}{((1+r)^t}$$

$$\sum_{t=o}^{\infty} \frac{1}{(1+r)^t}) y^p = PV = \sum_{t=0}^{\infty} \frac{Ey_t}{((1+r)^t} \quad (2\text{-}25)$$

$$\sum_{t=o}^{\infty} \frac{1}{(1+r)^t} = \frac{1+r}{r}, \text{thus } y^p = \frac{r}{(1+r)} PV \quad (2\text{-}26)$$

$$C_0 = f(y^p) \quad (2\text{-}27)$$

From equation (2-27), Friedman claims that "a household borrows to increase consumption today when it anticipates higher income in the future. In other words, the household saves less when its expected future income will be high. Conversely, the household uses additional savings to buffer its consumption against expected declines in income; it saves more when it's expected future income to be low" (Ireland 1995). The PIH inspired many theoretical and empirical studies to further strengthen the explanation of the relationship between consumption expenditure and long-term future expected income. Empirical study was proliferated with econometric testing of consumption functions related to the PIH with time series and cross-sectional data but the results were mixed. For example, Ireland (1995) contends that PIH is useful in forecasting future income from long-term aggregate data of saving. On the other hand, Campbell and Mankiw (1990) substantiated that there is a substantial portion of individual's income being consumed in the current disposable income rather than the permanent income[20]. This result suggests that in reality, consumption

[19] Friedman has assumed that an individual's or household's consumption expenditure depends on the present value of his or her long-term expected average income.

[20] Campbell and Mankiw (1990) constructed a hypothetical economy comprises two groups of household. Y_{1t}

expenditure is not necessary dictated by the expected future income.

(4) Life cycle hypothesis

The greatest limitation of Friedman's theory on permanent income as well as Keynes' consumption function and Dusenberry's RIH is their inability to include people's perceptions on uncertain future either in the short-term or the long-term horizon. Although the PIH contends that consumption expenditure is influenced by the long-term expected income, and thus uncertainty is considered implicitly in the discount rate for transforming future expected income to the present value. From this reason, Modigliani and Brumberg (1954) conceived the idea of life cycle hypothesis (LCH) that explicitly includes the factor of how people behave in treating future uncertainty.

In an attempt to establish a theoretically satisfactory and tractable model of how people face future uncertainty in rationalizing their consumption behaviors, Modigliani and Brumberg (1954) attempted to explain the relationship between consumption expenditure, income and saving by testing cross-sectional data (Deaton 2005). LCH postulates consumption and saving of a person over his life time period. This model claims that every individual, during the working life, spends a fraction of his or her expected life time earnings. The accumulated saving is spent after retirement. Furthermore, LCH shows that average propensity to consume is higher for young individuals and retired old individuals because they are borrowing against future income or spending their savings. These explanations are justified by two assumptions. First, LCH assumes that an individual's utility function is homogeneous with respect to consumption at different points of time. Hence if an individual

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and Y_{2t} is the income of each respective group, and total income is $Y_t=Y_{1t}+Y_{2t}$. They further assume that the first group receives a fixed share λ of total income, i.e, $Y_{1t}=\lambda Y_t$, but consumes the current income, and the second group's income is $Y_{2t}=(1-\lambda)Y_{1tt}$ but consumes the permanent income. As such, the consumption of these two groups is $C_{1t}=Y_{1t}$, $C_{2t}=Y^p_{2t}=(1-\lambda)Y^p_t$.

earned extra income, he would consume that extra income at different points of time in the same proportion as he has spent before earning the extra income. Second, the individual neither wish nor expect to leave any inheritance.

Furthermore, in LCH, utility is a function of an individual's own aggregate consumption in current and future period. Thus, an individual maximizes his or her utility subject to the expected life time income and current net wealth. In formulating this model, it is assumed that there is an individual who expects to live for another T years and he has a net wealth of W. This individual also expects to earn annual income Y until he retires R years from now. In this situation, the individual's resources over his lifetime consist both of the initial net wealth W and of his lifetime earnings RY. For simplification, it is assumed that the interest rate is 0 (if the interest rate was positive, then the model would include interest earned on savings). The individual spreads his consumption expenditure over the remaining T years of his life. Therefore, the individual spends $\frac{W+RY}{T}$ (=average consumption expenditure over T years). As such, the individual's consumption function is expressed in equation (2-28).

$$C = \frac{1}{T}W + \frac{R}{T}Y \tag{2-28}$$

The individual's consumption function can be aggregated to derive the aggregate consumption function for a society. As a consequence, the aggregate consumption function of the economy is expressed in equation (2-29), where "a" is the marginal propensity to consume for net wealth and "b" is the marginal propensity to consume for income. This equation is testable either by cross-sectional or time series data.

$$C=aW+bY \tag{2-29}$$

Like any other theory, LCH is not without critics. Essentially, critics argue that LCH is unrealistic because of its strong assumptions. Particularly the assumption of the certainty of

life-time expected income is not realistic because any individual will for certainty encounter uncertain fluctuation in future expected earnings. Ironically, the criticisms were mainly related to the future uncertainty, which was also the main reason that induced the formation of LCH. The issue of uncertainty in consumption function was later dealt with persuasively in Hall (1978), which incorporates PIH and LCH. Hall's random walk theory of consumption was tested widely, for instance Campbell and Mankiw (1990).

2-7. Other relevant literature

Since using different models for the econometric estimation give different results, it is crucial to compare and contrast the advantages and drawbacks of each model of demand systems that were documented. Meyer and others (2011) made a comparative analysis of six demand systems, viz., LES, basic translog (BTL), AIDS, QES, quadratic almost ideal demand system (QUAIDS), and an implicitly, directly additive demand function (AIDADS). They obtained further findings following the definition of Lewbel (1991) who made a definition of these six demand systems by their ranks: the first three are the rank two demand system (i.e., LES, BTL, AIDS) and the last three are the rank three model (QES, QUAIDS, AIDADS). First, their simulations indicate that the numbers of commodities, the sample size and the real elasticities have significant impacts on the performances of different models for different elasticity of demand, and the effects are quite diversified. Second, after controlling sample size, scale of elasticities, and the number of commodities, they found that different models actually have different advantages in estimating different elasticities. Specially, QES, AIDS, and AIDADS model are the best in income, own-price and cross-price elasticities, respectively. Moreover, they found the AIDADS model has the best performance in their estimation on the data.

Cranfield (2003) and the joint researchers[21] assessed the ability of five structural demand systems to predict demands when estimated with cross sectional data spanning countries with widely varying per capita expenditure levels. In their research, the data from 1985 International Comparisons Project composed of real and nominal expenditure on 113 final goods and services in 64 counties. According to their estimated results, rank three demand systems (i.e., QES, QUAIDS, AIDADS) are better than to rank two demand systems. Among the rank three demand systems in this comparison, the AIDADS model and the QUAIDS seem to have performed better than QES. Amongst these rank three systems, each model is very much context dependant.

In addition, Attfield (2004) conducted a comparison of the translog and the AIDS models. In the estimation, the times series data from the Family Expenditure Surveys (1971Q1~2001Q3) of the UK is used. In both models the demographic variables in the form of the proportion of individuals in each of the age groups from 19~84 inclusive in the population are added, which combine the demographic age effect on each commodity group with a measure of income distribution among the age groups and the indices are incorporated into the demand models. He found the demographic indices are significant in both models. Nevertheless, the AIDS model with demographic indices is the preferred model as it is more straightforward to estimate than the translog model, which contains non-linearities but satisfies the proposition of demand theory and provides marginally superior out of sample forecasts.

In spite of the different conclusions due to the comparative researches on the demand systems, it is difficult to judge which one is absolutely the perfect model that applies any empirical analysis. Because regardless of which model being used in the estimation, both advantages and disadvantages exist comparatively. The selection of the model relates to the

[21] James S. Eales, Thomas W. Hertel and Paul V. Preclel

characteristics of the data used and objective of analysis. However the AIDS model has been a popular analytical tool in the research of household consumption.

Farooq, Young, and Iqbal (1999) made an analysis on a farm household consumption expenditure 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 bought about a certain special impact on the consumption of these two crops.

Halbrendt, Tuan, Gempesaw, and Dolk-Etz (2011) analysed 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 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 food consumption expenditures in rural province of Guangdong but it is difficult to verify whether the analytical results reflect the general consumption

behavior 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.

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.

Wakabayashi (2001) analyzes household final consumption expenditure in Japan based on data collected from National Consumer Survey across 47 prefectures in Japan in 1984, 1989, 1994. This data-set was then compiled into 13 age groups (from less than 24 years old to more than 75 years at 5 years interval). In spite of using AIDS specification, this study did not examine the difference between uncompensated and compensate cross-price elasticity of demand. The analysis could have addressed issues such as if the analysis had focused on how households behaved to price changes with respect to the change in income and also with regard to how if households' utilities were held constant with the change in real income.

Tachibanaki and Imayama (1999) conducted a time series empirical analysis of the changes in consumer behavior in Japan, Taiwan and Thailand, which was based on the specification of Stone's demand function. Though this empirical work has contributed to a better understanding of how consumer behaviors have changed in the process of economic development, it did not identify if goods were net substitutes or net complements. Their analytical focus was on uncompensated elasticity of demand, which only implies gross substitutes and gross complements. For this reason, therefore this study did not clarify which demand was affected by the change in price of which particular goods.

Fan (2004) analyzed the diversity of consumption behavior out of income by building up

an AIDS model of Chinese rural residents, classified into five income groups. This empirical research just gave a conclusion that the income has a crucial effect on consumption in a rural area, without any notable outcome. In comparison, 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 the findings, 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, from the analytical findings of Nolintha and Lau (in press), asset ownerships differ between urban-rural and asset gaps exist inside urban and rural areas. Inequality can be mitigated if government targets its interventions at within-group inequality to narrow the inequality gap in consumption expenditure, but for the case of inequality in assets the measures would have to be targeted at between-group inequality.

Regmi and 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 good 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.

Quite similar to the Japanese experience, China’s high economic growth has brought about a relatively high saving rate in comparison with industrialized and other comparable middle-income countries. During the period of high economic growth in Japan, the phenomenon household saving rate attracted considerable interests from scholars and policy makers. By and large, empirical evidences show that there were six most important influential factors that allegedly contributed to the high level of household saving rate in Japan. These factors were: first, the inequality among the income classes; second, the ratio of personal income from property to the total income was too large; second, the saving rate of sole proprietor was large; third, the ratio of income from sole proprietors to the total personal income was also high; fourth, the growth rate of real personal disposal income was high; fifth, the inadequate society security system; and sixth, less developed consumer finance system.

In the light of these contentions, Komiya (1975) provided a comprehensive response. Regarding the first allegation, the inequality of personal income is not serious in Japan when compared with other countries. Hence this allegation was not inconvincible. For the second

point, although that trend was conspicuous in the period of pre-war, the ratio of personal income from property to the total income had declined remarkably because of agrarian reforms and dissolution of the financial cliques. As a result, this argument was ill founded. He stressed that the study by Shinohara (1958) explained the third point, i.e., if the ratio of sole proprietor`s quantity to all household was extremely high then it could be considered as an important determinant that causes high saving rate. Nevertheless, taking into account the trend that the proportion of sole proprietor was falling, this factor had lost its importance. The fourth contention was a plausible rational explanation. As for the fifth assertion, according to the international comparison, there was no correlation between the developing level of society security system and high household saving rate. Hence this argument was unreasonable. The final point explained the high saving rate in household sector.

8. Summary

The review in this Chapter has centred on theoretical development and econometric model specifications of explaining and empirical testing of consumer behavior. Indeed, the review has highlighted some positive discussions that are relevant to the formulation of an analytical framework for investigating individuals and household's behavior in consumption expenditure with respect to changes in income and prices of goods/services in urban areas in China.

From the result of literature review, this study intends to adopt AIDS for the econometric estimation of elasticities of demand in urban China. AIDS is useful for this thesis because the empirical inquiry deals with broad spectrum of goods/services that are classified into eight categories of the household's (or individual's) consumption expenditures, viz., "food", "clothing", "household utensils", "housing", "medical care", "transportation and

communication", "education, culture and recreation", "other expenditures". Equally important, AIDS model is chosen because of its linearity, flexibility in terms of the econometric approaches for individuals/household and aggregate consumption expenditures, and uncomplicated use of Stone's price index and Slustky equation to estimate income effect and substitution effect for real consumption expenditures.

Chapter 4 of this thesis explains the formulation of the analytical framework as well as to define specific questions of this empirical inquiry pertain to the actual conditions of consumer behavior in urban areas of China using income and expenditure data collected from questionnaire surveys conducted in four major cities (Beijing, Shanghai, Tianjin and Qingdao) and household surveys conducted in Changchun City.

Chapter 3 China's Household Consumption Expenditure: An Overview

Since the inception of reform and open-door policy, Chinese economy has grown with leaps and bounds. In order to transform the centrally planned economic system to one that is market based, Chinese government initiated a broad spectrum of reform policies such as creation of township village enterprises in rural areas, private businesses in urban areas, state-owned enterprises reforms, liberalization of trade and foreign direct investments, price liberalization, financial sector reform and others. Incentives that were introduced through these reform policies brought about the remarkable economic growth records unprecedented in the modern history of economic development. In between 1978-2013, China's real GDP grew about 10% a year. As a consequence, China's nominal GDP was about 56.9 trillion RMB in 2013. In the same period, per capita GDP quadrupled and its nominal value was about 42,000 RMB in 2013 (Table 3-1). Although China's GDP growth rate has slowed down in recent years, but many observers predict that Chinese economy will be larger than that of the U. S. in the second half of the 2020s[22].

The remarkable long-term high economic growth is mainly attributed to two major sources, viz., capital accumulation and exports. The former are due to aggressive investments for physical economic infrastructure and large influx of foreign investments in the manufacturing sectors. Foreign direct investments (FDIs) were crucial to the capital formation in terms of production facilities. Gross capital formation grew from 38.2% of GDP share in 1978 to 47.8% in 2013, and the absolute value grew about 16% a year between 1978-2013

[22] For example, the Economist Intelligence Unit predicts that China's GDP will surpassed the U.S.' in 2016 (www.businessinsider.com/chinas-gdp-is-expected-to-surpass-the-us-in-11-years-2015-6, retrieved on June 24, 2015).

(Table 3-2). Furthermore, FDIs not only created employment that raised people's income, they provided linkages to international markets for manufacturing goods that resulted resilient export performances. Total trade and net export is about 26 trillion RMB and 1.4 trillion RMB (about 2.4% of GDP), respectively, in 2013 (Table 3-2).

Table 3-1 Population, GDP, industrial structure, per capita GDP (current prices)

	1978	1990	2000	2013
Population (10,000 persons)	96,259.0	114,333.0	126,743.0	134,735.0
GDP (100 millions RMB)	3,645.2	18,667.8	99,214.6	568,845.2
Primary industry (100 millions RMB)	1,027.5	5,062.0	14,944.7	56,957.0
Secondary industry (100 millions RMB)	1,745.2	7,717.4.0	45,555.9	249,684.4
Tertiary industry (100 millions RMB)	872.5.0	5,888.4.0	38,714.0	262,203.8
GDP per capita (RMB)	378.7	1,632.8	7,828.0	41,908.0

Source: National Bureau of Statistics of China, *China Statistical Yearbook 2014*.

Table 3-2 GDP by expenditure and external sector (current price)

	1978	1990	2000	2013
GDP by expenditure (100 millions RMB)	3,605.6	19,347.8	98,749.0	586,673.0
Private consumption	1,759.1	9,450.9	45,854.6	212,187.5
Government expenditure	480.0	2,639.6	15,661.4	79,978.1
Investment	1,377.9	6,747.0	34,842.8	280,356.1
Net export	-11.4	510.3	2,390.2	14,151.3
Trade				
Total trade (100 millions RMB)	355.0	5,560.1	39,273.2	258,168.9
Export	167.6	2,985.8	20,634.4	137,131.4
Import	187.4	2,574.4	18,638.8	121,037.5
GDP share in trade (%)	9.8	28.7	39.8	44.0

Note: Figures for net export in the upper half do not tally with those in the lower half because of different method for aggregation.
Source: Ibid.

Table 3-3 Industrial structures

	GDP			Employment		
	Primary	Secondary	Tertiary	Primary	Secondary	Tertiary
1978	28.2	47.9	23.9	70.5	17.4	12.1
1990	27.1	41.3	31.6	60.1	21.4	18.5
2000	15.1	45.9	39.0	50.0	22.5	27.5
2010	10.1	46.7	43.2	36.7	28.7	34.6
2013	10.0	43.9	46.1	31.4	30.1	38.5

Source: Ibid.

In last few years, China's economic growth has slowed down. This is inevitable because the catch-up effect has diminished on one hand, and investments have become less efficient on the other hand. The latter is quite obvious for the incremental input-output ratio (ICOR) has risen from 3.8 for 1991-2000 to 4.5 for 2001-2013[23]. These figures imply that the marginal efficiency of capital has declined. At the same time, wages have risen in tandem with the rise in per capita GDP over time. Consequently, low cost export-oriented growth approach has become less prospective than before.

In light of these circumstances, Chinese policy makers are re-tooling the growth engine to drive domestic demand. China's private consumption was averagely at 46-48% of GDP in the period from 1978 to 2000 but it decreased substantially to 36% in 2013. In this regard, there is a huge potential to stimulate more private consumption. Households and individuals are the key drivers for a higher level of private consumption. The continuous increase in per capita income and the huge population in China provide plenty of rooms for stimulating individual's quest for better material wants and service consumption. From this viewpoint, by focusing on Chinese urban areas, this thesis intends to examine how changes in income and prices of commodities (goods and services) affect Chinese consumer behaviors. This undertaking is important because the analytical findings of this study can provide crucial bearings for policy intervention in promoting a higher level of the consumer spending in China.

This chapter provides an overview of the scale of household consumption expenditures and their prevailing trends in general from the viewpoint of the aggregate economy. This chapter is organized as follows. Section 1 examines the final consumption expenditures trend. Section 2 provides an international comparison of private consumption expenditures vis-à-vis China's situation. Section 3 explains those reasons that caused low consumption rate in China.

[23] ICOR is defined as the ratio of investment share in GDP and GDP growth rate. The figures here are calculated from *China Statistical Yearbook 2014*.

Section 4 examines how household consumption expenditures were stimulated in the past years from the perspectives of Engel coefficient and the composition of consumption expenditures. Section 5 reviews the inequality in consumption expenditures in terms of urban and rural gap, between regions and between income strata. Section 6 highlights three key factors, viz., urbanization, *hukou* system and lack of social security system, that are influencing household expenditures in China. The last section summarizes the chapter.

3-1. The final consumption expenditure trend

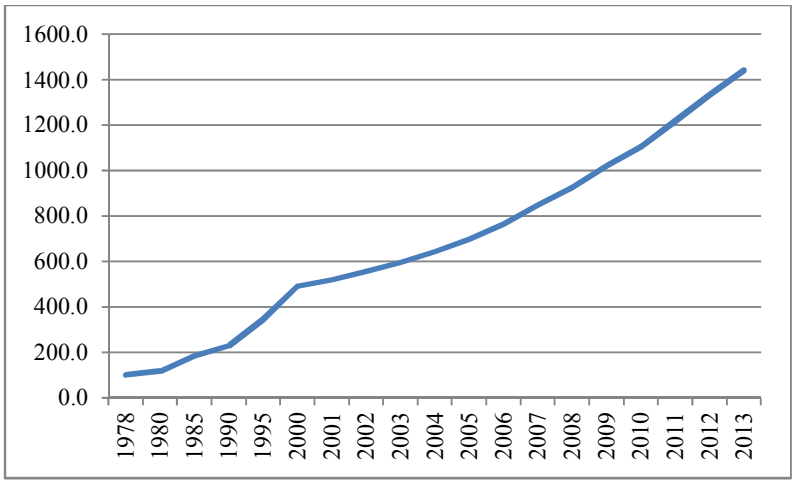
Along with continuous reform and open door policies since 1978, the persistent high economic growth has caused the dramatic expansion of final consumption in China. Although the absolute amount of final consumption expenditure has increased impressively, its share in GDP has not risen. Instead, China's final consumption expenditure rate has become one of the lowest in the world for a long time period. The relentless low consumption expenditure rate has caused extensive criticism from economists both from within and from outside of China. The final consumption expenditure rate of China has declined from 62.1% in 1978 to 49.6% in 2013. This level is not only significantly lower than the average of industrialized countries, but it is also lower than that in most of the middle-income countries. This phenomenon has become a serious concern of the Chinese government because the final consumption expenditure holds a crucial role in replacing investment as the locomotive for high economic growth rate in China. Hence for this reason, it is of the utmost importance to make an objective assessment of the final consumption expenditure in China.

According to National Bureau of Statistics of China, final consumption expenditure comprises two major aggregate components, viz., government consumption expenditure and household consumption expenditure. Table 3-4 shows that final consumption expenditure was

50% of China's GDP and it contributed 3.9% in terms of GDP growth rate in 2013. The same table also depicts that China's final consumption expenditure share in GDP and the contribution in GDP growth rate have declined from the peak since 2000. Government consumption expenditures reflect the government's costs to provide services and transfer payments to the households. These expenditures mainly concentrate in areas such as public utilities, health services, education, culture and arts, broadcast media, scientific research, and administrative related costs. Chinese government consumption expenditure rate was basically stable, and the extent of the fluctuations has been small since 1978. According to the *China Statistical Yearbook 2014*, the government expenditure has increased rapidly, from 48 billion RMB in 1978 to 7,998 billion RMB in 2013 (in nominal prices). Furthermore, between the highest point in 2001 and the lowest point in 1988 there was a difference of 3.4%, whereas the government consumption rate has been declining after subprime crisis. One of the reasons for the rise in government consumption rate from 1995 to 2001 was the increase in the public sector investment and frequent government interventions through macro-control policies for stimulating domestic demand. Recently, the government consumption rate has gradually decreased since 2001. Compared with 2001, this ratio decreased 2.9% in 2008.

Figure 3-1 illustrates the trend of all household consumption expenditures from 1978 to 2013. In terms of country wide, its size grew about 14.4 times from 1978 to 2013. Household consumption expenditures in urban and rural area grew 9.2 times, respectively (Figure 3-2). From the founding time to the end of 1970s, high investment, high savings and low consumption expenditure were the characteristics of the heavy industrial-oriented development strategy in the Chinese centrally planned economic systems. The reform and open-door policies had brought about impressive uplifting of individuals' income, which is the result of economic growth and also the outcome of government's interventions in upward adjustment of wages in industry and service sectors as well as the rise in purchase prices of

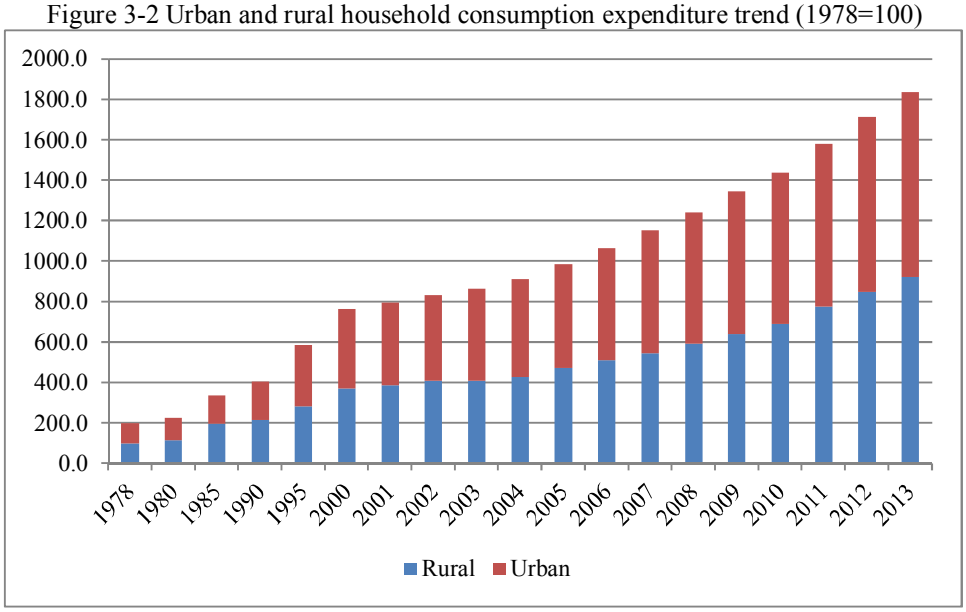
Figure 3-1 Household consumption expenditures trend (1978=100)



Source: Ibid.

agriculture produces. Consequently, the capacity of households' consumption expenditures was broaden substantially. Table 3-4 shows the average amount of China's household consumption expenditures between 1978 and 2013, in 2010 prices. During the period, the consumption expenditures of all households grew at 13.5% annually, whereas that amount for rural and urban households expanded 54 and 56 times, respectively.

Figure 3-2 Urban and rural household consumption expenditure trend (1978=100)



Source: Ibid.

Furthermore, more than past three decades, the household consumption rate reached the highest level (51.6%) in 1985 and the lowest level (35.3%) in 2008 and 2009, where the gap between the highest and the lowest was 16.3%. The stages of change in household consumption are the same as the total final consumption rate. But the urban household consumption rate in China had gradually risen in the last century but has decreased since the year 1985. In general, rural household consumption rate is declining at a faster rate than the growth rate of urban household consumption rate, which causes a decline in the total house-hold consumption rate. In aggregate terms, the rural household expenditures in 2010 prices have increased gradually from 138 billion RMB in 1978 to 7,409 billion RMB in 2013. Its annual growth rate was about 12%, which was lower than that of all household final consumption expenditure (Table 3-4).

Table 3-4 Household consumption expenditures amount (billion RMB in 2010 prices)

	All	Rural	Urban	Rural-urban ratio
1978	184	138	405	2.93
1990	833	560	1,596	2.85
1995	2,355	1,313	4,931	3.76
2005	5,596	2,657	9,593	3.61
2010	10,522	4,700	16,546	3.52
2013	15,632	7,409	22,880	3.09

Source: National Bureau of Statistics of China, *China Statistical Yearbook 2011*

Rural household consumption rate had increased for 6 years since 1978 and in 1983 reached the highest value (32.3%) of the past 30 years. After that it had decreased in the subsequent years. Even in a few growth years, the range of its growth rate was small. In 2013, rural household consumption rate reached the lowest value in the past 30 years (8%). Between the highest value and the lowest value there was a difference of 24.3%. The average annual rate of decline rate is 0.9%, and the most intensive fluctuation in these years was a decrease of 2.6%.

On the other hand, the urban household consumption rate increased gradually, with its highest value (31.1%) in 2000. Before then, this ratio showed quite a high rate of growth. The largest range of increase was 2%. But the urban household consumption rate began to decrease as that of rural after 2000. The largest range of decreasing was 1.3% in 2005. Even so, its range of decrease was less than that of the rural household consumption rate. Therefore, the decline of both the urban and rural household consumption rates since 2001 led to the enlarged decreasing range of the household consumption rate.

Since the sub-prime crisis, Chinese government has put in place a huge package of stimulus with 4 trillion RMB, in which it was desired to expand domestic demand by stimulating private consumption expenditure. However, that stimulus package failed to deliver the intended outcome, i.e., the expansion of household consumption expenditures. From the perspective of economic institutional transition, the change of household consumption has a direct relation with economic reform and policy change in China. In retrospect, the household consumption rate increased for the first time in the period from 1978 to 1981. The reason is that during this period, China was at the primary stage of economic reform. The productive enthusiasm of the farmers was greatly ignited by the household contract responsibility system, and the purchase prices of the agricultural produces increased rapidly. Thus the farmers' incomes grew to some extent.

At the same time, wages of urban employees had also increased. The increasing household consumption rate in 1988 was related to that year's price reform. The increased rate in 1995 occurred because the government implemented tightening policies and investment was restricted, thereby improved the proportion of consumption expenditure to GDP. After that, due to the policies of expanding domestic demand and stimulating consumption to avoid deflation, there were increases in the household consumption rate. On the whole, the household consumption rate (both urban and rural) remained in an increase

trend before China's membership in WTO but declined year by year after then. During this period, the sharp rise in real estate prices has also limited the expansion of household consumption expenditures.

3-2. International comparison on consumption rate

China's final consumption rate is lower than many other countries (Table 3-5). The final consumption rate of the United States is the highest among the countries in this comparison, and it has exhibited a continuing rise in recent years. Similarly, other developed country like Japan also shows a rising tendency in the final consumption rate. Upper middle-income country like Brazil has maintained high final consumption rate without palpable gap compared with the United States. Other emerging economies such as Malaysia and India are lower than the advanced countries but they are higher than China. More specifically in recent years, China's final consumption rate is notably less than developed countries (the United States and Japan) by more than 30%, whereas less developed countries such as Malaysia and India by about 15-20%. This is not only reflected in the comparison with high-income countries, but also with East Asian and South Asian countries with economies similar to China's. Furthermore, take Brazil for example—which has quite similar development level to that of China, its final consumption rate exceeded China's by more than 30% too in 2013. At the world level, the average final consumption rate—which stabilizes at around 76-78% between 1980 and 2013—has been higher than China. The gap indeed has gradually widened.

Table 3-6 depicts the international comparison of government consumption rate. It is evident that China's government consumption rate is the lowest among the countries in this comparison. On the whole, the average world's government consumption rate has been consistently at 15-18%. The ratio in China is higher than that of India and Malaysia, but it is

Table 3-5 International comparison of final consumption rate (%)

	1980	1990	2000	2005	2010	2011	2012	2013
Word	76	76	77	76	78	78	78	78
China	66	62	63	53	50	51	50	50
Brazil	—	78	84	79	79	79	81	82
India	85	87	77	69	67	67	70	70
Malaysia	70	66	54	55	60	60	63	65
Korea	78	66	65	65	64	66	66	66
Japan	69	67	74	76	79	80	81	82
United States	77	80	80	82	85	85	85	83

Source: World Bank, URL: http://data.worldbank.org/ (retrieved on 11 October 2014)

Table 3-6 International Consumption of government consumption rate (%)

	1980	1990	2000	2005	2010	2011	2012	2013
Word	15	17	15	17	18	18	18	18
China	15	12	16	14	13	13	13	14
Brazil	—	19	19	19	19	19	19	20
India	10	12	13	11	11	11	11	11
Malaysia	16	14	10	11	12	13	14	14
Korea	12	11	11	13	14	15	15	15
Japan	14	13	17	18	20	20	20	21
United States	16	16	14	15	17	16	16	15

Source: Ibid.

Table 3-7 International consumption of household consumption rate (%)

	1980	1990	2000	2005	2010	2011	2012	2013
Word	61	59	62	59	60	60	60	60
China	51	50	47	39	37	38	37	36
Brazil	—	59	65	60	60	60	62	62
India	75	65	64	58	56	56	59	59
Malaysia	54	52	44	44	48	47	49	51
Korea	66	55	54	52	50	51	51	51
Japan	55	53	57	58	59	60	61	61
United States	61	64	66	67	68	69	69	68

Source: Ibid.

less than that of the United States, Japan and Brazil. Regarding the household consumption rate, China's is lower than that of other countries.

Table 3-7 indicates that China`s household consumption rate has declined from 51% in 1980 to 36 % in 2013. Other countries in this comparison have not fluctuated so dramatically but their rates have remained generally relatively stable over the same period of time. In addition, in the last decade, it is quite notable that the gap between China and world average

was more than 20%. Compared with Malaysia and India, China's rate was lower by more than 15% in 2013. These facts suggest that the direct reason for China's lower consumption rate lies on the country's low household consumption rate.

3-3. Reasons for China's low consumption rate

The final consumption rate consists of the household consumption rate and government consumption rate; the former comprises rural and urban household consumption rates. Thus a change in any one of three factors leads to a direct fluctuation in the final consumption rate. Table 3-8 shows the proportion of government consumption rate and household consumption rate with respect to the final consumption rate between 1978 and 2013 in 2010 prices. The following trends are apparent from the figures. Firstly, government consumption rate has increased but household consumption has declined during the period. Secondly, rural household consumption rate was higher than that in urban areas until the end of 1980s.

Table 3-8 Government and household consumption (1978~2013, 100 million RMB in 2010 prices)

	Govern-ment	Household	Rural	Urban	Govern-ment	Household	Rural	Urban
1978	480.0	1,759.1	1,092.4	666.7	21.4	78.6	62.1	37.9
1985	1,298.9	4,687.4	2,809.6	1,877.8	21.7	78.3	59.9	40.1
1990	2,639.6	9,450.9	4,683.1	4,767.8	21.8	78.2	49.6	50.4
1995	8,378.5	28,369.7	11,271.6	17,098.1	22.8	77.2	39.7	60.3
2000	15,661.4	45,854.5	15,147.4	30,707.2	25.5	74.5	33.0	67.0
2005	26,398.8	72,958.6	19,958.4	53,000.3	26.6	73.4	27.4	72.6
2010	53,356.3	140,758.4	31,974.6	108,784.0	27.5	72.5	22.7	77.3
2011	63,154.9	168,956.4	38,969.6	129,987.0	27.2	72.8	23.1	76.9
2012	71,409.0	190,584.3	43,065.4	147,519.2	27.3	72.7	22.6	77.4
2013	79,978.1	212,187.2	47,113.5	165,074.0	27.4	72.6	22.2	77.8

Source: National Bureau of Statistics of China, *China Statistical Yearbook 2014.*

Between 1978 and 2013, the mean value of the proportion of government consumption rate was 24.3%, and the standard deviation was 2.3%. That is to say, this proportion is nearly

stable and the range of change was within 2.3%. Similarly, the mean value of the proportion in terms of household consumption rate was 75.7% and its range of change was 2.3% too. Regarding the proportion of rural and urban household consumption rate, the mean value was 41.5% and 58.5%, respectively, whereas both components share the same level of standard deviation, i.e., 14.6%. This implies that although incomes have increased in household sector, both in rural and urban areas, its consumption rate between 1978 and 2013 has deviated downward from the mean value substantially. This is the underlying factor that caused the low household consumption rate in China.

The household consumption rate is the proportion of the household final consumption expenditure (C) in GDP by expenditure approach. Accordingly, we can divide the household consumption rate into two parts via decomposition analysis. In other words, multiplying the proportion of household final consumption expenditure (C) and household gross income (I) by the proportion of household gross income (I) to GDP, i.e., household consumption rate is expressed as $\frac{C}{I} x \frac{I}{GDP}$. For the first term, using annual living expenditure per capita of urban (or rural) households as C and using annual disposable income per capita of urban households (or rural households) as I, the movement of average propensity to consume of Chinese households is derived. The results of this computation are shown in Table 3-9.

We can find that average propensity to consume of urban household experienced a declining process in the past generally. Furthermore, the declining range of urban area is much larger than that of rural area. It seems that the average propensity to consume of urban area dropped more rapidly after China's accession to the WTO. Maybe due to the high prices in the real estate, the residents tended to increase their savings for the house purchasing. On the contrary, rural area appeared stable in the same period. Compared with urban area, the average propensity to consume in rural households has declined in these periods. From 1980 to 1999 it maintained a declining tendency. After that, it rose from 0.71 in 1999 to 0.79 in

2006. And then it declined again, but never returned to the lowest value of 0.71 in 1999. The average propensity to consume of urban and rural households has experienced a downtrend as a whole. The reasons for the change of households' consumption propensity were related strongly to a series of changes that arose from the reform of economic institutions in China.

Table 3-9 The change of average propensity to consume in China

	Urban household			Rural household		
Year	Expenditure per capita (RMB)	Disposable income per capita (RMB)	Average propensity to consume	Expenditure per capita (RMB)	Disposable income per capita (RMB)	Rural area
1980	412	478	0.86	162	191	0.85
1990	1,279	1,510	0.85	585	686	0.85
2000	4,998	6,280	0.80	1,670	2,253	0.74
2005	7,943	10,493	0.76	2,555	3,255	0.79
2010	13,472	19,109	0.70	4,382	5,919	0.74
2011	15,161	21,810	0.70	5,221	6,977	0.75
2012	16,674	24,565	0.68	5,908	7,917	0.75
2013	18,023	26,955	0.67	6,626	8,896	0.74

Source: Ibid.

First of all, the social security system in China has not been fully realized. This is why households are more motivated to achieve precautionary savings (Qin 2003; Gao and Jin 2006). An increase in precautionary savings would lead to a decrease in propensity to consume. Economists who study the theory of precautionary savings point out that such behavior is caused by the uncertainty regarding household's income. In fact, the uncertainty that increased rapidly in the shift from a planned economy to a market economy aggravated the precautionary psychology of consumers.

Consumers have rationally chosen to reduce their current consumption and to raise their long-term precautionary savings in tandem with the uncertainty created by the competitions in the market-based economic environment. In the 1990s, economic reforms, such as the reform

of the housing, medical care, and education systems, were implemented gradually, thereby induced higher self-responsibility for consumption expenditure of urban households.

First, government and employers previously provided support for long-term consumption in the form of housing and education provisions. As reform has proceeded, these financial supports have been removed gradually. As a consequence, the households' income was used not only for current daily consumption, but also for their long-term consumption expenditures. That is to say, the uncertainty of the future consumption expenditure increased significantly. At the same time, a sound social security system has not been established. Thus due to high uncertain risks, households have had to reduce their current consumption expenditure and to raise savings to keep away the possible large cash expenditures in the future. For rural households, the income they earn is not only to ensure necessary consumption expenditures, but also to buy inputs for the agricultural farming. Furthermore, in the vast rural areas, social security is virtually nonexistent for a long time. Old life securities wholly rely on rural households themselves. In order to ensure old life securities, farmers had to reduce current consumption expenditures and increase savings. Thus, it is the precautionary saving motive and the underdeveloped social security system that causes the decline in the consumption propensity of rural households.

Second, a growing gap in income distribution, not only between urban and rural households, but also among urban households and rural households, has led to the decline of average propensity to consume. Table 3-4 shows that the income gap had been widening gradually between rural and urban household consumption. The gap has reached about a factor of three in 2013. Actually, data about all kinds of benefits for urban households were not sufficiently collected, hence the actual income of urban households should be higher. But for rural households, the data refer to net incomes. Then, this ratio should be higher than 3.1 as depicted in Table 3-4. According to the Keynesian theory, the marginal propensity to

consume is diminishing. That is to say, the high-income stratum is inclined to raise savings rather than spent on consumption. These low-income consumers have the intent to consume but they do not have enough money. Conversely, high-income households are affordable for their level of consumption, but they prefer more saving and make more investment in tangible assets. As a result, the household consumption propensity has declined gradually.

Lastly, the liquidity constraint is another important reason for the decline of household consumption propensity in China. Consumption credit in China has developed gradually against the backdrop of an imperfect credit system (Luo and Liu 2005). Initially there was to some extent, constraints of the system. This would lead to a risk of information asymmetry when banks supply credits. That problem may cause a further short of credit supply. Low incomes would lead to stressfulness for consumption credit repayment. Then it constrains credit from playing a role in stimulating consumption. Furthermore, laws and regulations on the consumption credit are underdeveloped. Banks therefore face a higher risk, which constrains the development of the consumption credit facility. These conditions hamper the development of consumption credit in China and consequently they created households' liquidity constraints.

Without liquidity constraints, households' consumption propensity would definitely rise. When households have liquidity constraints, they use only their current income. Once they expect liquidity constraints, they reduce their consumption and increase their savings. If the consumption credit was made available, they could increase current consumption and use their future income to pay for credit. This indeed has practical implications for Chinese households under present circumstances because the consumption structure has been improved step by step, and expenditures for housing and education are major items of future expenditures. Ordinary consumers have to save for a substantial period of time in order to be able to purchase durable consumer goods and housing. Although some financial supporting

systems, such as the housing fund, have been improved, urban households still must save most of their income in order to buy a house because they do not have enough consumption credit. This is especially true given the recent increase in the housing prices in China. In addition to liquidity constraints, they would have to save as much money as possible and reduce their consumption expenditure. It is clear that this could decrease households' consumption propensity.

3-4. The stimulation of household consumption

As discussed earlier, although the overall household consumption rate is showing a declining trend, the consumption expenditure in absolute monetary terms have expanded quite impressively especially since the beginning of the 2000s. Chinese people buying of durable and non-durable consumer goods have been continuously expanding. The penetration of household appliances, information and communication related digital products, automobiles and the tendency for leisure, cultural activities as well as health consciousness have all risen astoundingly. Even despite the global economic slowdown resulted by subprime crisis in 2008, the enthusiasm to consume by the middle class Chinese has not completely dampened. Hence for this reason and also continuous long-term prospects, China's consumer market has attracted great attention from around the world.

The consumption expenditures in urban areas have a higher growth rate than that in rural areas. In current prices, annual consumption expenditure per capita in the urban areas increased 14 times, from 1,279 RMB in 1990 to 18,023 RMB in 2013. The rural areas increased 10 times, from 585 RMB to 6,626 RMB in the same period (Table 3-9). Urban and rural gap in consumption expenditures is about 2.7 times in 2013. At the same time, the growth rate in household consumption expenditure has actually surpassed other countries, which has narrowed the gap between China and the rest of the world. From 1978 to 2011, the

average annual consumption growth rate of the U.S., Japan and the European Union was 6.3 %, 5.9% and 5.9%, respectively. From this point of view the criticism about China`s low consumption seems not reasonable. In addition, along with the growth in consumption expenditures, the composition of consumption expenditures of Chinese urban and rural residents had shifted from the desire for life necessities to durable consumption goods and to pursue of services. In other words, the rise of consumption expenditure level in China not only has caused the change in composition of goods and services but also in terms of higher penetration rates in higher value added durable goods.

(1) The change of Engel coefficient

Engel coefficient is an important indicator for measuring the living standards of a country. It measures the proportion of a household's or an individual's disposable income spent on food. Generally, a lower figure reflects a higher standard of living. A large Engel coefficient means a poorer state of living standard because a large portion of the disposable income is spent on food. In contrast, a small Engle coefficient implies that a family or a household has more money to spend on other items beside their basic needs for food, hence a higher living standard.

In 1978, the Engel coefficient for urban and rural residents was 57.5% and 67.7%, respectively. By 2013, it had decreased to 35% and 37.7%, respectively (Table 3-10). It is worthy to say that the consumption on food should not be regarded as a mere food demand at home. The rise of disposable income in recent years has motivated many people to eat out for their lunches or dinners or as a means for get together among friends or relatives. This is not to appease the hunger but a common kind of luxury consumption. This type of expenditure might not necessarily be captured in the food category in household survey. Hence household

survey might not reflect people`s actual expenditure on food correctly. As such, to some extent in reality, people`s food consumption level could be higher than what the statistical data portrays.

In order to understand Chinese people`s behavior of food consumption expenditure, it is necessary to make an observation on the composition of their food expenditure. Especially, the change in consumer preference along with the continuous rise in disposable income has dramatically changed food consumption patterns in Chinese urban areas. A large number of Chinese urbanites frequently eat out than before. Figure 3-3 shows per capita expenditure of dining out and self-catering in major Chinese cities. The expenditure on dining out took up more than 25% of their total amount spending on food in every region. This high rate of dining out has exceeded that of Japan[24]. Furthermore, Shanghai`s people spent 2,598 RMB on dining out that accounted for 28% of their food expenditure. Both the value and the ratio are higher than any other cities in this comparison. Since Shanghai`s people`s household income is the highest, it is plausibly correct to predict that along with the increase of income, Chinese people prefer to spend more on dining out.

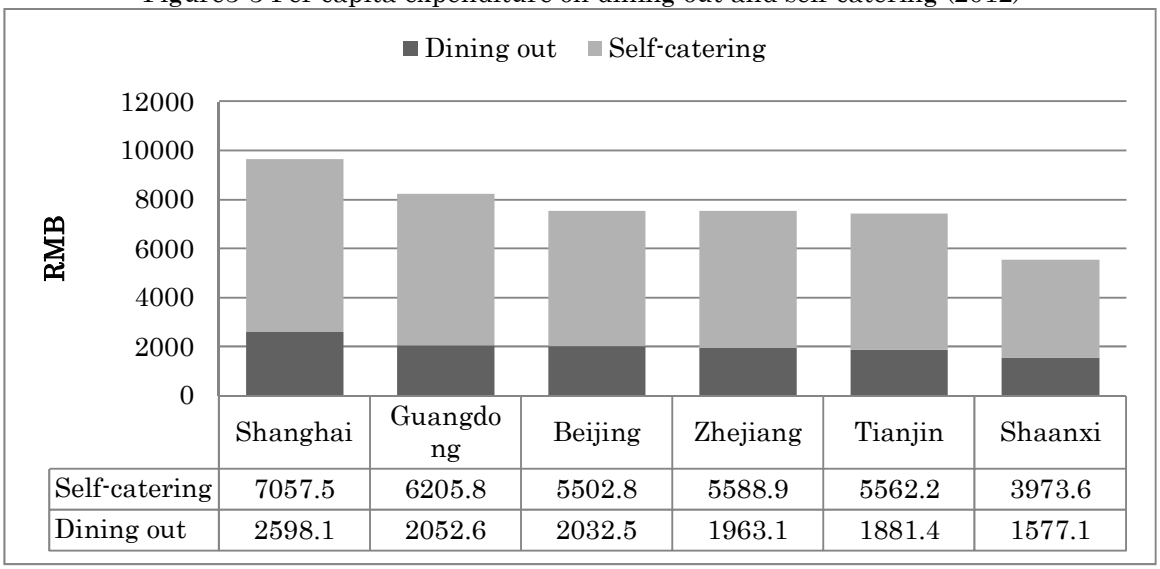
Table 3-10 Per capital disposable income and Engel coefficient

	Per Capita Disposable Income of Urban Households		Per Capita Disposable Income of Urban Households		Engel`s Coefficient of Urban Households	Engel`s Coefficient of Urban Households
	Value (RMB)	Index	Value (RMB)	Index	(%)	(%)
1978	343.4	100.0	133.6	100.0	57.5	67.7
1990	1,510.2	198.1	686.3	311.2	54.2	58.8
2000	6,280.0	383.7	2,253.4	483.4	39.4	49.1
2005	10,493.0	607.4	3,254.9	624.5	36.7	45.5
2010	19,109.4	965.2	5,919.0	954.4	35.7	41.1
2011	21,809.8	1,046.3	6,977.3	1,063.2	36.3	40.4
2012	24,564.7	1,146.7	7,916.6	1,176.9	36.2	39.3
2013	26,955.1	1,227.0	8,895.9	1,286.4	35.0	37.7

Source: Ibid.

[24] The spending on dining out by Japanese took up 16.9% of food expenditure in 2010. And the share of takeout and ready-made was calculated besides. See Fukui, Nakamura and Kuranuki (2013).

Figure3-3 Per capita expenditure on dining out and self-catering (2012)



	Shanghai	Guangdong	Beijing	Zhejiang	Tianjin	Shaanxi
Self-catering	7057.5	6205.8	5502.8	5588.9	5562.2	3973.6
Dining out	2598.1	2052.6	2032.5	1963.1	1881.4	1577.1

Source: The data of dining out are cited from The Statistics Portal. The self-catering part is calculated according to *China Statistical Yearbook 2013*.

(2) The composition of household consumption expenditure

Before systemic reform in China, household consumption expenditures focused on "food" and "clothing". Especially, the expense of food took up most of the household expenditures. However, after the inception of systemic transformation, the composition of people`s consumption expenditures has changed remarkably due to the continuous rise in disposable income. Owing to the introduction of the social security system in the second half of 1990s, the urban residents` propensity to consumer was further stimulated. Urban residents spend less on basic daily needs but consume more on digital related products, housing, medical care, education, entertainment and other services.

Table 3-11 compares the changes in per capita disposable income and the compositions of household consumption expenditure between 1990 and 2013. During the period, per capital disposable income and consumption expenditures have increased by about 20 and 14 times, respectively. Most notably, expenses for transportation and communication, medical and clothing have expanded about 68, 44 and 35 times during this period. Put differently, in 1990s,

urban people spent more than 60 percent on basic living needs like food and clothings. Other consumption expenditure categories amounted to less than 40 percent. In present days, the expenditure structures have changed noticeable.

The proportion of expenditure on necessities goods such food and clothing has decreased significantly. Instead, the proportion of the consumption on the items of "transport and communication", "education, culture and recreation", and "health care and medical service" has increased significant. Equally impressive, per capita saving has expanded about 49 times and saving rates rose from 16% in 1990 to 39% in 2013, which implies the inclination to save by the Chinese urbanite has risen quite remarkably.

Table 3-11 Per capita disposable income and expenditures in urban areas (1990~2013, current prices, RMB)

	1990 (A)	2000	2010	2013 (B)	(B)/(A)
Disposable income (E)	1,516.2	6,295.9	21,033.4	29,547.1	19.5
Expenditures (F)	1,278.9	4,998.0	13,471.5	18,022.6	14.1
Food	683.8	1,971.3	4,804.7	6,311.9	9.2
Clothing	179.9	1,871.3	4,804.7	6,311.9	35.1
Housing utensils	108.5	374.5	908.0	1,215.1	11.2
Housing	60.9	565.3	1,332.1	1,745.1	28.7
Medical	25.7	318.1	871.8	1,118.3	43.5
Transportation and communication	40.5	427.0	1,983.7	2,736.9	67.6
Education and culture	112.3	669.6	1,627.6	2,294.0	20.4
Other expendituress	66.6	171.8	499.2	699.4	10.5
Disposable income	1,516.2	6,295.9	21,033.4	29,547.1	19.5
Saving ((E)-(F))	237.3	1,297.9	7,561.9	11,524.5	48.6
Saving rate ((E)-(F)/(E))	0.16	0.21	0.36	0.39	

Source: Ibid.

3-5. The inequality in consumption expenditure

The level of household income with respect to the consumption expenditure has lifted impressively but at the same time the inequality in consumption expenditure has also become more conspicuous. This inequality appears not only between urban and rural residents, between the different income groups, but also between different regions. Especially, the gap

of urban-rural in China is persistently accounted for a widened disparity of income. Part of this reason is the result of the institutional legacies of socialism, viz., a strict residential permit called as *hukou*[25] system. Because of these kinds of economic and social systematic factors, the inequality of consumption expenditures has become more serious, which has increasingly required more attention from the policy makers.

(1) The level of consumption expenditure gap between urban and rural residents.

Per capita household expenditure of urban area in 1980 was 412 RMB but it had increased to 18,023 RMB in 2013. Contrary, in rural area this value had enlarged from 162 RMB to 6,625 RMB (Table 3-9). By calculation, in 1980 the per capita household expenditure in urban areas was 2.5 times of that in rural areas. After 35 years this figure had risen to 2.7, which seemed the gap had not enlarged evidently. But if compared in terms of the gap of per capita household expenditure between urban and rural area, the gap had indeed widened noticeable. The average expenditure of an urban family was 250 RMB larger than that of a rural family in 1980. By 2013 this difference has reached to 11,397 RMB, which means this gap has increased 45 times. Comparing the growth of consumption expenditure between urban and rural areas, the average per capita consumption in urban area has grown steeply. By contrast, that rate in rural area has grown comparatively slow. In other words, the grow rate of the average per capita consumption in urban area is visibly faster than that in rural area. This result implies a widening tendency about household consumption gap between urban and rural area.

With the large difference in disposable income and consumption expenditure, it is reasonable to argue that a gap has caused a disparity of the living standard between urban and

[25] *Hukou* is a record in the system of household registration required by law in China`s inland and Taiwan. The system itself is more properly called "*huji*", and has origins in ancient China.

rural residents. Engel coefficient is an effective tool that can measure the living standard of people. In 1978, the Engel coefficient for urban residents was 0.56 and 0.68 for rural citizens. By 2013, the Engel coefficient for urban citizens had decreased to 0.35, whereas it was 0.38 for rural residents. This tendency suggests that the disparity of living standard has shrunk substantially. However, this observation is not sufficiently convincing. As Engel coefficient is not likely to drop unlimitedly and always at a fast speed. Observing the change of Engel coefficient in the past, it has dropped with a state of deceleration. In addition, actually in urban area it had dropped to 0.38 in 2002, whereas the rural area attained this level in 2013. For this reason, it is not exaggerated to contend that the living standard of rural residents lagged about 10 years behind comparing with urban area.

(2) The disparity among different regions in China

Table 3-12 shows the per capita disposable income and expenditure of 2011 in four major regions. Comparing the four regions the disparities and their respective characteristics can be derived. The disposable income in eastern area was 26,406 RMB. On the contrary, this item in the other three regions was at quite a similar level but less than national average figure of urban areas. Moreover, the consumption expenditures in these three regions (Central, Western and Northeastern) were also at quite the same magnitude. It is worth noting that the people in northeastern China spent 1,145 RMB on health and medical cares that was distinctly higher than any other areas including eastern China (1,033 RMB) on this consumption item. With respect to the ratio of each consumption items, each area appeared to have a different preference. The per capita expenditure on "transport and communication" and "education and recreation" in eastern China took up 16% and 13% of the total expenditures, respectively. For the former item, it was 12%, 13% and 12 % in central, western, and northeastern, respectively. For the later item, the figure was 12%, 11%, and 11%, respectively. Since the people`s

disposable income in eastern China was much higher than other three regions, besides the basic living needs, they preferred to spend much more on the luxury consumption.

On the other hand, the income was not sufficiently high for the people in other regions to afford luxury goods as much as eastern region, since they have to maintain their expenditure on necessary consumption. It seems that there were no significant consumption gaps among the four regions. But, if observations are made on different provinces or cities, inequality in consumption expenditures across provinces and major cities is quite apparent. In order to put this into perspective, we selected ten regions from the four regions to make a comparison of consumption expenditures in 2013. The results are showed in Table 3-13 and Table 3-14. The former represents the urban areas, and the latter is rural areas. Furthermore, we have also made an inter-temporal comparison of urban regions over the past two decades in Table 3-15.

Firstly, regarding urban areas, the disparity was very large with respect to the expenditures especially on the item of "transport-communication" and "education-recreation". The total expenditure in Shanghai and Beijing was more than 2 times larger than that of Shanxi. It was also quite low in Hebei, Guizhou and Qinghai, with respective value of 13,641 RMB, 13,703 RMB and 13,540 RMB less than half of that in Shanghai but slightly more than half of those items in Beijing. With regard to the item of "transport and communication" and "education and recreation", the per capita expenditure was very high in Beijing, Shanghai and Guangdong. On the contrary, it was very low in Shanxi, Guizhou and Qinghai. For instance, Guangdong`s per capita expenditure on the item of "transportand communication" is 4,544 RMB, which is 2.5, 2.4 and 2.6 times of that in Shanxi, Guizhou and Qinghai, respectively.

Secondly, from Table 3-14, we find the gaps among different regions in rural area were larger than the urban area. The per capita total expenditure in Beijing's and Shanghai's rural area was 10,155 RMB and 14,235 RMB, respectively. The total expenditure was 2.3 times of that in Shanxi with a value of 5,823 RMB, and 2.8 times of that in Guizhou with a value of

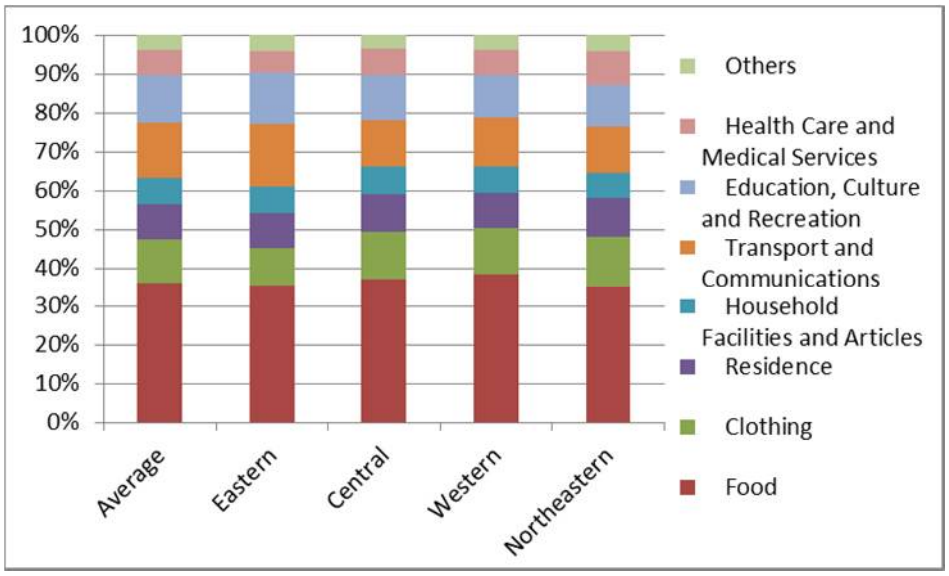
4,740 RMB. With respect to the item of "transport and communication" and "education and recreation", the per capita expenditure was also higher in Beijing, Shanghai comparatively. However, this item's expenditure was quite low in Shanxi and Guizhou. Nevertheless, the gaps in rural area were much larger than in urban area. For instance, Shanghai's per capita expenditure on the item of "transport and communication" was 1,719 RMB, which was 3.5 times of that in Guizhou with a value of 490 RMB. As for the item of "education and recreation", the per capita expenditure in Beijing was 1,331 RMB, reaching 4.4 times of 490 RMB in Guizhou.

Table 3-12 The Expenditure in Different Regions (2011, RMB)

Item	Average	Eastern	Central	Western	Northeastern
Disposable Income	23979	26406	18323	18159	18301
Total Expenditure	15161	17870	12647	13336	13491
Food	5506	6329	4711	5122	4730
Clothing	1675	1755	1536	1618	1779
Residence	1405	1635	1235	1162	1339
Household Facilities and Articles	1023	1205	871	916	842
Transport and Communications	2150	2838	1534	1700	1643
Education, Culture and Recreation	1852	2360	1476	1447	1443
Health Care and Medical Services	969	1033	856	880	1145
Others	581	714	429	491	571

Source: National Bureau of Statistics of China, *China Statistical Yearbook 2012.*

Figure 3-4 The Ratio of Each Expenditure Item in Different Region (2011, RMB)



Source: Ibid.

Table 3-13 Per capita consumption expenditure of urban residents (2013, current prices, RMB)

Region	Consumption Expenditure	Food	Clothing	Housing	Housing utensils	Transportation and Communication	Education and Culture	Medical	Other expenditures
Average	18,023	6,312	1,902	1,745	1,215	2,737	2,294	1,118	699
Beijing	26,275	8,170	2,795	2,126	1,974	4,106	3,985	1,718	1,401
Tianjin	21,712	7,943	1,951	2,089	1,206	3,469	2,353	1,694	1,007
Hebei	13,641	4,405	1,488	1,526	977	2,150	1,551	1,117	426
Shanxi	13,166	3,677	1,628	1,612	871	1,776	2,065	1,021	517
Liaoning	18,030	5,804	2,101	1,936	1,146	2,589	2,258	1,343	853
Jilin	15,932	4,658	1,961	1,932	908	2,218	1,935	1,692	627
Shanghai	28,155	9,823	2,032	2,848	1,705	4,736	4,122	1,350	1,538
Guangdong	24,133	8,857	1,615	2,339	1,539	4,544	3,222	1,123	894
Guizhou	13,703	4,915	1,402	1,496	1,084	1,870	1,950	634	352
Qinghai	13,540	4,777	1,675	1,685	890	1,743	1,472	813	484

Source: National Bureau of Statistics of China, *China Statistical Yearbook 2014.*

Table 3-14 Per Capita Consumption Expenditure of Rural Residents (2013, RMB)

Region	Consumption Expenditure	Food	Clothing	Housing	Housing utensils	Transportation and Communication	Education and Culture	Medical	Other expenditures
Average	6,626	2,495	438	1,234	387	796	486	614	175
Beijing	13,553	4,696	1,173	2,387	898	1,452	1,331	1,167	449
Tianjin	10,155	3,540	928	1,403	599	1,816	750	733	386
Hebei	6,134	1,963	458	1,267	383	792	399	696	176
Shanxi	5,813	1,921	472	1,206	288	699	503	559	165
Liaoning	7,159	2,519	584	1,279	299	850	633	790	204
Jilin	7,380	2,438	535	1,288	273	961	691	969	223
Shanghai	14,235	5,335	771	2,260	694	1,719	964	1,991	502
Guangdong	8,343	3,737	309	1,338	474	1,041	685	502	257
Guizhou	4,740	2,036	254	981	272	490	301	302	103
Qinghai	6,060	1,872	449	1,449	315	911	270	677	117

Source: Ibid.

Through the comparison mentioned above, it is evident that the consumption inequality within rural area is much more serious than the situation within urban areas. This phenomenon is not unexplainable actually. In Beijing, Shanghai and other advanced region, the urbanization ratio is very high, and at the same time secondary industry and tertiary industry have developed impressively. Therefore rural migrants in urban areas have lots of

chance to work in these industries and consequently earn higher income than rural residents comparatively. Although the agricultural production is no longer their main livelihood, their "*hukou*" statuses divide them as rural residents, which does not reflect to the real situation. But in Guizhou, Qinghai and other provinces that are agriculture-based economy, their residents have limited chances to increase their income through the participation in other manufacturing productions. Therefore the income and consumption gaps within these rural areas are higher than those in urban areas.

Table 3-15 Per capita cash expenditure of urban households by regions（current prices, RMB）

Year	1990	1995	2000	2005	2010	2011	2012	2013
Average	1,442	3,538	4,998	7,943	13,471	15,161	16,674	18,023
Beijing	1,646	5,020	8,493	13,244	19,934	21,984	24,046	26,275
Tianjin	1,589	4,064	6,121	9,653	16,562	18,424	20,024	21,712
Hebei	1,331	3,162	4,348	6,700	10,318	11,609	12,531	13,641
Shanxi	1,169	2,641	3,942	6,343	9,793	11,354	12,212	13,166
Liaoning	1,635	3,113	4,356	7,369	13,280	14,790	16,594	18,030
Jilin	1,243	2,598	4,021	6,795	11,679	13,011	14,614	15,932
Shanghai	2,045	5,868	8,868	13,773	23,200	25,102	26,253	28,155
Guangdong	1,707	6,254	8,017	11,810	18,490	20,252	22,396	24,133
Guizhou	1,062	3,251	4,278	6,159	10,058	11,353	12,586	13,703
Qinghai	1,292	2,870	4,186	6,245	9,614	10,955	12,346	13,540

Source: Ibid.

Thirdly, by observing the change of the comparison gaps among urban areas from 1990 to 2013, we find the consumption inequality has deteriorated seriously. In 1990, the difference between the highest and the lowest per capita expenditures was 2,045 RMB in Shanghai and in Guizhou was 1,707 RMB. Their gap was 1.9 times. By 2013 Shanghai's per capita expenditure increased to 28,155 RMB, which was the highest area in China. And the lowest one was Shanxi with per capita expenditure of 13,166 RMB. The gap has risen to 2.1 times. In addition, the gap between Beijing and Liaoning has continuously enlarged, with the per capita expenditure of 26,275 RMB and 18,030 RMB, respectively in 2013, although the figures of 1,646 RMB and 1,635 RMB were very close in 1990. Similar phenomenon is also observable

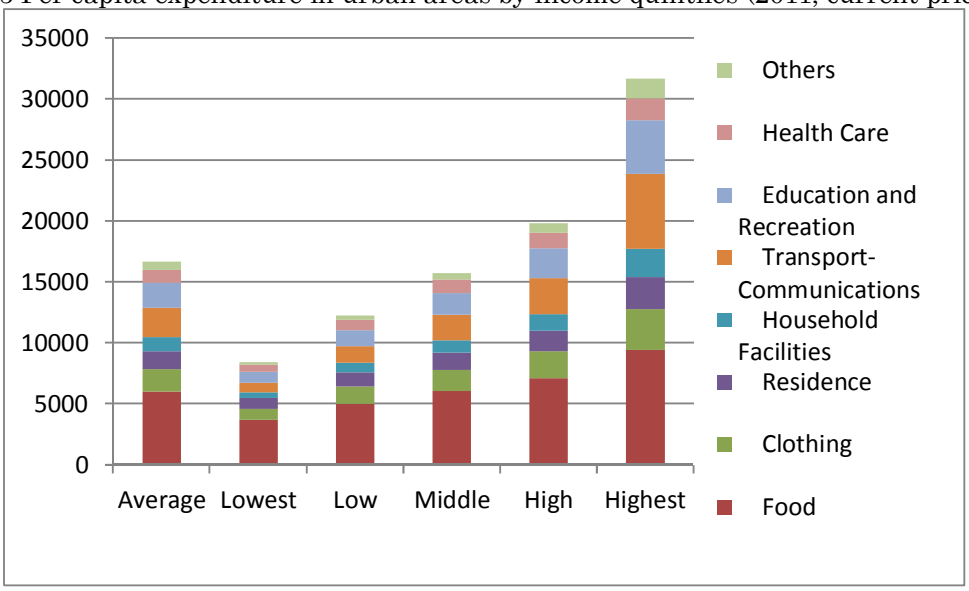
between Tianjin and Hebei, which borders one another. The expansion of consumption gaps was due to unbalanced development of economy caused by the government's policies. According to Zheng and Chen (2007), in the early stages of the reform, the Chinese government gave preferential policy treatment to coastal regions and hence greatly promoted their development. As a result, China's regional inequalities are to a great extent the cause and consequence of regional development policies by the government.

(3) The gap in consumption expenditures among income strata

Figures 3-5 and 3-6 show the consumption expenditures of urban households in 2011 by income quintiles. The disparity on expenditure patterns was also quite apparent. Moreover, the gaps within urban areas were larger than that of within rural area. However, similarities between groups of the same income level in urban and rural areas were also evident.

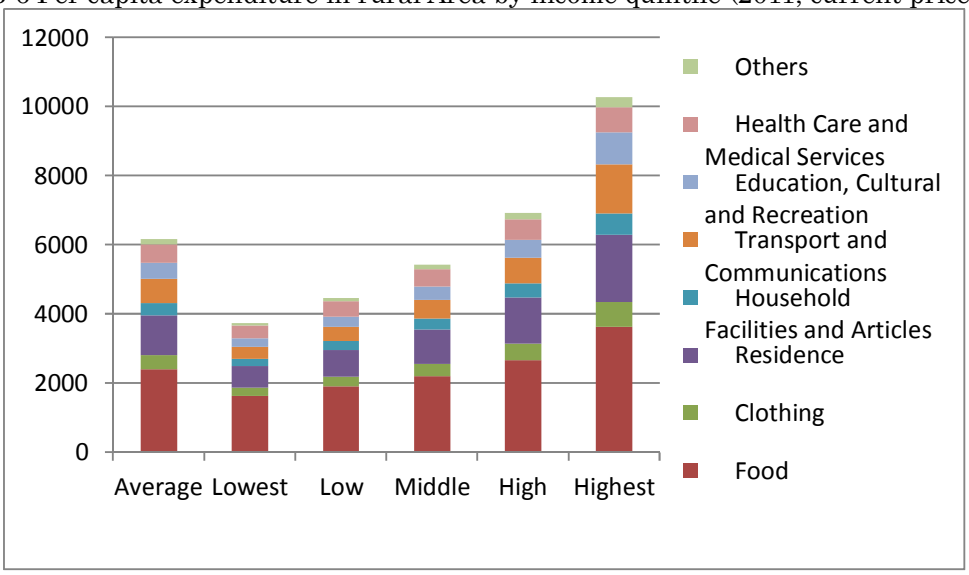
Firstly, looking into the data of urban areas, the expenditure of 31,730 RMB in top income group was 3.75 times bigger than the lowest group. With regard to expenditure categories such as "transport and communication" and "education and recreation," the gaps were quite large. The top income group spent 6,138 RMB and 4,432 RMB on each item, respectively. But in the lowest income, the expenditures in these two categories were merely 487 RMB and 779 RMB. On the other hand, the Engel coefficient in the top income group was less than 0.3, which was closed to the developed country like Japan. On the contrary, the Engel coefficient of the lowest income and that of the low-income group was 0.44 and 0.41, respectively. That means the spending on food took up more than 40% of their total expense. It is necessary to point out that the middle-income group's Engel coefficient was also 2 basis points higher than the average level of 36.2%.

Figure 3-5 Per capita expenditure in urban areas by income quintiles (2011, current prices, RMB)



Source: National Bureau of Statistics of China, *China Statistical Yearbook 2012*.

Figure 3-6 Per capita expenditure in rural Area by income quintile (2011, current prices, RMB)



Source: Ibid.

Secondly, the data of rural household shows a low standard universally. The top income strata's total expenditure was 10,275 RMB, even less than the amount of the low income strata in urban areas, whose expenditure was 12,281 RMB. Comparing with the 3,742 RMB expenditure of the lowest income group in rural areas, the multiple was 2.7 and hence that

indicates the gaps among different income groups in rural area are not as serious as that in urban area. In addition, the rural household also has a preference to spend more on the categories of "transport and communication" and "education and recreation" when the household disposable income has increased. But the disparity between different income groups is not as large as that in urban area.

According to the comparisons, the widening income gap has placed high, middle, low, and the lowest income households in urban areas on different rungs of the consumption ladder. Top income households prefer a relatively high standard of living and have an average consumption level similar to that of people in developed economies. Their consumption expenditures tend to target luxury categories such as "transport and communication" and "education and recreation." Middle-income households' consumption capacity was also lower than the average consumption standard of the society, because its Engel coefficient was also higher than the average level, which is explained above. Regarding the situation of low income households, they have to control their desire for new commodities in order to maintain expenditures for necessities. Whereas, the lowest income households were still at the subsistence stage and they were at a similar level to most rural households in terms of their consumption capacity and propensity to consume.

3-6. Major factors influencing household consumption expenditure in China

The consumption behaviour appears to show different patterns and preferences in different countries, period and under different environment. Although the income is the conclusive factor that affects the consumption expenditures, there are many other complicated elements affecting the people's consumption behavior. For example, the traditional culture, demographic factor, the process of urbanization and social systems etc. As for the income

factor, we shall examine it in the Chapter 5 and Chapter 6 through a series of empirical analyses. With respect of other important factors, the following sections provide a concise explanation.

(1) Urbanization and household consumption expenditures

China's urbanization over the past three decades has been rapid. China's urban population rose from less than 20% in 1978 to 53% in 2012, an increase of more than 500 million urban residents. The increasing number of urbanites created huge potentials for the expansion in consumption expenditures as the average income of urban residents is more than three times of rural people. For instance, in 2013 per capita disposable income in urban areas was 26,955 RMB, whereas it was 18,023 RMB in rural area (Table 3-9).

Urban residents' average revenue is 3 times bigger than in rural area. As a result, the multiple of per capita expenditure in urban area and rural area is also high, with former at 18,023 RMB and latter value of 6,626 RMB. We could not deny that the high standard of consumption expenditure is led by a high disposable income in urban areas compared with the rural area. The consumption structure is affected by life styles, and urbanites' life style can arouse desires that stimulate more consumption expenditures than life styles in rural areas. Even with the same disposable income, the households' propensity to consume in cities should be higher than villages in general. Therefore we can anticipate that along with the acceleration of urbanization, more people will achieve higher level of disposable income and that will trigger higher consumption expenditures.

Although China's urbanization is without precedent in absolute terms, the increase in its urbanization rate has not been exceptional when compared to other countries, according to the

findings of a joint study between the State Council Development Research Center and the World Bank[26]. In fact, the speed of urbanization in China has been lower than that of late industrializers such as Japan and the Republic of Korea at comparable stages of development, but faster than that of the United States and the United Kingdom in the past. Moreover, China's urbanization still remains incomplete. About 260 million residents living in urban areas, known as migrants, who lack urban *hukou*, which is the urban registration that determines the entitlement for the access to urban public services and social security.

(2) The *hukou* system and consumption expenditures

Urban and rural differences arise in part from China's household registration or *hukou* system, which was established during the Maoist era. The *hukou* system is an internal passport system that was initially adopted in the late 1950s to control domestic population movements, especially from rural to urban areas. For many years, individuals who wished to move their place of residence were required to apply to the relevant authorities for permission, and approvals were tightly controlled. Since the mid-1990s, the *hukou* system has undergone a series of reforms that have led to a reduction in constraints on geographic mobility and hence the rapid increase of rural-urban migration. In fact, earnings from migrant work have become an important source of income in rural areas, contributing to rural income growth and moderating the urban-rural income and consumption gap.

Nevertheless, *hukou* restrictions have depressed consumption demand of the migrant residents from rural areas. The average propensity to consume is found to be substantially lower for migrants (Dreger, Wang and Zhang, 2014). Since they are not likely to settle in city permanently, generally they have a tendency to restrict their consumption expenditure relative

[26] Development Research Center of the State Council, the People's Republic of China & The Word Bank (July, 2014), *Urban China: Toward Efficient, Inclusive, and Sustainable Urbanization*, p. 5.

to housing and children's education. People without urban *hukou* are excluded from receiving full public sector supports including education. Children of migrants are often not allowed to enroll in urban public schools, so they must live with their grandparents or other relatives to attend school in their hometowns or villages.

Table 3-16 Urbanization and per capita consumption expenditure

year	urbanization rate	income		consumption	
		urban	rural	urban	rural
1985	23.71	739	398	673	317
1990	26.41	1510	686	1279	585
2000	36.22	6280	2253	4998	1670
2010	49.95	19,109	5919	13,472	4382
2011	51.27	21,810	6977	15,160	5221
2012	52.57	24,565	7917	16,674	5908

Source: National Bureau of Statistics of China, *China Statistical Yearbook 1990~2013*

(3) The social security system and consumption

The household consumption rate has been rising in the past three decades. Similarly, China's household saving rate has increased from 12% in 1982 to 32% in 2012, which has attracted much attention from policy maker and economists. This phenomenon, to a certain degree bears relationship to the social security system. In China, social security coverage was not universal, but instead covered only qualified companies' staff and workers, and civil servants in urban areas. The rural residents are generally excluded from this social security system.

From the experiences of many developed countries, a universal coverage of social security system can stimulates higher level of household consumption. As the state provides allowances to low-income people, it enables the lower income social groups to have a greater affordability in consumption expenditures, thus raising more domestic demand. But in a society lacking the social security system, its citizens inevitably have to save money for life after retirement, medical treatment and other worries, and consequently these factors restrict

their consumption expenditures. Social security does indeed reduce private savings and increase household consumption, which was substantiated by Feldstein (1996). Equally important, social security is also an important means for regulating the distribution of income, which should be tilted to the groups with a higher marginal propensity to consume (such as urban and rural disadvantaged groups). It is crucial to expand the coverage of rural subsistence allowances, which should be institutionalized and gradually increase the level of protection, can certainly play a positive role in the improvement on consumption level of urban and rural residents in China (Zhao and Li, 2013). Because households that have social security coverage tend to spend more in consumption, Chinese government ought to establish an effective social security system on one hand, and expand its provision levels of rural subsistence supports on the other hand.

3-7. Summary

This chapter has concisely reviewed household consumption expenditures from several dimensions: overall trends since the inception of reform and open door policies; international comparison to show that the level of China's consumption expenditures is low when it is compared with other countries either advanced or less developed one; the change in household consumption expenditures by Engel coefficient and structural change; inequality in consumption expenditures in terms of urban and rural gap, between regions and between income strata; three key factors, viz., urbanization, *hukou* system and lack of social security system, that are influencing household expenditures in China.

This chapter has attempted to include other non-income factors in explaining the changes and progress of household consumption expenditures in China. The objective of this thesis is to examine how income and price changes—which are the fundamental determinants of the

consumer behavior in microeconomics—in key consumption expenditure items that influence individuals' or households' choices in consumption. The detailed empirical analyses and discussion of those findings will be dealt with in Chapter 5 and 6.

Chapter 4 Analytical Framework

The purpose of this thesis is to investigate empirically how individuals or households in Chinese urban areas behave in making decision for their consumption expenditures with respect to changes in prices of goods/services and also changes in their disposal income. For this purpose, Chapter 2 has reviewed major representative studies that explain the formulation of theoretical foundations and their usages in econometrical analyses. From the literature review, this study has chosen AIDS propounded by Deaton-Muelbauer (1980) as the econometric specification in estimating the income elasticity of demand, own-price elasticity of demand and cross-price elasticity of demand for eight categories of household consumption expenditures.

This chapter explains the formulation of the analytical framework that is to be used in Chapter 5 and Chapter 6. The chapter comprises following sections. Section 1 defines the key questions that this empirical study seeks to answer. Section 2 explains the main assumptions for this study. Section 3 sets the conventional theoretical perspectives of elasticity of demand, income and substitution effects that determine the parameters this study intends to estimate. Section 4 provides the model specifications of the econometric analyses. Section 5 describes the considerations for estimation techniques to be used in this model. Section 6 provides a list of parameters that are to be estimated. The last section summarizes this chapter.

4-1. Key research questions and analytical focus

This empirical inquiry raises at least two important questions with regard to the consumer behaviour in China. Firstly, how prices have affected the consumer's preference among different goods? Secondly, how does the income level affect the consumer behaviour of each

stratum? Additionally, how the empirical evidences can help to shed light on how consumer demand theory postulates the consumer behavior in China when it is expected that people's income will continue to change.

The literature review in Chapter 2 suggests that both problems have not been adequately explored in China. In order to compensate this lack of information, this empirical study intends to reveal the consumption pattern in Chinese urban areas. In view of this, this investigation uses three different data sets of individual/household consumption expenditures for econometric estimations. These estimations focus on eight major consumption categories, viz., "food", "clothing", "household utensils", "housing", "medical care", "transportation and communication", "education, culture and recreation", "other expenditures." The eight categories were chosen in order to keep a consistency with National Bureau of Statistics of China's survey on household consumption expenditures.

The first data set is a cross-section data compiled from questionnaire surveys conducted in in 2010 in four major cities, viz., Beijing, Shanghai, Tianjin, and Qingdao (BSTQ). In addition, for the purpose of comparing BSTQ and other Chinese urban areas, a second data set compiled from the time-series aggregated data of Chinese urban household incomes and consumption expenditures between 1992 and 2012 is used. The third data set is a panel data set (from January 2009 to December 2011) compiled from the surveys of household consumption expenditures in Changchun city.

4-2. Main assumptions in this study

For the purpose of econometric analysis, this study incorporates the following three main assumptions in formulating the analytical model.

Firstly, this study assumes that each individual or household has the same utility

function. The same property also applies to aggregated individuals or households at national economy level.

Secondly, the model specification assumes that income and price are the variables that determine consumption expenditure of all categories of consumption items being used in the analyses.

Thirdly, this investigation assumes similar demographic characteristics across China and its urban areas throughout the country.

4-3. Elasticity of demand, income and substitution effects

In order to answer our key research questions, as defined in the preceding section, the empirical analysis conducts econometric estimation of income elasticity of demand, Marshallian and Hicksian own-price elasticity of demand, Marshallian and Hicksian cross-price elasticity of demand. The estimated results will be used to determine if a category of goods/services was: a necessity or a luxury good with respect to changes in income; a normal good or an inferior good, a normal good or a Giffen good with respect to changes in its own price or change in price of another good. Moreover, the estimated results are used to determine if a pair of goods was a (net) substitute or a (net) complement.

Essentially, the model specification of this empirical analysis is related to the duality of Marshallian and Hicksian demand functions. Marshallian elasticity of demand is derived from solving the Lagrangian maximization of utility function subject to the budget constraint, whereas Hicksian elasticity of demand is obtained from solving dual problem of Marshallian's utility maximization, viz., Lagrangian minimization of the budget constraint subject to the utility function. These optimization procedures are reviewed in Section 3 of Chapter 2. The movement from one optimal point of an indifference curve and a budget constraint to another

optimal coordinate induces a total effect, which is the sum of substitution effect and income effect created by Marshall and Hicksian demand functions. These movements and the resulting substitution and income effects are shown in Figure 4-1. The total effect can be expressed by the Slustky equation, which can also be defined in terms of elasticities. The Slutsky equation is derived from both the Marshallian and Hicksian demand functions.

Taking two goods as an example, Marshallian demand function postulates how a consumer faces two commodities, x_1 $(x_1 > 0)$ and x_2 $(x_2 > 0)$, with prices, p_1 and p_2. The consumer holds a budget constraint being expressed as $p_1x_1 + p_2x_2 \leq I$, where I denotes the disposable income and it satisfies the equality. The consumer maximizes utility $U(x_1, x_2)$ subject to the budget constraint. This maximization problem is expressed as follow.

$$\max_{x_1,x_2} U(x_1, x_2) \text{ subject to } p_1x_1 + p_2x_2 = I$$

The Lagragian equation is expressed in equation (4-1).

$$L = U(x_1, x_2) + \lambda(I - p_1x_1 - p_2x_2) \tag{4-1}$$

The first order condition with respect to x_1, x_2, $\mathcal{L}$, respectively, is shown from equations (4-2a) to (4-2c).

$$\frac{\delta L}{\delta x_1} = U_{x_1} - \lambda p_1 = 0 \tag{4-2a}$$

$$\frac{\delta L}{\delta x_2} = U_{x_2} - \lambda p_2 = 0 \tag{4-2b}$$

$$\frac{\delta L}{\delta \lambda} = I - p_1x_1 - p_2x_2 = 0 \tag{4-2c}$$

The solutions of the first order conditions are shown in equation (4-3).

$$U_{x_1} = \lambda p_1, \; U_{x_2} = \lambda p_2 \tag{4-3}$$

In addition, the solutions of first order condition provide a demand function known as

Marshallian demand function, and it is expressed as $M^D=(x_1^m(p_1, p_2, I), x_2^m(p_1, p_2, I))$. Substituting these solutions into the original utility function, we derive the following equation.

$$\tilde{U}^m(p_1, p_2, I)\equiv U(x_1^m(p_1, p_2, I), x_2^m(p_1, p_2, I)) \quad (4\text{-}4)$$

This equation asks to what extend utility changes with respect to changes in prices (x_1, x_2) and disposable income I. In this regard, an increase of a unit of disposable income causes the utility to increase by the Lagrangian multiplier λ, i.e., $\frac{\delta L}{\delta \lambda}=\lambda$. Furthermore, the derivatives of $\tilde{U}^m$ are expressed as follow. Maximizing $I=p_1x_1+p_2x_2$ with respect to p_1 yields equation (4-6), which was then substituted into equation (4-5b) to obtain $\frac{\widetilde{\delta U}^m}{\delta p_1}=-\lambda x_1^m$. This relation explains that if p_1 increases by a unit, then the individual or the consumer loses $-\lambda x_1^m$ of utility (a unit of utility is determined by x_1^m).

$$\frac{\widetilde{\delta U}^m}{\delta p_1}=\frac{\delta U}{\delta x_1}\frac{\delta x_1^m}{\delta p_1}+\frac{\delta U}{\delta x_2}\frac{\delta x_2^m}{\delta p_1} \quad (4\text{-}5a)$$

$$\because U_{x_1}=\lambda p_1,\ U_{x_2}=\lambda p_2,\ \therefore \frac{\widetilde{\delta U}^m}{\delta p_1}=\lambda p_1\frac{\delta x_1^m}{\delta p_1}+\lambda p_2\frac{\delta x_2^m}{\delta p_1} \quad (4\text{-}5b)$$

$$\frac{\delta I}{\delta p_1}=x_1^m+p_1\frac{\delta x_1^m}{\delta p_1}+p_2\frac{\delta x_2^m}{\delta p_1}=0,\ p_1\frac{\delta x_1^m}{\delta p_1}+p_2\frac{\delta x_2^m}{\delta p_1}=-x_1^m \quad (4\text{-}6)$$

With regard to Hicksian demand function of two goods, x_1, x_2 and p_1, p_2 it is derived from solving the dual problem of utility maximization, i.e., minimize $(p_1x_1+p_2x_2)$ subject to the utility function $U(x_1, x_2) \le \bar{U}$. The formulation is shown in equation (4-7).

$$L=p_1x_1+p_2x_2+\kappa(\bar{U}-U(x_1, x_2)) \quad (4\text{-}7)$$

The first order conditions are as follow.

$$\frac{\delta L}{\delta x_1}=p_1-\kappa U_{x_1}=0 \quad (4\text{-}8a)$$

$$\frac{\delta L}{\delta x_2} = p_2 - \kappa U_{x_2} = 0 \quad (4\text{-}8b)$$

$$\frac{\delta L}{\delta \kappa} = \bar{U} - U(C) = 0 \quad (4\text{-}8c)$$

Also, the solutions of first order condition provide a demand function known as Hicksian demand function, and it is expressed as $H^D = (x_1^h(p_1, p_2, U), x_2^h(p_1, p_2, U))$. Substituting these solutions into the expenditure function, we derive the following equation.

$$E(x_1, x_2, U) \equiv p_1 x_1^h(p_1, p_2, \bar{U}) + p_2 x_2^h(p_1, p_2, \bar{U}) \quad (4\text{-}9)$$

Substituting the first order condition of the Lagrangian minimization into the derivative of E with respect to p_1 yields the following result.

$$\frac{\delta E}{\delta p_1} = x_1^h + \kappa \frac{\delta U}{\delta x_1}\frac{\delta x_1^h}{\delta p_1} + \frac{\delta U}{\delta x_2}\frac{\delta x_2^h}{\delta p_1} \quad (4\text{-}10)$$

Since the derivatives of $U(x_1^h, x_2^h)$ is 0, therefore, $\frac{\delta E}{\delta p_1} = x_1^h$[27]. Similarly, $\frac{\delta E}{\delta p_2} = x_2^h$ as well.

As shown above, Marshallian and Hicksian demand functions are closely related but they are not identical. However, both demand functions become identical if both satisfied a same level of utility $\bar{U}$, and the identity is expressed as follow. This identity shows that for any similar level of utility, Marshallian demand and Hicksian demand must equal to one another (i.e., both demand curves cross at a point to achieve same level of utility). In other words, if $\bar{U}$ is fixed then a disposable income $\bar{I}$ attains utility $\bar{U}$ at prices p_1, p_2. As such, this identity gives $D^h(p_x, p_2, \bar{U}) = D^m(p_1, p_2, \bar{I})$.

$$D^h(p_1, p_2, \bar{U}) \equiv D^m(p_1, p_2, E(p_1, p_2, I)) \quad (4\text{-}9)$$

D^h, D^m is Hicksian and Marshallian demand function, respectively. This relationship explains that D^h and D^m cross one another at any same level of utility but that each does

[27] This is also known as Sherphad's Lemma. Similar to the Roy's Identity and Lagrangian multiplier, it is derived from the envelope theorem.

not respond identically to a change in price. Therefore, if each side is differentiated by prices (e.g., p_1), the Slutsky equation is obtained, the left hand side is Hicksian demand and right hand side is Marshallian demand.

$$\frac{\delta D_{x_1}^{h}}{\delta p_1} = \frac{\delta D_{x_1}^{m}}{\delta p_1} + \frac{\delta D_{x_1}^{m}}{\delta I} * \frac{\delta E}{\delta p_1} \tag{4-9}$$

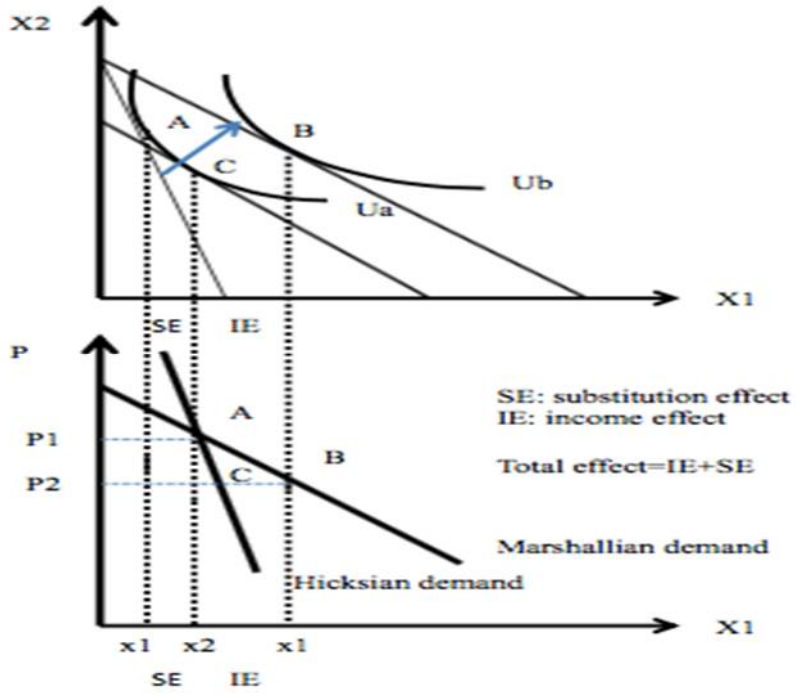
The Slutsky equation can also be expressed in terms of elasticity by multiplying both sides by $\frac{p_1}{x_1}$ as shown in equation (4-10), in which Hicksian elasticity of demand with respect to x_1 is the sum of Marshallian elasticity of demand and the product of share of expenditure and income elasticity with respect to x_1. Put differently, Hicksian demand response to a price change is equivalent to the total change of Marshallian demand response to that price change and the income effect causes by that price change. Moreover, the size of the income effect in total demand for x_1 in response to a change in p_1 depends on the expenditure share already spent on x_1. Hicksian demand response is known as substitution effect, Marshallian demand response is known as income effect (or Slutsky effect) and the sum of this is known as total effect, which is graphically shown in Figure 4-1. Equation (4-10) can be expressed by equation (4-11), where i=j is own-price elasticity of demand, i≠j is cross-price elasticity of demand.

$$\frac{p_1}{x_1}\frac{\delta D_{x_1}^{h}}{\delta p_1} = \frac{p_1}{x_1} * \frac{\delta D_{x_1}^{m}}{\delta p_1} + \frac{p_1}{x_1}\left(\frac{\delta D_{x_1}^{m}}{\delta I} * \frac{\delta E}{\delta p_1}\right)$$

$$\frac{p_1}{x_1}\frac{\delta D_{x_1}^{h}}{\delta p_1} = \frac{p_1}{x_1} * \frac{\delta D_{x_1}^{m}}{\delta p_1} + \frac{p_1}{x_1}\frac{\delta D_{x_1}^{m}}{\delta I} * \frac{p_1}{x_1}\frac{\delta E}{\delta p_1} * \frac{I}{I}$$

$$\frac{p_1}{x_1}\frac{\delta D_{x_1}^{h}}{\delta p_1} = \frac{p_1}{x_1} * \frac{\delta D_{x_1}^{m}}{\delta p_1} + \frac{p_1 x_1}{I} * \frac{I}{x_1}\frac{\delta D_{x_1}^{m}}{\delta p_1} \tag{4-10}$$

Figure 4-1 Substitution and income effects from Marshallian and Hicksian demand functions



Source: produced by author.

$$\varepsilon^{h}_{i\,j} = \varepsilon^{m}_{i\,j} + w_i * \pi_i \qquad (4\text{-}11)$$

From equation (4-11), for i≠j, an increase in p_j causes $\varepsilon^{m}_{i\,j} > 0$ and $\varepsilon^{m}_{i\,j} < 0$, then good x_i and x_j is a pair of gross substitute and gross complement, respectively. In a similar situation, an increase in p_j causes $\varepsilon^{h}_{i\,j} > 0$ and $\varepsilon^{h}_{i\,j} < 0$, then good x_i and x_j is a pair of net substitute and net complement, respectively. But, for $i \neq j$, an increase in p_i causes the substitution effect to be greater than income effect, then x_i is a normal good. A normal good is a good when the consumer's income increases its demand rises. However, if the sum of substitution effect (SE) and income effect (IE) is negative but $|SE| > |IE|$ (i.e., SE>IE or SE<-IE), then x_i is an inferior good. An inferior good is a good that decreases in demand when the income rises. On the contrary, if the sum of SE and IE is positive but $|SE| < |IE|$ (i.e., -IE<SE<IE), then x_i is a Giffen good. A Giffen good is a good that demand increase when its price rises. Furthermore, If $\pi_i > 0$ and $\pi_i < 0$ then good x_i is a luxury good and

a necesssity good, respectively. A luxury good is the demand increases when income rises, whereas a necessity good is the demand decreases when income rises.

4-4. Specifications and estimation methods

There are two specifications in this econometric analysis. Firstly, this study uses the following specification for the time series analysis of the aggregate disposable income and consumption expenditures from 1992 to 2012. The specification has also taken into consideration of the effect of China's accession to the World Trade Organization in December 2001, and thus it incorporates a dummy variable in order to differentiate any influence attributed to this structural change. This specification is shown in equation (4-11), where C_t, con, Y denotes consumption expenditure, intercept and disposable income, respectively. α_i and α_2 is marginal propensity to consume and explanatory coefficient for the structural change. t is from 1992 to 2012, and dwto denotes the dummy variable (before 2012=0, in and after 2002=1), and $\mu_{i\,t}$ is the error term corresponding to the dependent and independent variables.

$$C_t = con + \alpha_i Y_t + \alpha_2 dwto_t + \mu_{it} \qquad (4\text{-}11)$$

Secondly, as reviewed in Chapter 2, this study adopts AIDS model propounded by Deaton-Muellbauer (1980) because its specification is linear and it is suitable for estimating elasticity of demand pertain to the consumption expenditures of a wide variety of goods and services at individual or household level and at aggregate consumption expenditure. More specifically, the estimations focus on three different types of data set. Firstly, consumption expenditures collected from questionnaire surveys in BSTQ (Bejing, Shanghai, Tianjin and Qingdao) that is on individuals level. Secondly, a time series estimation of the aggregate consumption expenditures of Chinese urban areas that is based on aggregate consumption expenditures. Thirdly, a panel analysis of a cross-sectional time series data set compiled from

300 household surveys in Changchun City from January 2009 to December 2011 that is on household level of consumption expenditures. In these estimations, AIDS model is uncomplicated because Stone's price index and the estimated results can both be used for interpreting estimate income effect and substitution effect defined by Slutsky equation (i.e., equation (4-11)). All estimations deal with eight categories of the household's (or individual's) consumption expenditures, viz., "food", "clothing", "household utensils", "housing", "medical care", "transportation and communication", "education, culture and recreation", "other expenditures".

A linear form of AIDS model is specified as follow, and it satisfies linear restrictions in additive, homogeneity and symmetry on fixed parameters (equation (4-12)).

$$\omega_i = con + \pi_i \log\left(\frac{x}{p}\right) + \sum_{ij} \varepsilon_{ij}^h \log(p_j) + \mu_i \tag{4-12}$$

$$\sum_{i=1}^{n} con = 1,\ \sum_{i=1}^{n} \pi_i = 0,\ \sum_{i=1}^{n} \varepsilon_{ij}^h = 0 \tag{4-13a}$$

$$\sum_{j} \varepsilon_{ij}^h = 0 \tag{4-13b}$$

$$\varepsilon_{ij}^h = \epsilon_{ji}^h,\ \forall i, j \tag{4-13c}$$

Equation (4-11) can be expressed as follow. This implies from the estimated ε_{ij}^h, hence then ε_{ij}^m can also be computed from one-sample t-test.

$$\varepsilon_{ij}^m = \varepsilon_{ij}^h - w_i * \pi_i \tag{4-14}$$

4-5. Analytical consideration for the econometric estimation

In estimating equation (4-11), α_i is estimated by Prais-Winsten AR(1) after testing for the Augmented Dickey-Fuller unit root test for correcting non-stationary errors for the time series

aggregate estimation[28].

Using the aggregate time series of consumption expenditures and eight categories of goods and services to estimate (4-12), the empirical exercise uses "seemingly unrelated regression (SUR)" method. The method is chosen because there is a high likelihood that the aggregate time series data set has a serial correlation between the dependent and independent variables which are reflected in the error term (i.e., μ_i). Hence technically, the estimation has to split equation (4-13) into two separate equations as shown in equations (4-15a) and (4-15b). These two equations are linked together because of correlation between the two error terms.

$$\omega_{t,1}=con_1+\pi_{t,1i}\log(\tfrac{x}{P})+\sum_{ij}\varepsilon^{h}_{t,ij}\log(p_j)+\mu_{t,i} \quad (4\text{-}15a)$$

$$\omega_{t,2}=con_1+\pi_{t,2i}\log(\tfrac{x}{P})+\sum_{ij}\varepsilon^{h}_{t,2j}\log(p_j)+\mu_{t,2} \quad (4\text{-}15b)$$

Hence the estimation is conducted by assuming the two equations form a system of "seemingly unrelated regression" equations where the error terms are independent and identically distributed random variables with mean zero and a covariance matrix. However, with regard to cross-sectional data set, viz., BSQT data set, the estimation of elasticity of demand in equation (4-12) is conducted by multivariate regression method. This is unavoidable because in using cross-sectional data for the estimation, SUR encounters the problem of omitted variables caused by the collinearity of prices in the eight consumption expenditure categories[29].

The analysis of panel data set, viz., Changchun City household surveys from January 2009 to December 2011, the estimation uses equation (4-12). This estimation is conducted by AR(1) with fixed effect (FE) approach. This approach is adopted from Kruiniger (2002) that

[28] For detailed technical explanations of AR(1) and Augmented Dickey-Fuller test, see Greene (2003), pp. 581-585, pp. 637-648, respectively.

[29] For detailed technical explanations pertain to SUR, see ibid. pp. 340-362.

suggests: "time series cross-sectional data estimation with FE brings consistent estimators because it includes "individual" effects that are unobservable but may give bias to the predictors." In other words, FE eliminates time-invariant characteristics in order to explain the impact of independent variables over the period under study. The regression model is expressed in the form: $y_{ij}=\alpha+\beta x_{ij}+\mu_{ij}$ where error term is μ_{ij} that is defined as $\mu_{ij}=m_i+n_{ij}$. If m_i is correlated with x_{ij} (n_{ij} is not correlated with x_{ij}), then $E(m_i,n_{ij})=Cov(m_i,n_{ij})\neq 0$[30].

4-6. Parameters to be estimated

Based on the model specifications outlined in Section 4-4, the econometric analyses estimate a set of parameters summarized in Table 4-1.

Table 4-1 Parameters to be estimated

Data set	Model specification	Parameters	
Time series aggregate disposal income and consumption expenditures	Equation (4-11)	con, α_1, α_2	constant, marginal propensity to consume, coefficient for dummy variable, respectively.
Time series aggregate consumption expenditures	Equation (4-12)	con, π_i, ε_{ij}^h	constant, income elasticity of demand, compensated (or Hicksian) own-price elasticity of demand ($i=j$), compensated cross-price (or Hicksian) elasticity of demand ($i\neq j$), respectively.
BSQT (cross-section)	Equation (4-12)	con, π_i, ε_{ij}^h	constant, income elasticity of demand, compensated (or Hicksian) own-price elasticity of demand ($i=j$), compensated cross-price (or Hicksian) elasticity of demand ($i\neq j$), respectively.
Panel data (Changchun City)	Equation (4-12)	con, π_i, ε_{ij}^h	constant, income elasticity of demand, compensated (or Hicksian) own-price elasticity of demand ($i=j$), compensated cross-price (or Hicksian) elasticity of demand ($i\neq j$), respectively.
Estimated panel data π_i, ε_{ij}^h (Changchun City)	Equation (4-14))	ε_{ij}^m	uncompensated (or Marshallian) own-price elasticity of demand ($i=j$), uncompensated (or Marshallian) elasticity of demand ($i\neq j$).

[30] See ibid. pp. 283-293.

4-7. Summary

This chapter has explained the formulation of the analytical framework of this empirical study. The model specifications are mainly derived from the linear AIDS model pioneered by Deaton-Muelbauer (1980). This chapter elucidated that the predictors (or parameters to be estimated) are theoretically grounded in the conventional Marshallian and Hicksian demand functions and their relationships with Slutsky equation.

Based on this framework, Chapter 5 analyzes the aggregate disposable income and consumption expenditures of the Chinese urban areas and the individual's cross-section data set of consumption expenditures collected from the survey in BSTQ. Chapter 6 shows the econometric estimation of a panel data set of household surveys conducted in Changchun City from January 2009 to December 2011.

Chapter 5 Empirical Analyses of Aggregate and Individuals' Consumption Expenditures in Chinese Urban Areas

Based on the analytical framework developed in Chapter 4, this chapter conducts two econometric analyses of household consumption expenditures in Chinese urban areas. The first empirical investigation deals with the time series aggregate household consumption expenditures from 1992 to 2012. The second empirical analysis focuses on the econometric estimation of cross section data from questionnaires survey responses (QSR) conducted on individuals' consumption expenditures in Beijing, Shanghai, Tianjin and Qingdao (BSTQ) in 2010. These two analyses focus on consumption expenditures of eight major categories, viz., "food," "clothing," "housing utensils," "housing," "medical," "transportation and communication," "education and culture," and "other expenditures."

The structure of this chapter is as follows. Section 1 provides model specifications and analytical procedures for three stages of empirical investigations to be conducted based on the analytical framework described in Chapter 4. Section 2 explains the data sets in details. Section 3 summarizes the descriptive statistics of the data sets. Section 4 shows the statistical results pertain to fitness of specification. Section 5 provides the analytical results and related observations. Section 6 gives an overall discussion with regard to the empirical evidences derived from the investigations. The last section summarizes the chapter.

5-1. Model specification and analytical procedure

(1) Model specification for time series analysis

This part of empirical investigation uses two model specifications for econometric analysis of

time series aggregate consumption expenditures in Chinese urban areas. The first model is defined by equation (4-11) describes in Chapter 4. This model is restated below, where C_t, con, Y denotes consumption expenditure, intercept and disposable income, respectively. α_1 and α_2 is marginal propensity to consume and explanatory coefficient for the structural change, respectively. Subscript t is from 1992 to 2012, and *dwto* denotes the dummy variable (before 2012=0, in and after 2002=1), and $\mu_{i\,t}$ is the error term corresponding to the dependent and independent variables. The parameters that are to be estimated from equation (4-11) are *con* (constant, the value of minimum consumption expenditure regardless whether there is any disposable income), α_1 (marginal propensity to consume) and α_2 (parameter for structural change affected by China's accession to WTO).

$$C_t = con + \alpha_1 Y_t + \alpha_2 dwto_t + \mu_{i\,t} \qquad (4\text{-}11)$$

The second model is defined by Deaton-Muellbauer (1980a) specification, described in Chapter 4's equation (4-12). This model—which satisfies linear restrictions in additive, homogeneity and symmetry on fixed parameters of the model—is reiterated here. w_i denotes expenditure share in total consumption of good i, whereas $\frac{x}{P}$ represents real disposable income and p_j is the price of good j. The parameters to be estimated are con, π_i, ε^h_{ij} (for i = j and $i \neq j$). π_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. ε^h_{ij} is the value of compensated (Hicksian) cross-price elasticity of demand between goods i and goods i. If i=j, then the estimated coefficient is the value of compensated (Hicksian) own-price elasticity of demand of good i. A positive value of compensated (Hicksian) cross-price elasticity of demand means a pair of goods is a net substitute, whereas a negative value means a net complementary.

$$\omega_i = con + \pi_i \log\left(\frac{x}{p}\right) + \sum_{ij} \varepsilon_{ij}^{h} \log(p_j) + \mu_i \qquad (4\text{-}12)$$

(2) Analytical procedure

There are three stages of econometric analysis in this investigation on consumption expenditure with respect to eight major categories of goods and service, as described in the outset of this chapter. Firstly, using the time series aggregate data on disposal income and consumption expenditure of China's urban areas (CUA) from 1992 to 2012, the econometric estimation of equation (4-11) is conducted by the method known as Prais-Winsten AR(1) after testing for the Augmented Dickey-Fuller unit root test for correcting non-stationary errors for this time series aggregate data set.

Secondly, for estimating aggregate data of CUA with respect to equation (4-12), the econometric analysis uses "seemingly unrelated regression (SUR)." Technical consideration for this estimation method is discussed in Chapter 4. In addition, estimation uses geometric means of the prices from eight major categories of goods and services to deflate consumption expenditure and disposable income into real values.

Thirdly, for estimating cross section data set of BSTQ with respect to equation (4-12), the econometric analysis uses multivariate regression method because SUR approach encounters the problem of omitted variables caused by collinearity of prices among the eight major categories of goods and services. In addition, this estimation uses the mean age of the respondents as the weight. Similar to the estimation of CUA, this analysis uses geometric means of the prices from eight major categories of goods and services to deflate consumption expenditure and disposable income.

All three estimations are conducted by Stata/SE11.1 statistical software package.

5-2. Data set

There are two data sets in these econometric analyses. The first and second stage of the investigation as explained in the preceding section, a time series aggregated data of disposable income and consumption expenditure of CUA from 1992 to 2012. Consumption expenditure comprises eight major expenditure items, viz., "food," "clothing," "housing utensils," "housing," "medical," "transportation and communication," "education, culture and recreation," and "other expenditures." This data set is compiled from various issues of *Chinese Statistical Yearbook* published by the National Bureau of Statistics of China.

The third stage analyzes a cross section data set collected from QSR conducted in BSTQ with regard to disposable income and consumption expenditure of eight major categories of goods and services. This survey was conducted from 5 August to 20 September 2010. BSTQ were selected because BST are direct-controlled municipal under the national government and their living standards are of the highest level in China, whereas Q is a city administered at the sub-provincial level and it represents an average income level of CUA.

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 questionnaire survey questions are shown in the Appendix 1 of this thesis.

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 BSTQ.

These residential areas are Chaoyang District, Haidian District, Fengtai District and Dongcheng District in Beijing (B); Hongkou District, Jingan District and Yangpu District in Shanghai (S); Heping District, Hedong District, Hebei District and Jinnan District in Tianjing (T); Sinan District, Sibei District and Sifang District in Qingdao (Q).

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 (Table 5-1).

This cross section data set is used in two ways: the whole questionnaire survey respondents' sample (QSR) and five quintiles of disposable income. The disposable income of the first quintile ranged from 26,000 RMB to 48,000 RMB. The second quintile to the fifth is 49,000-66,000 RMB, 67,000-91,000 RMB, 92,000-128,000 RMB, 129,000-980,000 RMB, respectively.

The prices used in these estimations are shown in Table 2a and Table 2b. The analyses use the geometric means of CPI, prices for each consumption expenditure categories in time series CUA and cross section BSTQ (whole sample and each respective quintile).

Table 5-1 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 5-2a Time series price indices in the estimation of CUA's sample

	CPI	1	2	3	4	5	6	7	8
1992	108.60	110.70	104.10	107.30	101.50	110.10	100.00	95.50	108.60
1993	116.10	116.50	109.30	114.50	109.30	111.00	108.00	102.00	116.10
1994	125.00	131.80	119.40	122.50	111.90	111.40	106.00	112.10	125.00
1995	116.80	122.20	114.80	112.90	105.70	110.70	98.90	104.50	116.80
1996	108.80	107.70	107.70	118.40	102.80	109.00	98.10	110.40	108.80
1997	103.10	100.00	103.20	113.00	99.90	104.50	97.20	100.50	103.10
1998	99.40	96.90	99.10	105.00	98.00	102.60	95.60	96.70	99.40
1999	98.70	95.60	97.30	103.40	97.60	101.00	94.60	96.80	98.70
2000	100.80	97.40	99.50	106.70	97.70	100.10	94.10	96.90	100.80
2001	100.70	100.10	97.80	101.70	97.50	99.30	99.10	106.70	100.70
2002	99.00	99.50	97.30	99.80	97.30	98.00	98.00	100.20	99.00
2003	100.90	103.40	97.40	102.80	97.00	98.80	97.40	102.80	100.90
2004	103.30	109.10	98.50	104.30	98.10	99.20	97.90	100.80	103.30
2005	101.60	103.10	98.00	105.60	99.70	99.60	98.40	103.80	101.60
2006	101.50	102.50	99.40	104.70	101.30	100.90	99.30	98.60	101.50
2007	104.50	111.70	99.10	104.50	101.90	101.70	98.40	99.30	104.50
2008	105.60	114.50	98.20	104.30	103.00	102.80	98.40	99.10	105.60
2009	99.10	101.00	97.80	95.40	100.30	101.10	97.30	98.80	99.10
2010	103.20	107.10	98.90	104.50	99.90	103.20	99.40	100.40	103.20
2011	105.30	111.60	102.20	105.10	102.70	103.40	100.20	100.30	105.30
2012	102.70	105.10	102.90	102.20	102.10	102.00	99.70	100.40	102.70

Source: National Bureau of Statistics of China, *China Statistical Yearbook,* various years.

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

Table 5-2b Prices in BSTQ (2010)

	Beijing	Shanghai	Tianjing	Qingdao
CPI	102.4	103.1	103.5	102.9
1	105.5	107.7	108.0	108.3
2	98.4	98.6	102.8	97.6
3	99.0	97.7	99.4	99.6
4	105.2	103.5	102.3	103.6
5	100.6	100.8	104.1	102.0
6	100.8	97.4	98.1	99.3
7	99.4	100.9	99.4	99.7
8	102.4	103.1	103.5	102.9

Source: National Bureau of Statistics of China, *Jilin Statistical Yearbo*ok 2011

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

5-3. Descriptive statistics

Table 5-3a 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 17,100 RMB and the mean is 55,520 RMB. 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 expenditures" at 4.6%.

Table 5-3b provides the descriptive statistics of each targeted city. The range between the lowest and the highest disposable income was 36,000-520,000 RMB, 31,000-290,000 RMB, 28,000-980,000 RMB, 26,000-200,000 RMB in Beijing, Shanghai, Tianjin and Qingdao, respectively. In terms of consumption expenditure, the range in the respective city was 18,800-132,200 RMB, 27,700-128,700 RMB, 17,100-980,000 RMB, 26,000-200,000 RMB. 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. Comparatively, respondents in Beijing have the highest mean disposal income of 122,421 RMB, followed by Shanghai with 85,062 RMB, Qingdao with 81,348 RMB and Tianjin with 79,106. For consumption expenditures, the ranks is the same order as respondents of each city spent 63,178 RMB, 58,121 RMB, 49,296 RMB, and 45,771 RMB, respectively (Table5-3b). In terms of the difference between disposal income and consumption expenditure (i.e., saving), respondents in Beijing have the highest with 59,243 RMB followed by Tianjin with 33,335 RMB, Qingdao with 32,025 RMB and Shanghai with 26,941 RMB (Table 5-3b).

Table 5-4 tabulates the descriptive statistics of each quintile. The minimum and maximum disposable incomes in each quintile were 26,000-48,000 RMB, 49,000-66,000 RMB, 67,000-91,000 RMB, 92,000-128,000 RMB, 129,000-980,000 RMB, respectively. Regarding the consumption expenditure, the lowest and the highest amounts in each quintile were 17,100-56,900 RMB, 27,900-50,900 RMB, 38,100-65,900 RMB, 52,000-82,100 RMB,

Table5-3 Descriptive statistics of questionnaire survey sample

	Obs.	Mean	Std. dev	Min	Max
Income (RMB)	1,485	95,646	66,902	26,000	980,000
Consumption expenditure (RMB)	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 expenditures	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 expenditures	1,485	0.046	0.017	0.008	0.278
Beijing					
Disposable income	499	122,421	68,249	36,000	520,000
Consumption expenditure	499	63,178	24,321	18,800	132,200
Food	499	17,294	5,620	1,000	112,000
Clothing	499	7,297	3,406	1,000	33,000
Housing utensils	499	4,836	1,985	1,500	10,000
Housing	499	4,707	1,826	500	9,000
Medical	499	5,212	1,802	1,900	11,000
Transport. and comm.	499	8,575	4,640	850	22,000
Education and culture	499	12,020	5,785	1,250	29,500
Other expenditures	499	3,236	2,424	500	21,001
Share in con. expenditure					
Food	499	0.290	0.057	0.053	0.847
Clothing	499	0.115	0.026	0.011	0.580
Housing utensils	499	0.076	0.009	0.015	0.126
Housing	499	0.075	0.009	0.009	0.114
Medical	499	0.085	0.015	0.024	0.179
Transport. and comm.	499	0.128	0.025	0.016	0.195
Education and culture	499	0.184	0.029	0.024	0.244
Other expenditures	499	0.047	0.020	0.008	0.278
Shanghai					
Disposable income	387	85,062	52,501	31,000	290,000
Con. expenditure	387	58,121	22,869	27,700	128,700
Food	387	21,009	4,775	12,000	34,500
Clothing	387	4,693	2,699	1,450	14,500
Housing utensils	387	3,811	1,945	1,300	9,500
Housing	387	5,054	1,537	2,300	9,000
Medical	387	2,608	867	1,600	6,000
Transport. and comm.	387	9,198	5,976	2,900	28,000
Education and culture	387	8,782	3,924	4,250	24,500
Other expenditures	387	2,966	1,683	800	9,500
Share in con. expenditure					
Food	387	0.381	0.053	0.263	0.473
Clothing	387	0.077	0.012	0.039	0.128
Housing utensils	387	0.063	0.011	0.040	0.080
Housing	387	0.089	0.012	0.063	0.111
Medical	387	0.046	0.005	0.036	0.064
Transport. and comm.	387	0.146	0.035	0.102	0.234
Education and culture	387	0.150	0.009	0.131	0.205
Other expenditures	387	0.048	0.009	0.026	0.079
Tianjin					
Disposable income	312	79,106	83,356	28,000	980,000

Table5-3 Continue

Consumption expenditure	312	45,771	18,151	17,100	91,200
Food	312	13,657	3,282	1,050	20,500
Clothing	312	4,244	2,064	1,900	9,800
Housing utensils	312	3,556	2,265	1,250	9,500
Housing	312	5,831	2,249	2,500	11,000
Medical	312	4,402	1,373	2,850	8,500
Transport. and comm.	312	5,364	2,746	2,210	12,600
Education and culture	312	6,277	2,921	2,700	15,000
Other expenditures	312	2,441	1,775	750	8,000
Share in con. expenditure					
Food	312	0.315	0.052	0.061	0.393
Clothing	312	0.090	0.009	0.072	0.122
Housing utensils	312	0.071	0.018	0.047	0.128
Housing	312	0.127	0.011	0.093	0.170
Medical	312	0.100	0.014	0.072	0.173
Transport. and comm.	312	0.112	0.016	0.079	0.142
Education and culture	312	0.135	0.012	0.098	0.201
Other expenditures	312	0.048	0.021	0.029	0.233
Qingdao					
Disposable income	287	81,348	43,954	26,000	200,000
Consumption expenditure	287	49,296	18,663	22,650	95,000
Food	287	14,553	3,107	4,300	21,000
Clothing	287	5,286	2,439	2,200	33,000
Housing utensils	287	4,134	2,272	1,300	9,600
Housing	287	5,085	2,561	1,750	10,500
Medical	287	4,770	2,426	1,700	9,700
Transport. and comm.	287	6,095	3,001	1,000	14,500
Education and culture	287	7,398	2,878	2,800	19,000
Other expenditures	287	1,974	1,290	600	5,500
Share in con. expenditure					
Food	287	0.315	0.058	0.128	0.442
Clothing	287	0.109	0.030	0.080	0.580
Housing utensils	287	0.079	0.017	0.032	0.133
Housing	287	0.099	0.016	0.039	0.143
Medical	287	0.092	0.017	0.049	0.149
Transport. and comm.	287	0.119	0.023	0.015	0.200
Education and culture	287	0.151	0.016	0.070	0.221
Other expenditures	287	0.037	0.010	0.018	0.074

59,600-132,200 RMB, 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 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. Comparatively, it is worth noting that the gap between the mean disposable income between Quintile 1 and Quintile 5 is about 159,000 RMB, which is about 4 times of the mean value in Quintile 1. The saving amount in Quintile 5 is about 12 times larger than that in Quintile 1. Although the mean consumption expenditure becomes larger as the mean disposable income increase from

Table5-4 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 expenditures	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 expenditures	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 expenditures	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 expenditures	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 expenditures	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 expenditures	286	0.062	0.013	0.008	0.115					

one quintile to another higher level of quintile but the gap of mean consumption expenditure one quintile and another become even larger from the lowest quintile to the highest quintile (Table 5-4).

5-4. Fitness of specification: RMSE, adjusted R-squared, F-statistics

Table 5-5 and Table 5-6 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 aggregate data of Chinese urban areas, each dependent variable in SUR (i.e., each respective share of expenditure in disposable income in 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 (4-11).

Table5-5 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 expenditures	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 expenditures	1,485	0.0139	0.3452	86.40	0.000

Table5-6 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 expenditures 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

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 expenditures” 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 5-6).

Table 5-6 shows the results of QSR in quintiles. By and large, the statistical results from the estimation of equation (4-12) by multivariate regression explained reasonably well between the dependent variables and independent variables of the demand equations. But it ist is worth noting that for the values of adjusted R-squared for the expenditure share in “other expenditures” were very low for quintiles 1, 2 and 3, in which their disposable income is below 92,000 RMB.

5-5. Estimated result

(1) 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 CUA is 76.7%. On the other hand, the mean APC of the questionnaire respondents from BSTQ 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 5-7). 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.

The marginal propensity to consume (MPC) of CUA for the period of 1992 and 2012 is 0.59, whereas the MPC of QRS is about 0.20. The former means for every 100 RMB increase

of disposable income, a Chinese urban consumer spends additional 59 RMB. The latter implies that in QSR for every additional disposable income 100 RMB, the respondents will spend extra 20 RMB in consumption expenditure. Among the sample, the MPC of each quintile is 0.53, 0.66, 0.56, 0.22, and 0.03, respectively.

The highest MPC is the second quintile that implies for an additional 100 RMB of disposable income, the respondents will spend another 66 RMB. The lowest MPC is the fifth quintile which suggests that if a respondent's disposable income rises by 100 RMB, it induces 3 RMB of additional consumption expenditure. Furthermore, the value of MPC becomes smaller if a respondent's disposable income was higher than 66,000 RMB.

The estimated coefficient for *dwto* dummy variable is statistically significant. The intercept (i.e., *con*) is also statistically significant for all dependent variables (expenditure share of each respective expenditure category) except with respect to "housing utensils." These results indicate that China's accession to the WTO has influenced the people's consumer behavior in terms of their expenditure share in CUA.

(2) Income elasticity of demand

(a) Chinese urban areas (CUA, time series 1992-2012)

Table 5-8 shows the estimated income elasticity of demand for two sets of data. For the CUA, the time series aggregated data indicate that "food," "clothing," "education and culture and "other expenditures" are necessity goods, whereas "transportation and communication" is a luxury good. "Housing utensils," "housing," "medical" and "other expenditures" 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 expenditures" suggests that every 1% increase in income reduces 0.01%, 0.01% and 0.004% of its respective expenditure share[31]. On the other hand, 1% increase of income causes 0.03 percent rise in the expenditure share of "transportation and communication."

Table5-7 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 (α_i)			
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. (α_1)	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
Urban areas		Coef. (α_2)			
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

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* (α_2, equation (4-11)) is not statistically significant.

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

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

(b) Questionnaire survey responses (QSR): whole sample

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 expenditures" are not statistically significant. The estimated 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" suggests 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."

(c) QSR: Quintile 1

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 expenditures" 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 expenditures," respectively.

(d) QSR: Quintile 2

For Quintile 2, "food," "clothing" and "medical" are necessity goods, whereas "housing," "transportation and communication" and "other expenditures" are luxury 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 expenditures," respectively.

(e) QSR: Quintile 3

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 expenditures" 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.

(f) QSR: Quintile 4

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 expenditures" 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, respectively. The same condition causes 0.01% reduction of expenditure share in each item like "clothing," "housing utensils" and "transportation and communication."

(g) QSR: Quintile 5

For Quintile 5, "food" and "housing" are necessity goods but "clothing," "transportation and communication," "education and culture" and "other expenditures" 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 one hand, and 0.02% for each item like "transportation and communication," "education and culture"

Table 5-8 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 1%, **=statistical significant at 5%, *= statistical significant at 10%

and "other expenditures" on the other hand.

(3) Compensated (Hicksian) own-price elasticity of demand

(a) CUA (time series between 1992 and 2012)

For the time series aggregated data set of CUA, 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 5-9).

(b) QSR: whole sample

Table 5-10 compiles the own-price elasticity of demand for eight categories 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.

(c) QSR: Quintile 1

For the first quintile, the estimated coefficient for the "transportation and communication", "education and culture" and "other expenditures" is not statistically significant. But 1% increase in the price of "food", "clothing" and "medical" brings up its own demand by 7.2%, 2.5 and 0.5%, respectively. It is necessary to emphasize that the demand for "food" in Quintile 1 is very responsive to changes in price. In contrast, 1% rise in price of "household utensils" and "housing" leads to 0.55% and 0.84% decline in its own demand, respectively.

(d) QSR: Quintile 2

For Quintile 2, the estimated coefficient is only statistically significant for "food, "clothing" and "household utensils" but not statistically significant for other items. 1% rise in price of "food, "clothing" and "household utensils" causes its demand decline by 4.31%, 0.52% and 0.6%, respectively.

(e) QSR: Quintile 3

For Quintile 3, the estimated coefficient is statistically significant except the expenditure item of "housing". 1% increase of the price in "housing utensils" and "other expenditures" reduces its demand by 0.24% and 0.68%, respectively. Conversely, a same magnitude of price`s increase causes its demand to augment by 1.52%, 0.29%, 0.40%, 0.69% and 0.95% for "food", "clothing", "medical" "housing utensils" "transportation and communication" and "education and culture," respectively.

(f) QSR: Quintile 4

For Quintile 4, the estimated coefficient for "clothing", "transportation and communication" and "other expenditures" is not statistically significant but it is significant for other items. 1% increase in the price of "housing utensils" leads to 0.45% decline in its own demand. With regard to "food", "housing", "medical" and "education and culture", every 1% rise in price causes its own demand to augment by 0.71%, 2.02%, 1.11% and 3.74%, respectively.

(g) QSR: Quintile 5

For Quintile 5, it is as same as Quintile 4 that the estimated coefficient is not statistically significant for "clothing", "transportation and communication" and "other expenditures" but significant for other items. Every 1% falls in the price of "housing utensils" leads to an increase of 0.63% in its demand. With respect to "food", "housing", "medical" and "education and culture", it raises its own demand by 1.54%, 2.02%, 1.38% and 5.73%, respectively, in response to a 1% rise in price.

By comparison among the five quintiles, there exists different characteristic in each income quintile. However, Quintile 5 is very similar with Quintile 4 that shows higher elasticity in "medical" and "education and culture". Moreover, the lower income quintile is more elastic in "food" and "clothing". As a result, Quintile 1 is the most elastic in those two items.

(4) Compensated cross-price elasticity of demand

(a) CUA (time series between 1992 and 2012)

Table 5-9 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 causes 0.62% increase in the share of consumption expenditure in food. Additionally, these two pairs of expenditure items are net substitute goods[32]. On the other hand, the estimated coefficient for the pair "food" and "other

[32] A negative value of compensated cross-price elasticity of demand means goods i and goods j are net complement, whereas a positive means they are net substitute. A pair of net complement 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 .g., goods j) increased then the demand of another goods (i.e., goods i) will increase (the reverse also holds).

expenditures" is -1.0395, which means this pair is a net complement. 1% increases in the price of "other expenditures" 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. 1% increase in "medical" causes 0.3% rise in demand of "clothing." Conversely, "clothing" and "other expenditures" 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 expenditures."

"Housing utensils" and "housing" are net complementary goods. The estimated elasticity of this pair of goods indicates that 1% 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. 1% rise in the price of "education and culture" reduces 0.04% of the demand in "housing utensils."

"Housing" is a net complementary good 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%, respectively. On the contrary, "housing" is net substitute good with "education and culture" and "other expenditures," respectively, in which 1% increase in the price of each respective goods raise 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%.

Table 5-9 Estimated compensated elasticity of demand in Chinese urban areas (Dependent variable: share of consumption expenditure)

$j=$	1	2	3	4	5	6	7	8	cons
ε_{1j}^h	0.3253**	0.4797***	0.0772	0.0862	0.6167***	-0.1527	0.0236	-1.0395***	-1.2950***
ε_{2j}^h	0.0186	0.1085***	0.0012	0.0195	0.2858***	0.0335	0.0168	-0.1896**	-1.2195***
ε_{3j}^h	-0.0896	0.0218	-0.0486	-0.0487*	0.0365	-0.0095	-0.0376*	0.2024	-0.0544
ε_{4j}^h	-0.1565**	-0.1967***	-0.0079	-0.0174	-0.3204***	-0.1384***	0.0372*	0.4767***	1.5498***
ε_{5j}^h	-0.0456	-0.0985***	0.0878**	-0.0022	-0.2842***	-0.1168***	0.0359***	0.1655**	1.2325*
ε_{6j}^h	-0.2065**	-0.1897**	-0.1107	-0.0422	-0.1935***	-0.0091	0.0096	0.6207**	0.4969**
ε_{7j}^h	-0.0325	-0.0107	-0.0725	0.0437*	-0.4686***	0.0123	-0.0026	0.1300	1.9830***
ε_{8j}^h	0.0520	0.0443	0.0848*	0.0137	0.0696***	-0.0078	-0.0087	-0.1959	-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 expenditures
Note 2: ***=statistical significant at 1%, **=statistical significant at 5%, *=statistical significant at 10%

Table 5-10 Estimated compensated own-price elasticity of demand for QSR (whole sample, dependent variable: share of consumption expenditure)

	ε_{1j}^h	ε_{2j}^h	ε_{3j}^h	ε_{4j}^h	ε_{5j}^h	ε_{6j}^h	ε_{7j}^h	ε_{8j}^h
Whole sample	3.0724***	-0.3376**	-0.5025***	-0.4230***	0.0355	0.4385**	0.1855	-0.1331
Quintile 1	7.1897***	2.4934***	-0.5539***	-0.8436***	0.5128***	0.7984	-0.2288	0.2350
Quintile 2	4.3111***	0.5219**	0.6018***	-0.4790	0.2436	-0.1827	-0.0101	0.0930
Quintile 3	1.5160***	0.2889***	-0.2388***	0.0531	0.3952***	0.6877**	0.9469*	-0.6785***
Quintile 4	0.7105***	0.2007	-0.4505***	2.0153***	1.1074***	0.4522	3.7366***	0.3032
Quintile 5	1.5438***	-0.1835	-0.6279***	2.0192***	1.3806***	-0.0982	5.7255***	0.1824

Note 1: 1=food, 2=clothing, 3=household utensils, 4=housing, 5=medical, 6=transportation and communication, 7=education and culture, 8=other expenditures
Note 2: ***=statistical significant at 1%, **=statistical significant at 5%, *=statistical significant at 10%

"Transportation and communication" is net complementary goods with "food," "clothing" and "medical," but it is a net substitute with "other expenditures." 1% increase in "food," "clothing" and "medical," respectively, reduces the demand of "transportation and communication" by 0.2%. However, similar magnitude in "other expenditures" 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 1% of price increase in the latter causes the demand of the former to rise by 0.04%.

"Other expenditures," "housing" and "medical" are net substitute goods, in which 1% increase in the price of "housing" and "medical," respectively, raises the demand of "other expenditures" by 0.08% and 0.07%.

(b) QSR: whole sample

The estimated compensated cross-price elasticities of demand in the data set collected from BSTQ are tabulated in Table 5-11. "Food" is a net substitute good with "clothing" and "medical," respectively, but it is a net complementary good with "other expenditures." 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 a net substitute good with "housing" and "other expenditures," respectively, in which 1% increase in the second item of each pair induces the rise of the demand of "clothing" by 0.8% and 2.2%, respectively. On the other hand, it is a net complement good 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%, respectively.

“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 expenditures” are net substitute goods. 1% increase of the prices in “clothing,” “medical,” “transportation and communication” and “other expenditures,” 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 expenditures” 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 expenditures” are net complementary goods. 1% increase in “medical” and “other expenditures,” 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 percent.

"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 expenditures" 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 expenditures" 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 expenditures," "housing utensils" and "medical" are net substitute goods. 1% increase of the price in each respective item increases the demand of "other expenditures" by 0.3% and 0.2%, respectively.

(c) QSR: all quintiles

Table 5-12 shows the estimated results of the compensated cross-price elasticity of demand of QSR in quintiles. For all the five quintiles, the same relationships between two goods are examined as below.

"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% increases in the price of "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.

"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 rises. "Clothing" and "other expenditures" are complementary goods across all income groups. 1% increase of the price in "other expenditures" 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 is highly sensitive to changes in price of "other expenditures."

"Housing utensils" and "other expenditures" is a pair of substitute goods across all income groups. 1% increase of the price in "other expenditures" increases the demand of "housing utensils" by 1.7%, 2.4%, 1.7%, 2.6% and 2.1% in each respective income group. "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 "other expenditures" is a pair of net substitute goods across all income groups. 1% increase in the price of "other expenditures" 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. "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.

As there are different relationships between same pair of goods among different quintiles, subsequent sections describe their results.

(d) QSR: Quintile 1

Table5-11 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
ε_{1j}^{h}	3.0724***	-0.2903	2.5810***	0.4158*	-0.1210	-0.2862	0.0670	-5.5834***	-11.04052***
ε_{2j}^{h}	-1.0006***	-0.3376**	-1.2561***	0.7595***	-0.0717	-0.0875	-0.2935	2.2183***	5.8055***
ε_{3j}^{h}	0.1078	0.5396***	-0.5025***	0.0878	0.2724***	0.1962*	-0.8980***	0.3826***	2.2701***
ε_{4j}^{h}	-0.0531	0.6116***	-0.0725	-0.4230***	0.2603*	-0.2378	-0.5456**	0.1691	0.4904**
ε_{5j}^{h}	-2.3825***	0.5708***	-1.7272***	-0.8238***	0.0355	0.6063***	0.1855	4.1449***	8.1271***
ε_{6j}^{h}	1.9721***	-0.1487	1.1053***	-0.0999	-0.2951**	0.4385**	0.51044***	-3.1356***	-5.2159***
ε_{7j}^{h}	-2.3825***	0.5708***	-1.7272***	-0.8238***	0.0355	0.6063***	0.1855	4.1449***	8.1271***
ε_{8j}^{h}	-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 expenditures
Note 2: ***=statistical significant at 1%, **=statistical significant at 5%, *=statistical significant at 10%

Table5-12 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	ε_{1j}^{h}	7.1897***	0.3822	3.0573***	0.0801	0.0441	5.0330	-0.6339	10.1714***	13.310***
	ε_{2j}^{h}	-0.0350	2.4934***	-1.7890***	1.2378**	-0.9065	-4.3697	-2.7623***	-10.17***	-13.310***
	ε_{3j}^{h}	-0.4808**	0.8794***	-0.5539***	0.3875**	-0.2126	0.3450	-1.101***	1.7071**	8.0727***
	ε_{4j}^{h}	-4.1479***	-2.8429***	0.6666***	-0.8436	1.0420***	0.0220	2.6948***	4.8740***	3.1635***
	ε_{5j}^{h}	-5.9010***	-1.3566***	-1.6562***	-0.4385*	0.5128***	0.1765	1.3229***	7.6109***	-0.7282
	ε_{6j}^{h}	1.1682***	0.0046	0.9091***	0.0314	-0.1644	0.7984	0.1064	-2.0950***	7.8142***
	ε_{7j}^{h}	2.6966***	0.3813	0.4516***	-0.1886	-0.0271	-0.2303	-0.2288	-3.1534***	-4.1801***
	ε_{8j}^{h}	-0.4808***	0.0587	0.2477**	-0.2661	-0.2882	-1.7309	0.6021*	0.2350	-1.9845***
Quintile 2	ε_{1j}^{h}	4.3111***	-0.0064	3.4979***	0.4386	0.1989	-0.2341	-0.5024	0.2349	-1.0823**
	ε_{2j}^{h}	-0.8507***	0.5219**	-1.5418***	0.6488*	0.1771	0.1395	-1.2995***	-7.7574***	-15.3651***
	ε_{3j}^{h}	-0.4377***	0.2114	-0.6018***	-0.1011	0.0696	0.0077	-0.1433	2.3947***	7.2870***

	ε_{4j}^{h}	-1.6575***	-0.2857	0.1529	-0.4790	-0.5029	0.0854	1.0727**	1.0372***	2.8139***
	ε_{5j}^{h}	-3.8976***	-0.313**	-1.7173***	-0.4080**	0.2436	0.7098***	0.4411*	5.6578***	-0.7282
	ε_{6j}^{h}	2.29580***	0.1744	0.3005***	-0.2912	-0.0508	-0.1827	0.1657	-2.654***	8.1550***
	ε_{7j}^{h}	0.5286**	-0.1972	-0.4590***	0.2250	0.0493	-1.0380***	-0.0101	-0.0711	-1.6475***
	ε_{8j}^{h}	-0.2920	-0.1054	0.3695***	-0.0332	-0.1847	0.5125*	0.2756	0.0930	2.2455***
Quintile 3	ε_{1j}^{h}	1.516***	-0.4646	2.1168***	0.1826	-0.4959	-0.2907	0.8425*	-0.0930	-1.7605***
	ε_{2j}^{h}	-0.8217***	0.2889**	-0.8663***	0.0630	-0.5038***	-0.0935	0.1695	-3.5275***	-8.5600***
	ε_{3j}^{h}	-0.1945*	0.3742**	-0.2388***	-0.0149	0.0728	0.0906	-0.4304**	1.6586***	4.0658***
	ε_{4j}^{h}	0.5326*	-0.0004	0.3328***	-0.0531	0.6528*	-0.3770	-0.6394	0.3970***	0.9219***
	ε_{5j}^{h}	-2.2527***	-0.0726	-1.7961***	-0.0380	0.3952***	0.0668	-0.2635	4.0728**	-1.1682**
	ε_{6j}^{h}	2.6426***	0.2610	0.4520***	-0.5198*	-0.3085	0.6877**	0.4951	-3.216***	8.3908***
	ε_{7j}^{h}	-1.546***	-0.2178	-0.5756***	-0.1863	-0.5462*	-0.1234	0.9469*	2.0770***	-2.7036***
	ε_{8j}^{h}	0.1237	-0.1687	0.5751***	0.5665***	0.7335*	0.0394	-1.1207***	-0.6785***	2.6503***
Quintile 4	ε_{1j}^{h}	0.7105**	-0.4379	1.8730***	-1.3940***	-1.7769***	-0.8944	3.6767***	-0.6785***	-2.59696***
	ε_{2j}^{h}	-1.7544***	0.2007	-0.8843***	-0.2170	-0.7160***	0.5358	0.7773***	-2.5667***	-7.9436***
	ε_{3j}^{h}	0.8441***	0.1726	-0.4505***	0.6576***	0.7808***	-0.2509	-1.6403***	2.5982***	4.1354***
	ε_{4j}^{h}	2.3058***	0.0714	-0.3478**	2.0153***	2.2787***	0.9326	-4.5885***	-0.3840**	2.0513***
	ε_{5j}^{h}	0.2589**	-0.2462	-2.1842***	0.4959***	1.1074***	-0.5135	-1.396***	-1.9659***	1.5272**
	ε_{6j}^{h}	2.4258***	0.2775	2.2480***	-0.6072**	-0.7988***	0.4522	1.1594***	-4.7112***	10.1538***
	ε_{7j}^{h}	-4.6942***	0.0421	-0.6615***	-1.7978***	-1.7990***	-0.2364	3.7366***	5.3070***	-10.26***
	ε_{8j}^{h}	-0.0966	-0.0802	0.4074***	0.8471**	0.9238***	-0.0254	-1.7249***	0.3032	3.2733***
Quintile 5	ε_{1j}^{h}	1.5438**	0.6024	2.0835***	-0.2799	-0.9675	-1.7528***	0.9738	-0.3032	-1.9334
	ε_{2j}^{h}	-1.579***	-0.1835	-0.5130***	-0.5686**	-0.8608***	-0.4289	1.6246***	-3.6189***	-8.8969***
	ε_{3j}^{h}	0.7335***	0.2160	-0.6279***	1.2272***	1.4686***	0.1736	-2.9701***	2.0634***	2.4242***
	ε_{4j}^{h}	1.7180***	0.5461**	-0.8199***	2.0192***	2.7584***	0.5259*	-5.4601***	-0.0697	2.9080***
	ε_{5j}^{h}	-0.1373	0.2118	-1.8197***	0.4574**	1.3806***	0.7948***	-2.1682***	2.0094***	3.7641***
	ε_{6j}^{h}	1.7629***	-0.6163	2.2716***	-1.1846***	-2.0530***	-0.0982	3.9536***	-4.1194	8.4246***
	ε_{7j}^{h}	-3.7758***	-0.7641*	-0.6569***	-2.1943***	-2.8383***	-0.0735	5.7255***	4.3802***	-10.3331***
	ε_{8j}^{h}	-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, 8=other expenditures
Note 2: ***=statistical significant at 1%, **=statistical significant at 5%, *=statistical significant at 10%

“Transportation and communication” and “food” are net substitute goods. As a result, 1% increase of the price in “transportation and communication” raises the demand of “food” in Quintile 1 by 1.8%. “Food” and “other expenditures” are net substitute goods. 1% increase of the price in “Food” leads to 10.2% increase of demand of “other expenditures”. “Clothing” and “housing” are net substitute goods, whereby 1% increase in the price of “housing” raises the demand of “clothing” by 1.2%. “Clothing” and “education and culture” are net complementary goods, whereby 1% increase of “education and culture” reduces the demand of “clothing” by 2.8%.

“Housing utensils” and “food” are net complementary goods. 1% increase of the price in “food” reduces the demand of “housing utensils” by 0.5%. “Housing utensils” and “clothing” are net substitute goods, whereby 1% increase of price in “Housing utensils” raise the demand of latter by 0.9%. “Housing utensils” and “housing” is a pair of net substitute goods, whereby 1% increase of the price in “housing” causes the rise of the demand in “housing utensils” by 0.4%. “Housing utensils” and “education and culture” is a pair of complementary goods. 1% increase of the price in “education and culture” reduces the demand of “housing utensils” by 1.1%. “Housing” and “food” is a pair of net complementary goods. 1% increase of the price in “food” reduces the demand of “housing” by 1.7%. “Housing” and “clothing” is a pair of net complementary goods. 1% increase of the price in “clothing” reduces the demand of “housing” by 2.8%. Housing” and “housing utensils” is a pair of net substitute goods. 1% increase of the price in “housing utensils” raises the demand of “housing” by 0.3%. “Housing” and “medical” is a pair of substitute goods. 1% of price hike in “medical” raises the demand of “housing” by 1.0%. “Housing” and “education and culture” is a pair of net substitute goods. 1% increase of the price in “education and culture” raises 4.1% demand of “Housing”. “Housing” and “other expenditures” is a pair of net substitute goods. 1% increase of the price in “other expenditures”

raises the demand of “housing” by 3.2%.

“Medical” and “food” is a pair of net complementary goods. 1% increase of the price in “food” decreases the demand of “medical” by 5.9%. “Medical” and “clothing” is a pair of net complementary goods. 1% increase of the price in “clothing” reduces the demand of “medical” by 1.4%. “Medical” and “housing” is a pair of net complementary goods. 1% increase of the price in “housing” decreases the demand of “medical” by 0.4%. “Medical” and “education and culture” is a pair of net substitute goods, whereby 1% increase in the price of “education and culture” raises the demand of “medical” by 1.3%.

“Transportation and communication” and “other expenditures” is a pair of net complementary goods. 1% increase of “other expenditures” reduces the demand of “transportation and communication” by 2.1%. “Education” and “food” is a pair of net substitute goods. 1% increase in “food” raises the demand of “education and culture” by 2.7%. “Education and culture” and “housing utensils” is a pair of net substitute goods. 1% increase of “housing utensils” raises the demand of “education and culture” by 0.5%. “Education and culture” and “housing” is a pair of net complementary goods. 1% increase in the price of “housing” reduces the demand of “education and culture” by 0.2%.

“Education and culture” and “other expenditures” is a pair of net complementary goods. 1% increase in “other expenditures” reduces the demand of “education and culture” by 3.1%. “Other expenditures” and “food” is a pair of net complementary goods, whereby 1% increase in the price of “food” reduces the demand of “other expenditures” by 0.5%. “Other expenditures” and “housing utensils” is a pair of net substitute goods, whereby 1% increase in the price of “housing utensils” raises the demand of “other expenditures” by 0.3%. “Other expenditures” and “education and culture” is a pair of net substitute goods. 1% increase in “education and culture” raises the demand of “other expenditures” by 0.6%.

(e) QSR: Quintile 2

"Clothing" and "food" is a pair of complementary good. 1% increase of the price in "food" reduces the demand in "clothing" by 0.9%. "Clothing" and "housing" are net substitute goods, whereby 1% increase in the price of "housing" raises the demand of "clothing" by 0.6%. "Clothing" and "education and culture" are net complementary goods, whereby 1% increase of "education and culture" reduces the demand of "clothing" and 1.3%.

"Housing utensils" and "food" are net complementary goods. 1% increase of the price in "food" reduces the demand of "housing utensils" by 0.4%. "Housing" and "food" is a pair of net complementary goods. 1% increase of the price in "food" reduces the demand of "housing" by 4.1%. "Housing" and "education and culture" is a pair of net substitute goods. 1% increase of the price in "education and culture" raises 1.1% demand of "Housing". "Housing" and "other expenditures" is a pair of net substitute goods. 1% increase of the price in "other expenditures" raises the demand of "housing" by 1.0%.

"Medical" and "food" is a pair of net complementary goods. 1% increase of the price in "food" decreases the demand of "medical" by 3.9%. "Medical" and "clothing" is a pair of net complementary goods. 1% increase of the price in "clothing" reduces the demand of "medical" by 0.3%. "Medical" and "housing" is a pair of net complementary goods. 1% increase of the price in "housing" decreases the demand of "medical" by 0.4%. "Medical" and "transportation and communication" is a pair of substitute goods. 1% increase of the price in "transportation and communication" raises the demand of "medical" by 0.7%. "Medical" and "education and culture" is a pair of net substitute goods, whereby 1% increase in the price of "education and culture" raises the demand of "medical" by 0.4%.

"Transportation and communication" and "other expenditures" is a pair of net complementary goods. 1% increase of "other expenditures" reduces the demand of

"transportation and communication" by 2.7%. "Education and culture" and "food" is a pair of net substitute goods. 1% increase in "food" raises the demand of "education and culture" 0.5 percent. "Education and culture" and "housing utensils" are net complementary goods. 1% increase of price in "housing utensils" causes the demand to shrink by 0.5%. "Education and culture" and "transportation and communication" is a pair of net complementary goods, whereby 1% increase in the price of "transportation and communication" reduces the demand of ""education and culture" by 1.0%.

"Other expenditures" and "housing utensils" is a pair of net substitute goods, whereby 1% increase in the price of "housing utensils" raises the demand of "other expenditures" by 0.4%. "Other expenditures" and "transportation and communication" is a pair of net substitute goods, whereby 1% increase in the price of "transportation and communication" raises the demand of "other expenditures" by 0.5%. "Other expenditures" and "education and culture" is a pair of net substitute goods. 1% increase in "education and culture" raises the demand of "other expenditures" by 0.3%.

(f) QSR: Quintile 3

The relationship between "food" and "education and culture" is statistically significant. 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%. "Clothing" and "food" is a pair of complementary good. 1% increase of the price in "food" reduces the demand in "clothing" by0.8%. "Clothing" and "medical" are net complementary goods. 1% increase in the price of "medical" in these three income groups reduces the demand of "clothing" by 0.5%. "Clothing" and "education and culture" are net substitute goods, whereby 1% increase of "education and culture" increases the demand of "clothing" by 0.8%. "Housing utensils" and "food" are net complementary goods. 1% increase of the price in "food" reduces

the demand of “housing utensils” 0.2%.

“Housing utensils” and “clothing” are net substitute goods, whereby 1% increase of latter increases the demand of the former by 0.4%. “Housing utensils” and “education and culture” is a pair of complementary goods. 1% increase of the price in “education and culture” reduces the demand of “housing utensils” by 0.4%. “Housing” and “food” is a pair of substitute goods. 1% increase of the price in “food” increases the demand of “housing” by 0.5%. “Housing” and “housing utensils” is a pair of net substitute goods. 1% increase of the price in “housing utensils” raises the demand of “housing” by 0.7%.

“Housing” and “medical” is a pair of substitute goods. 1% of price hike in “medical” raises the demand of “housing” by 0.7%. “Housing” and “other expenditures” is a pair of net substitute goods. 1% increase of the price in “other expenditures” raises the demand of “housing” by 0.4%. “Medical” and “food” is a pair of net complementary goods. 1% increase of the price in “food” decreases the demand of “medical” by 3.3%.

“Transportation and communication” and “housing” is a pair of net complementary goods. 1% increase in the price of “housing” causes the demand in “transportation and communication” to shrink by 0.5%. “Transportation and communication” and “other expenditures” is a pair of net substitute goods, whereby similar price change increases the demand of “transportation and communication” by 4.1%.

“Education” and “food” are net complementary goods. 1% increase of price in “food” causes the demand of “education and culture” to shrink by 1.5%. “Education and culture” and “housing utensils” are net complementary goods. 1% price hike in “housing utensils” causes the demand to shrink by 0.6%. “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%. “Education and culture” and “other expenditures” are net

substitute goods. 1% increase of price in "other expenditures" raises the demand of "Education and culture" by 2.1%.

"Other expenditures" and "housing utensils" is a pair of net substitute goods, whereby 1% increase in the price of "housing utensils" raises the demand of "other expenditures" by 0.6%. Similarly, "Other expenditures" and "housing" is a pair of net substitute goods, whereby 1% increase in the price of "housing" raises the demand of "other expenditures" also by 0.6%. "Other expenditures" and "medical" is a pair of net substitute goods, whereby 1% increase in the price of "medical" raises the demand of "other expenditures" by 0.8%. "Other expenditures" and "education and culture" is a pair of complementary goods. 1% increase in "education and culture" reduces the demand of "Other expenditures" by 1.1%.

(g) QSR: Quintile 4

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. The relationship between "food" and "education and culture" is statistically significant, 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 3.7%. "Food" and "other expenditures" 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. 1% increase of the price in "food" reduces the demand for "clothing" by1.8%. "Clothing" and "medical" are net complementary goods. 1% increase in the price of "medical" in these three income groups reduces the demand of "clothing" by 0.7%. "Clothing" and "education and culture" are net substitute goods, whereby 1% increase of "education and culture" increases the demand for "clothing" by 1.6%.

“Housing utensils” and “food” are net complementary goods. 1% increase of the price in “food” raises the demand of “housing by 0.8%. “Housing utensils” and “housing” is a pair of net substitute goods in, whereby 1% increase of the price in “housing” causes the rise of the demand in “housing utensils” by 0.7%. “Housing utensils” and “medical” is also a pair of net substitute goods. 1% increase of the price in “medical” cause the rise in the demand of “housing utensils” by 0.8%. “Housing utensils” and “education and culture” is a pair of complementary goods. 1% increase of the price in “education and culture” reduces the demand of “housing utensils” by 1.6%. “Housing” and “food” is a pair of net substitute goods. 1% increase of the price in “food” increases the demand of “housing” by 2.3%. “Housing” and “housing utensils” are net complementary goods. 1% increase of the price in “housing utensils” reduces the demand for “Housing” by 0.3%. “Housing” and “medical” is a pair of substitute goods, whereby 1% of price hike in “medical” raises the demand of “housing” by 2.3%. Housing” and “education and culture” are net complementary goods. 1% increase of the price in “education and culture” reduces by 4.6%. “Housing” and “other expenditures” is a pair of net complementary goods. 1% increase of the price in “other expenditures” causes the demand of “housing” to reduce by 0.4%.

“Medical” and “food” are net substitute goods. 1% increase of the price in “food” causes the demand of “medical” to increase by 2.4%. “Medical” and “housing” are net substitute goods. 1% increase of the price in “housing” increases by 0.5%. “Medical” and “education and culture” is net complementary goods, whereby the demand of “medical” reduces by 1.4% by 1% increase of price in “education and culture.”

“Transportation and communication” and “housing” is a pair of net complementary goods. 1% increase in the price of “housing” causes the demand for “transportation and communication” to shrink by 0.6%. “Transportation and communication” and “medical” is a

pair of net complement goods. 1% increase in the price of “medical” reduces the demand of “transportation and communication” by 0.8%. One the contrary, “Transportation and communication” and “education and culture” is a pair of net substitute goods, whereby 1% increase of “education and culture” raises the demand of “transportation and communication” by 1.6%. “Transportation and communication” and “other expenditures” is a pair of net complementary goods. 1% increase of “other expenditures” reduces the demand of “transportation and communication” by 4.7%.

“Education” and “food” are net complementary goods. 1% increase of price in “food” causes the demand of “education and culture” to shrink by 4.7%. “Education and culture” and “housing utensils” are net complementary goods. 1% increase of price in “housing utensils” causes the demand to shrink by 0.6%. “Education and culture” and “housing” is a pair of net complementary goods. 1% increase in the price of “housing” reduces the demand of “education and culture” by 1.8%. “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 1.8%. “Education and culture” and “other expenditures” are net substitute goods. 1% increase of price in “other expenditures” raises the demand for the other good by 5.3%.

“Other expenditures” and “housing utensils” is a pair of net substitute goods, whereby 1% increase in the price of “housing utensils” raises the demand of “other expenditures” by 0.4%. “Other expenditures” and “housing” is a pair of net substitute goods, whereby 1% increase in the price of “housing” raises the demand of “other expenditures” by 0.8%. “Other expenditures” and “medical” is a pair of net substitute goods, whereby 1% increase in the price of “medical” raises the demand of “other expenditures” by 0.9%. “Other expenditures” and “education and culture” is a pair of complementary goods. 1% increase in “education and

culture" reduces the demand for "Other expenditures" by 1.7%.

(h) QSR: Quintile 5

"Food" and "transportation and communication" are net substitute goods in Quintile 5 but not in other income groups. "Clothing" and "food" is a pair of complementary good 1% increase of the price in "food" reduces the demand in "clothing" by 1.6%. "Clothing" and "housing" are net complementary goods, whereby 1% increase in the price of "housing" reduces the demand of "clothing" by 0.6%. "Clothing" and "medical" are net complementary goods. 1% increase in the price of "medical" reduces the demand of "clothing" by 0.8%.

"Housing utensils" and "food" are net complementary goods. 1% increase of the price in "food" raises the demand for "housing utensils" by 0.7%. "Housing utensils" and "housing" is a pair of net substitute goods, whereby 1% increase of the price in "housing" causes the rise of the demand in "housing utensils" by 1.2%. "Housing utensils" and "medical" is also a pair of net substitute goods. 1% increase of the price in "medical" causes the rise in the demand of "housing utensils" by 1.5%. "Housing utensils" and "education and culture" is a pair of complementary. 1% increase of the price in "education and culture" reduces the demand of "housing utensils" by 3.0%.

"Housing" and "food" is a pair of substitute goods. 1% increase of the price in "food" increases the demand of "housing" by 1.7%. "Housing" and "clothing" is a pair of net substitute goods. 1% increase of the price in "clothing" raises the demand of "housing" by 0.5%. "Housing" and "housing utensils" are net complementary goods. 1% increase of the price in "housing utensils" reduces the demand by 0.8%. "Housing" and "medical" is a pair of substitute goods. 1% of price hike in "medical" raises the demand of "housing" by 2.8%. "Housing" and "transportation and communication" is a pair of net substitute goods, whereby 1% increase of the price in "transportation and communicated" increases the demand of

“housing” by 0.5%. Housing” and “education and culture” are net complementary goods. 1% increase of the price in “education and culture” reduces by 5.5%. “Housing” and “other expenditures” is a pair of net complementary goods. 1% increase of the price in “other expenditures” causes the demand of “housing” to reduce by 0.1%.

“Medical” and “food” is a pair of net complementary goods. 1% increase of the price in “food” decreases the demand of “medical” by 0.1%. “Medical” and “housing” are net substitute goods. 1% increase of the price in “housing” increases by 0.5%. “Medical” and “transportation and communication” is a pair of substitute goods. 1% increase of the price in “transportation and communication” raises the demand of “medical” by 0.8%. “Medical” and “education and culture” is net complementary goods, whereby the demand of “medical” reduces by 2.2% with every 1% increase of price in “education and culture.”

“Transportation and communication” and “housing” is a pair of net complementary goods. 1% increase in the price of “housing” causes the demand in “transportation and communication” to shrink by 1.2%. “Transportation and communication” and “medical” is a pair of net complement goods. 1% increase in the price of “medical” reduces the demand of “transportation and communication” by 2.1%. “Transportation and communication” and “education and culture” is a pair of net substitute goods. 1% increase of “education and culture” raises the demand of “transportation and communication” by 4.0%. “Transportation and communication” and “other expenditures” is a pair of net complementary goods. 1% increase of “other expenditures” reduces the demand of “transportation and communication” by 4.1%.

“Education” and “food” are net complementary goods in. 1% increase of price in “food” causes the demand of “education and culture” to shrink by 3.8%. Education and culture” and “clothing” is a pair of complementary goods, whereby 1% increase of “clothing” reduces the demand of “education and culture” by 0.8%. “Education and culture” and “housing utensils”

are net complementary. 1% increase of price in “housing utensils” causes the demand to shrink by 0.7%. “Education and culture” and “housing” is a pair of net complementary goods. 1% increase in the price of “housing” reduces the demand of “education and culture” by 0.7%. “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 2.8%.

“Education and culture” and “transportation and communication” is a pair of net complementary goods, whereby 1% increase in the price of “transportation and communication” reduces the demand of ““education and culture” by 0.1%. “Education and culture” and “other expenditures” are net substitute goods. 1% increase of price in “other expenditures” raises the demand by 4.3%. “Other expenditures” and “housing” is a pair of net substitute goods, whereby 1% increase in the price of “housing” raises the demand of “other expenditures” by 0.5%. “Other expenditures” and “medical” is a pair of net substitute goods, whereby 1% increase in the price of “medical” raises the demand of “other expenditures” by 1.1%.

“Other expenditures” and “transportation and communication” is a pair of net substitute goods, whereby 1% increase in the price of “transportation and communication” raises the demand of “other expenditures” by 0.9%. “Other expenditures” and “education and culture” is a pair of complementary goods. 1% increase in “education and culture” reduces the demand by 1.7%.

5-6. Overall discussion

This empirical analysis has focused on three aspects of consumption expenditure, viz., income elasticity of demand, own-price elasticity of demand, and cross-price elasticity of demand. The analytical findings reveal the following characteristics regarding the consumer behaviors in

CUA in general and the respondents in BSTQ 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 narrowing the gap between the highest 20% and the lowest 20% income group are desired for stimulating private consumption expenditure in CUA.

The estimated results of income elasticity of demand reveal that "food," "clothing," "housing utensils," "education and culture" and "other expenditures" are necessity goods in CUA. 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 expenditures" are luxury goods in BSTQ. Also, it is interesting to note that "transportation and communication" is a luxury good 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 67,000 RMB 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 Quintile 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 67,000 RMB. “Medical” is a necessity category of consumption expenditure in 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 26,000-48,000 RMB is not high enough to pay for adequate attention on medical and health services. Although the provision in medical and healthcare services are subsidized in China but this consumption expenditure category remains as a luxury basket of goods/services 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 quintiles 1 and 2 but it has a positive influenced for higher disposable income in quintiles 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 92,000 RMB. 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.

5-7. Summary

In this chapter, we have estimated the time series aggregate 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 BSTQ with regard to disposable income and consumption expenditure in eight major items. This data set comprised 1,485 respondents from these four cities. Thirdly, the empirical analysis was extended to five income strata 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 observations from the analytical results were discussed in the Section 6. It should be noted here that the analyzes in this chapter have confined to compensated (Hicksian) elasticity of demand in terms of net complementary and net substitute goods among the expenditure items with respect to the changes in their prices. This study intends to incorporate the estimations of the uncompensated (Marshallian) elasticity of demand by using Slustky equation and t-tests for the computed results for another data set, viz., a panel data set of household consumption expenditures of Changchun City in Chapter 6. As explained in Chapter 4, 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.

Chapter 6 Empirical Analysis of Household Consumption Expenditures in Changchun City

This chapter deals with the econometric analysis of the household consumption expenditures in Changchun City based on Deaton-Muellbauer (1980a) AIDS model, which was discussed in Chapter 4. The model specification is equation (4-12). Furthermore, this investigation adds equation (4-14) for estimating the uncompensated (Marshallian) demand of elasticity. It is expected that this extension helps to discern how households' behave in choosing what type of goods and services with respect to each category of household consumption expenditure. The analytical results can help to identify the types of good such as a normal good/service, or an inferior good/service, or a Giffen good/service. This clarification is based on the substitution effect and income effect of the Slustky equation, as explained in Chapter 4.

Changchun City is the capital and the largest city of Jilin Province in northeastern part of China. Including its suburban areas, Changchun has about 7.6 million inhabitants. In 2012, Changchun's per capita GDP was 57,594 RMB (about $9,200), about 1.5 times of national level (38,354 RMB) but about 0.8 of that in Shanghai (73,297RMB). Automotive production is the leading industrial sector in Changchun, and it is the home for First Automotive Works (FAW) Group—the largest automobile manufacturer in China. Thus, Changchun City is also called "China's Detroit." Table 6-1 summarizes key economic indicators of Changchun City. Disposal income per capita was 17,922 RMB in 2012, which is 80% of national level (24,565 RMB). Consumption expenditure per capita was 14,400 RMB, which is about 2,200 RMB lower than national level (16,674 RMB). Hence an average person in Changchun saves less of his or her income than national average. This study chooses Changchun City as the object of this empirical research on the consumer behaviour due to the following consideration. Firstly,

the respective gap in terms of GDP per capital and disposal income per capita in Changchun City and Chinese urban areas in general is not too big, and thus the analytical findings can offer a deeper understanding of how changes in disposable income and prices influence consumer behavior in an average Chinese urban area. Secondly, Changchun typically represents the economic development pattern of China that investment and exports have been the twin engines of economic growth.

This chapter has five sections. Section 1 explains the panel data set of this econometric estimation. Section 2 outlines the analytical procedure. Section 3 summarizes the descriptive statistics of the panel data set. Section 4 provides the analytical findings and observations regarding the estimated elasticity of demand. Section 5 provides an overall discussion of the analytical findings. The last section gives a summary of this chapter.

Table 6-1 Basic Economic Indicators of Changchun City

Population (1,000 persons, 2012)	7,600
Administrative coverage	6 districts, 1 county and 3 county-level cities
GDP (billion RMB, 2012)	437.71
Primary industry (billion RMB, 2010)	25.27
Secondary industry (billion RMB, 2010)	171.99
Tertiary industry (billion RMB, 2010)	135.64
FDI (billion USD, 2012)	3.68
GDP per capita (RMB, 2012)	57,594
Disposable income per capita (RMB, 2012)	17,922
Consumption expenditure per capita (RMB, 2012)	14,400
Engel's coefficient (%)	32.2
Durable goods per 100 families	
Car	10.9
Color TVs	127.71
Refrigerators/freezers	100.32
Washing machines	99.36
Personal computers	75.8
Mobile phones	225.16
Major development zones	
Changchun Automotive Economic Trade and Development	
Changchun High Tech Development Zone	
Changchun Economic and Technological Development Zone	

Source: National Bureau of Statistics of China, J*ilin Statistical Yearbook 2011*, Changchun Municipal People's Government (URL: https://en.changchun.gov.cn/, retrieved February 20, 2016).

6-1. Data set

The data set for this analysis is compiled from the monthly household survey responses of Changchun City conducted by its Statistical Bureau from January 2009 to December 2011. The monthly household survey sample comprised 300 households, each household's disposable income, total consumption expenditure, and consumption expenditures for each of the eight categories of goods/services determined by the National Bureau of Statistics of China. Similar to Chapter 5, the eight categories are "food", "clothing," "household utensils," "housing," "medical," "transportation and communication," "education, culture and recreation," and "other expenditures." Hence the well-defined panel data set contains 118,800 observations (including missing data).

Because monthly prices in Changchun City from January 2009 to December 2011 were not available, we used monthly price indices of each consumption expenditure category compiled by Jilin provincial statistical bureau. In addition, this study uses the monthly consumer price index (CPI) of Jilin provinces for the period covering this empirical analysis to compute real disposable income in this data set. Table 6-1 shows the prices used in this analysis.

6-2. Analytical procedure

As shown in the outset, the econometric estimation of elasticity of demand for household consumption expenditure in Changchun City is based on Deaton-Muellbauer (1980a) AIDS model, which is specified in equation (4-12) in Chapter 4. There are two stages of estimation in this analysis.

Table 6-2 Price indices used in the estimation of equation (4-12)

	CPI	1	2	3	4	5	6	7	8
Jan.2009	100.8	101.7	99.8	103.8	100.0	102.2	97.7	100.4	100.8
Feb.2009	100.0	99.6	99.5	104.3	100.5	102.0	97.9	100.1	100.0
March,2009	99.7	98.9	99.2	103.9	100.1	101.9	97.6	100.0	99.7
April,2009	99.5	98.6	99.1	103.7	99.8	101.8	97.6	99.9	99.5
May,2009	99.4	98.6	99.0	103.5	99.6	101.7	97.5	99.8	99.4
June,2009	99.3	98.5	98.9	103.4	99.4	101.5	97.8	99.7	99.3
July,2009	99.3	99.1	98.7	103.3	99.2	101.4	97.5	99.7	99.3
Aug.2009	99.4	100.3	98.7	103.0	99.1	101.3	97.5	99.5	99.4
Sep.2009	100.0	102.3	98.7	102.7	98.9	101.2	97.5	99.4	100.0
Nov.2009	102.1	106.5	100.6	102.3	99.2	101.5	97.9	99.3	102.1
Dec.2009	103.8	109.8	102.7	102.5	100.8	101.6	98.5	99.3	103.8
Jan.2010	103.2	107.8	102.2	99.9	101.5	101.1	98.7	99.7	103.2
Feb.2010	103.6	109.4	101.9	99.5	101.4	101.0	98.7	100.7	103.6
March,2010	103.3	108.2	101.7	99.2	101.8	101.1	99.0	100.5	103.3
April,2010	103.6	108.8	101.5	99.4	102.6	101.3	99.0	100.5	103.6
May,2010	103.3	108.1	101.2	99.2	103.0	101.8	99.5	100.6	103.3
June,2010	103.2	108.0	101.1	99.1	102.7	101.8	99.3	100.7	103.2
July,2010	103.2	107.9	101.2	99.5	102.5	101.4	99.2	100.5	103.2
Aug.2010	104.2	111.2	101.0	100.1	102.2	101.4	99.3	100.5	104.2
Sep.2010	103.7	109.8	100.9	100.6	102.2	101.3	99.1	100.5	103.7
Nov.2010	105.6	114.0	100.7	100.1	103.3	103.3	99.2	100.7	105.6
Dec.2010	104.2	110.9	101.1	100.3	103.4	103.5	99.3	100.8	104.2
Jan.2011	104.0	109.2	100.6	100.9	104.2	103.1	99.9	100.0	104.0
Feb.2011	104.1	109.0	101.7	101.3	104.7	103.2	100.1	99.7	104.1
March,2011	104.8	110.7	101.1	101.5	105.1	103.1	100.2	100.0	104.8
April,2011	104.9	109.9	102.7	101.8	105.7	103.3	100.4	100.1	104.9
May,2011	105.4	110.9	103.1	102.1	106.4	103.3	100.6	100.4	105.4
June,2011	106.2	114.0	103.2	102.0	106.3	103.2	101.1	100.2	106.2
July,2011	106.6	114.8	103.3	101.8	106.3	104.0	100.9	100.4	106.6
Aug.2011	106.1	112.2	104.2	102.0	106.4	104.5	101.1	100.4	106.1
Sep.2011	106.5	113.2	104.2	101.9	106.2	104.5	101.2	101.1	106.5
Nov.2011	105.3	111.1	103.8	101.7	105.7	103.5	100.7	100.1	105.3
Dec.2011	106.0	111.9	104.5	101.9	106.2	103.5	101.4	100.8	106.0

Source: National Bureau of Statistics of China, *Jilin Statistical Yearbook* (various issues)
Note: 1="food", 2="clothing," 3="household utensils," 4="housing," 5="medical," 6="transportation and communication," 7="education, culture and recreation," 8= "other expendituress."

The first stage is to estimate the intercept, income elasticity of demand, cross-price elasticity of demand and own-price elasticity of demand. These parameters are denoted by *con*, π_i, $\varepsilon_{i\,j}^{h}$ (for i≠j), $\varepsilon_{i\,j}^{h}$ (for i=j), respectively, in equation (4-12). $\varepsilon_{i\,j}^{h}$ (for i = j and i≠j) represents compensated (Hicksian) demand of elasticity. This estimation is based on the first-order autoregressive model (AR(1)) for panel data with fixed effects (FE). Technical considerations for the econometric analytical approach is discussed in Chapter 4, Section 4-5.

The second stage is to estimate uncompensated (Marshallian) elasticity of demand from the Slutsky equation that is expressed in the form of elasticity. In this estimation, we pick $\varepsilon_{i\,j}^{h}$ (for i≠j and i=j) that are statistically significance, which would then be used for estimating $\varepsilon_{i\,j}^{h}$ (for i≠j and i=j) by one-sample t-test approach. Put differently, the estimation is to apply compensated elasticity of demand (i.e., $\varepsilon_{i\,j}^{h}$ (for i≠j and i=j)) that are statistically significant into equation (4-14) for the purpose of estimating $\varepsilon_{i\,j}^{m}$ (for all i≠j and i=j)—which is the difference between $\varepsilon_{i\,j}^{h}$ and the product of share of expenditure for good xi (w_i) and income elasticity of demand (π_i).

If π_i is more than zero then it indicates a luxury good, whereas if π_i is less than zero it refers to a necessity good. A luxury good is a good in which its demand increases more than proportionally with the increase in disposable income. By contrast, a necessity good is a good in which its demand increases less than proportionally with the rise in disposable income.The estimation is conducted by Stata/SE11.1 statistical software package.

6-3. Descriptive statistics

Table 6-2 summarizes the descriptive statistics of the data set. Monthly mean value of each variable in this panel data set is 4,416 RMB for disposable income, 3,602 RMB for

consumption expenditure, 1,130 RMB for “food,” 569 RMB for “clothing,” 317 RMB for “household utensils,” 557 RMB for “housing,” 585 RMB for “medical care,” 482 RMB for the “transportation and communication,” 754 RMB for “education, culture and recreation,” 229 RMB for “other expenditures.”

Table 6-3 tabulates mean expenditure share of each respective group of goods with respective to disposable income. In this panel data set, the highest monthly mean expenditure share is “food” which is 31.0% of disposable income. It is followed by “education, culture and recreation” (13.2%), “clothing” (12.5%), “housing” (10.5%), “medical” (10.4%), “transportation and communication” (10.2%), “household utensils” (7.8%), “other expenditures” (4.5%).

6-4. Analytical result and observation

(1) Income elasticity of demand

Table 6-3 summarizes the estimated income elasticity of demand from equation (4-12) using AR(1) with fixed effects. Income elasticity of demand for food (a necessity good) is -0.0118 which implies that expenditure share in “food” reduces 0.01% when disposable income increased by 1%. Notwithstanding, according to Engel’s law and also taking into consideration of continuous economic growth in China, it is reasonable to predict that the share of food expenditure will shrink as disposable income rises in Changchun

Likewise, the estimated income elasticity of demand for “education, culture and recreation” is -0.0133 and thus it indicates this expenditure item is a necessity good. Its expenditure share reduces 0.01% when disposable income is increased by 1%. The income elasticity of demand for this expenditure item is low because of the availability of compulsory education. At the

Table 6-3 Descriptive Statistics (in RMB)

Year		Disposable income	Consumption Expenditure	Food	Clothing	Household utensils	Housing	Medical care	Transportation and Communication	Education, culture and recreation	Other expenditures
2009	Mean	3,957	3,169	1,052	473	744	465	564	401	751	203
	Maximum	54,896	132,904	11,410	18,000	7,499	22,087	53,140	130,846	31,170	16,381
	Minimum	-8,127	317	95	1	1	3	2	2	1	2
	Standard deviation	2,498	3,899	634	781	1,204	1,048	1,838	2,704	2,005	666
	Sample size	3,600	3,600	3,600	2,845	202	2,926	2,445	3,388	1,905	2,926
2010	Mean	4,402	3,534	1,139	567	272	552	529	438	736	204
	Maximum	37,917	102,336	12,527	14,000	14,823	24,110	40,432	100,996	90,904	16,030
	Minimum	-6,319	254	105	1	1	2	1	2	0	1
	Standard deviation	2,692	3,845	729	822	806	1,085	1,590	2,235	2,437	613
	Sample size	3,597	3,600	3,600	2,834	2,970	2,606	2,186	3,291	2,153	2,865
2011	Mean	4,890	4,103	1,200	672	332	670	661	610	772	291
	Maximum	101,541	508,171	20,152	81,922	52,160	133,144	63,920	150,253	78,496	75,168
	Minimum	-22,610	86	10	1	0	3	1	1	1	1
	Standard deviation	4,269	10,212	904	1,962	1,292	3,042	2,373	4,118	2,683	1,981
	Sample size	3,589	3,600	3,598	2,701	3,063	2,501	2,227	3,255	2,334	2,366
All sample	Mean	4,416	3,602	1,130	569	317	557	585	482	754	229
	Maximum	101,541	508,171	20,152	81,922	52,160	133,144	63,920	150,253	90,904	75,168
	Minimum	-22,610	86	10	1	0	2	1	1	0	1
	Standard deviation	3,272	6,700	767	1,297	1,088	1,915	1,960	3,116	2,414	1,196
	Sample size	10,786	10,800	10,798	8,380	6,235	8,033	6,858	9,934	6,392	8,157

Table 6-4 Mean expenditure share with respect to the mean disposable income

	Mean	Std. Err.
Food	0.3101	0.0073
Clothing	0.1247	0.0051
Household utensils	0.0777	0.0060
Housing	0.1048	0.0062
Medical care	0.1042	0.0063
Transportation and communication	0.1020	0.0046
Education, culture and recreation	0.1317	0.0079
Other expenditures	0.0448	0.0027

Table 6-5 Estimated income elasticity of demand

	Income elasticity	Std. err.	t-value	
Food	-0.0118	0.0055	-2.14	**
Clothing	0.0021	0.00383	0.54	
Household utensils	0.0147	0.0075	1.96	*
Housing	0.0128	0.0043	3.00	***
Medical care	0.0029	0.0051	0.57	
Transportation and communication	0.0061	0.0031	1.98	**
Education, culture and recreation	-0.0133	0.0057	-2.31	**
Other expenditures	0.0021	0.0023	0.89	

Note: ***: t-statistics at 1% significant level; **: t-statistics at 5% significant level; *: t-statistics at 10% significant level.

Table 6-6 Interpretation of estimated income elasticity of demand

Food	Clothing	Household utensils	Housing	Medical care	Transportation & communication	Education, culture and recreation	Other expenditures
NG	-	LG	LG	-	LG	NG	

Note: NG: necessity goods; LG: luxury goods, "-" denotes good that is statistical insignificance (H_0: ε_i =0).

same time, it is also quite plausible to explain that price (income) sensitivity is low for education in Changchun because parents are willing to pay higher education fees (either in-school or out-of-school tuition or even both) for a better quality of education. This characteristic is widely observed across China.

On the other hand, "household utensils," "housing" and "transportation and communication" are luxury goods for people in Changchun. Also, the expenditure share of "household utensils" is the most sensitive but that of "transportation and communication" is the least sensitive to variation of disposable income.

Income elasticity of demand for “clothing”, “medical” and “other expenditures” is statistically insignificant, respectively. Thus their income elasticities of demand are zero ($H_0 : \varepsilon_i = 0$), which implies that the rise in disposable income does not affect the changes of demand in these goods. It is plausible that demand for these three sets of goods in Changchun is fixed. The classification in terms of necessity goods and luxury goods for the estimated income elasticity of demand is tabulated in Table 5-5.

(2) Uncompensated own-price elasticity of demand

We applied the estimated results of the specification based on equation (4-11) into equation (4-14), then used one-sample t-test to derive the coefficients of uncompensated or simply Marshallian own- and cross-price elasticity of demand for good i and good j. Table 6-6 summarizes those results.

Uncompensated own-price elasticity of demand for “food,” “household utensils,” “housing,” “transportation and communication,” “education, culture and recreation” is 0.6532, -0.001, -1.2623, -0.0007, 3.4484, respectively. Expenditure share in “clothing”, “transportation and communication” is respectively inelastic to change in its own price. This means even if the price of “clothing” and “transportation and communication” has increased respectively, the expenditure share of its own does not change significantly. The expenditure share of “food” increases 0.7% with about 1% hikes in “food” prices. Expenditure share in “housing,” “education, culture and recreation” is respectively elastic to change within its own price. A 1.3% rise in expenditure share in “housing” is caused by 1% of its own price reduction. Conversely, 3.4% rise in expenditure share in “education, culture and recreation” is caused by 1% of price increase of its own. As shown in Table 6-6, uncompensated own-price elasticity of demand for “clothing”, “medical care” and “other expenditures” is zero,

respectively. This means the change in each respective set of goods does not change its own expenditure share.

(3) Uncompensated cross-price elasticity of demand

The uncompensated cross-price elasticity of demand for "food" and "clothing," "household utensils," "housing," "medical," "transportation and communication," "education, culture and recreation," "other expenditures" is 0.005, 0.0008, 1.229, 0.0015, -2.3956, 4.334, -3.9328, respectively. These results suggest that "food-clothing," "food-housing utensils," "food-housing," "food-medical," "food-education, culture and recreation" are gross substitutes. "Food" and "transportation and communication," "food" and "other expenditures" are gross complements. "Food-clothing," "food-household utensils," and "food-medical care" are inelastic, but "food-housing," "food-transportation and communication," and "food-education, culture and recreation" are elastic.

Except "transportation and communication," uncompensated cross-price elasticity of demand for "household utensils" and other expenditures item is negative, respectively. These results mean that "household utensils" and "transportation and communication" are gross substitutes. Whereas all other pairs of goods are gross complementary. Furthermore, "houseutensils-transportation and communication" and "housing utensils-education, culture and recreation" are very elastic (2.3148, -2.065, respectively) while others are inelastic (Table 6-6).

"Housing-food", "housing-household utensils", "housing-medical", "housing and education, culture and recreation" are gross complements. Among them, "housing-medical" is elastic

(-1.4627). On the other hand, “housing-transportation and communication”, “housing-other expenditures” are gross substitutes and elastic (1.7156, 2.5773, respectively).

For “transportation and communication”, its uncompensated cross-price elasticity of demand with other goods are negative and thus all pairs of goods are gross complements. Furthermore, all pairs are extremely insensitive to price changes.

Uncompensated cross-price elasticity of demand for “education, culture and recreation” with other goods are positive except for “food.” By implication, “education, culture and recreation” and “food” are gross complements but other pairs are gross substitutes. Furthermore, ““education, culture and recreation”-“transportation and communication”” and ““education, culture”-“recreation-other expenditures”” are sensitive to price changes (1.9379, 1.8166, respectively).

Table 6-7 Estimated uncompensated cross price elasticity of demand

	j							
	1	2	3	4	5	6	7	8
ε_{1j}^{m}	0.6532	0.005	0.0008	1.229	0.0015	-2.3956	4.3334	-3.9328
t	2.60E+04	198.88	47.59	5.80E+04	60.24	-1.70E+05	1.70E+05	-1.60E+05
ε_{2j}^{m}	0	0	0	0	0	0	0	0
ε_{3j}^{m}	-0.0062	-0.0023	-0.001	-0.0021	-0.0019	2.3148	-2.065	-0.0008
t	-2.00E+02	-76.7	-47.59	-77.31	-60.24	1.30E+05	-6.60E+04	-60.4
ε_{4j}^{m}	-0.0054	0.9081	-0.0009	-1.2623	-1.4627	1.7156	-0.002	2.5773
t	-2.00E+02	3.50E+04	-47.59	-5.50E+04	-5.30E+04	1.10E+05	-70.568	2.30E+05
ε_{5j}^{m}	0	0	0	0	0	0	0	0
ε_{6j}^{m}	-0.0026	-0.00096	-0.0007	-0.0009	-0.0008	-0.0007	-0.0009	-0.0003
t	-2.00E+02	-76.7	-95.56	-77.31	-60.24	-95.56	-70.57	-60.4
ε_{7j}^{m}	-0.3977	0.0021	0.0009	0.0019	0.0017	1.9379	3.4484	1.8166
t	-1.40E+04	76.7	47.59	77.31	60.24	1.20E+05	1.20E+05	1.50E+05
ε_{8j}^{m}	0	0	0	0	0	0	0	0

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

Note 2: “0” is because the estimated income elasticity and compensated income elasticity (Equation 4-14) was statistically insignificance ($H_0 : \gamma_{ij}^{c} = 0$, $H_0 : \varepsilon_i = 0$), respectively.

Note 3: “t” denotes t-value.

(4) Compensated own-price elasticity of demand

The estimated results of compensated cross-price elasticity of demand for good i and good j are summarized in Table 6-7. The compensated own-price elasticity ($\varepsilon_{i^*j}^h$, i=j) of demand for "food," "clothing," "housing," "education, culture and recreation" is respectively statistically significant. Holding utility constant, the compensated own-price elasticity of demand for "food" is 0.6482. This means a consumer raises his/her expenditure share in food by 0.65% when its price increases 1%. Food's compensated own-price elasticity of demand (substitution effect) comprises 0.6542 substitution effect and -0.004 of income effect. Because substitution effect is greater than income effect, food items are Giffen goods in this data set[33]. The period of household survey of our data set was from January 2009 to December 2011 when in the same period food prices in China were affected by food commodities speculation. Figure 5-1 depicts the rise of food prices from the middle of 2009. The price increase in food has generated more demand. *This is because in or*der to keep utility constant, the drop in real disposal income (income effect) is compensated by the substitution effect.

As for "housing," its compensated own-price elasticity of demand is -1.2604. This means that the expenditure of "housing" decreases 1.26% when its own price increases by about 1%. Also this compensated own-price elasticity is less than zero because it is the sum of uncompensated own-price elasticity of demand (-1.2623) and income effect (0.001). Thus "housing" is a Giffen good. This result is not surprising in the observed reality in China in general; the demand of housing continues to increase even when its price is increasing. It is

[33] From the Slutsky equation, compensated own-price elasticity of demand (the substitution effect) is the sum of uncompensated own-price elasticity of demand and the product of income elasticity of demand and share of the good's expenditure (which is the income effect). If substitution effect is greater than income effect, then it is a normal good. A normal good is a good when consumer's income increases its demand increase. If the sum of substitution effect (SE) and income effect (IE) is negative but $|SE| > |IE|$ (i.e., SE>IE or SE<-IE), then it is an inferior good. An inferior good is a good that decreases in demand when the income rises. On the other hand, if the sum of substitution effect (SE) and income effect (IE) is positive but $|SE| < |IE|$ (i.e., -IE<SE<IE), then it is a Giffen good. A Giffen good is a good that demand increases when its price rises.

Table 6-8 Estimated compensated cross-price elasticity of demand

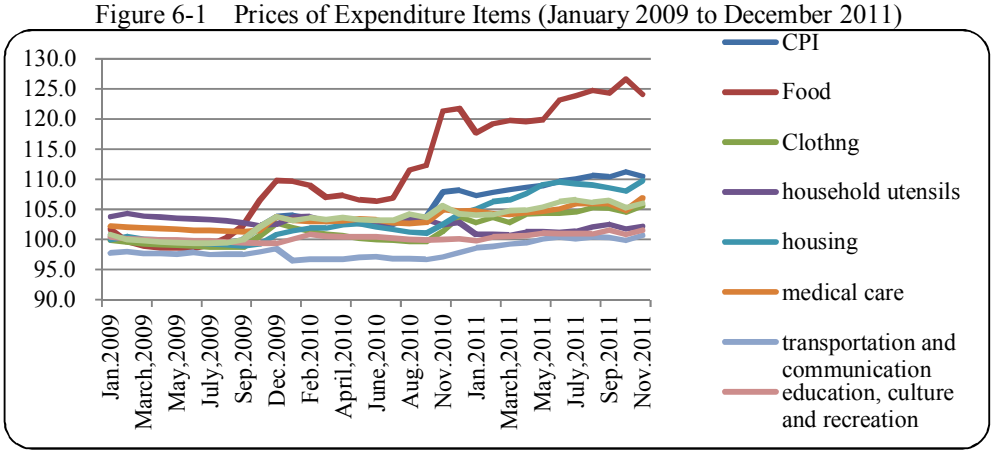
	j									
	1	2	3	4	5	6	7	8	Cons.	F
ε_{1j}^{h}	0.6482***	-0.7883	0.34	1.2274**	0.6663	-2.3969***	4.3319***	-3.9346***	-0.0386	8.60***
s.d.	0.2024	0.6158	0.579	0.5129	0.673	0.589	1.1818	0.7214	0.2403	
t	3.2	-1.28	0.59	2.39	0.99	-4.07	3.65	-5.45	-0.16	
ε_{2j}^{h}	-0.1696	-1.9086***	1.2185***	1.7989***	1.40161***	-4310	-1.8104*	-0.0868	-0.0054	11.69***
	0.1961	0.5213	0.4237	0.387903	0.4763	0.5371	1.0207	0.6772	0.0105	
	-0.86	-3.66	2.88	4.64	2.94	-0.8	-1.77	-0.13	-0.52	
ε_{3j}^{h}	-0.1586	0.7562	0.4734	-0.7691*	0.3488	2.3165***	-2.0627**	-0.8722	-0.0354***	13.81***
	0.1469	0.5027	0.4576	0.4218	0.3605	0.4767	8447	0.5436	0.1149	
	-1.08	1.5	1.03	-1.83	0.97	4.86	-2.44	-1.6	-3.08	
ε_{4j}^{h}	-0.2735	0.9101*	-0.9971	-1.2604***	-1.4610***	1.7171***	-1.1762	2.5780***	0.0079	14.93***
	0.1744	0.5396	0.4546	4106403	0.5076	5152	1.0496	0.6354	0.01703	
	-1.57	1.69	-2.19	-3.07	-2.88	333	-1.12	4.06	0.46	
ε_{5j}^{h}	0.1656	-0.7296	0.3237	0.4796	-0.2862	-0.0772	0.7703	-0.6186	-0.0205	6.22***
	0.2244	0.6695	0.5459	0.4981	0.6087	0.647	1.288	0.8052	0.0136	
	0.74	-1.09	0.59	0.96	-0.47	-0.12	0.6	-0.77	-1.51	
γ_{6j}^{C}	-0.1811	0.2632	-0.0555	0.1212	-0.2842	0.5008	-0.6422	0.311	-0.036	3.24***
	0.1121	0.3565	0.3218	0.2861	0.3538	0.3375	0.6897	0.4115	0.0362	
	-1.61	0.74	-0.17	0.42	-0.8	1.48	-0.93	0.76	0.99	
ε_{7j}^{h}	-0.4033*	0.1572	0.5127	-0.8496	0.3323	1.9364***	3.4464**	1.8159**	-0.0188	12.95***
	0.2253	0.7214	0.5893	0.5401	0.617	0.662	1.3339	0.8189	0.0149	
	-1.79	0.22	0.87	-1.57	0.54	2.92	-2.58	2.22	-126	
ε_{8j}^{h}	-0.0687	0.2877	0.0801	-0.4311*	-0.3723	0.6465**	-0.559	0.4334	-0.0018	7.70***
	0.923	0.2903	0.2518	0.2257	2712	0.2721	0.5718	0.3387	0.0109	
	-0.74	0.99	0.32	-1.91	-1.37	2.38	-0.98	1.28	-16	

Note 1: s.d.= standard error, t=t-value

Note 2: for j, 1="food", 2="clothing," 3="household utensils," 4="housing," 5="medical," 6= "transportation and communication," 7="education, culture and recreation," 8= "other expenditures."

Note 3: ***: t-statistics at 1% significant level; **: t-statistics at 5% significant level; *: t-statistics at 10% significant level.

Figure 6-1 Prices of Expenditure Items (January 2009 to December 2011)



Source: National Bureau of Statistics of China, Ibid.

suggested that this phenomenon occurs because Chinese believe demand outstrips supply and thus the value of housing will continue to rise over a long period of time. As such, the people of Changchun also behave in this manner.

For expenditure share in "education, culture and recreation," the compensated own-price elasticity of income is 3.4464. This suggests that expenditure share increases by 3.45% when its price increases by about 1%. The sum of substitution effect and income effect is positive but the former (3.4464) is greater than the latter (-0.002). This means this item is also a Giffen good. Although the demand for "education, culture and recreation" is negative (a necessity good) but inelastic to the change in disposable income, it can be contended that people in Changchun spend more on this expenditure item in order to get a higher quality of education even its price increases.

Although the compensated own-price elasticity of demand for "clothing" is -1.9086 (1% statistically significance) but its income effect is zero because income elasticity of demand for "clothing" is not statistically significant[34]. This means the expenditure share in "clothing"

[34] $H_0: \pi_i=0$ is not statistically rejected.

decrease 1.91 units if its price increases about 1 unit. The compensated own-price elasticity of demand for “household utensils,” “medical care,” “transportation and communication” and “other expenditures” are all statistically insignificant. These results suggest that expenditure share in each respective good remains the same even if its own prices changes. However, because the sum of substitution effect and income effect for “household utensils” and “transportation and communication” is respectively in negative value (-0.001 for each item), these two groups are normal goods.

(5) Compensated cross-price elasticity of demand

A negative value of compensated cross-price elasticity of demand means good i and good j are net complementary goods whereas a positive value means they are net substitute goods. A net complement means a good's demand decreases when the price of another increases (the reverse also holds). Conversely, a net substitute is when the demand of a good increases when the price of another good increases (the reverse also holds).

The estimated compensated cross-price elasticity of demand for “food-housing,” “food-transportation and communication,” “food-education, culture and recreation” and “food-other expenditures” is 1.2274, -2.3969, 4.3319 and -3.9346, respectively. By implication, “food-housing,” “food-education, culture and recreation” are net substitute goods, but “food-transportation,” “food-other expenditures” are net complementary goods. Put differently, when the price of “housing” and “education, culture and recreation” increases 1% then expenditure share increases 1.2% and 4.3%, respectively. Conversely, when the price of “transportation and communication” and “other expenditures” increases by 1% then the expenditure share in “food” decreases 2.4% and 3.9%, respectively.

Compensated cross-price elasticity of demand for “clothing-household utensils,” “clothing-housing,” “clothing-medical care,” “clothing-education, culture and recreation” is 1.2185, 1.7989, 1.4016, -1.8104, respectively. These findings suggest “clothing-household utensils,” “clothing-housing” and “clothing-medical care” are net substitute goods, respectively, but “clothing-education, culture and recreation” are net complementary goods. For the net substitute goods, it is apparent that when the prices of other goods like “household utensils”, “housing” and “medical care” rise about 1% then each corresponding expenditure share in “clothing” increases 1.2%, 1.8%, 1.4%. However, the expenditure share in “clothing” reduces 1.81% when the price of “education, culture and recreation” increases about 1%.

For the expenditure in “household utensils,” its compensated cross-price elasticity of demand with respect to “housing,” “transportation and communication,” “education, culture and recreation” is -0.7691, 2.3165, -2.0627, respectively. These indicate that “household utensils-housing,” “household-education, culture and recreation” are net complementary goods, but “household utensils-transportation and communication” are net substitute goods. These estimated coefficients indicate 0.8% and 2.1% decrease in the expenditure share in “household utensils” is caused by 1% of price hike in “housing”, “education, culture and recreation,” respectively. However, a 2.3% increase in the expenditure share in “household utensils” is caused by 1% increase in price of “transportation and communication.”

Compensated cross-price elasticity of demand for “housing-clothing,” “housing-medical care,” “housing-transportation and communication” and “housing-other expenditures” is 0.9101, -1.4610, 1.7171, and 2.5780, respectively. “Housing-clothing,” “housing-transportation and communication,” “housing-other expenditures” are net substitute goods. By implication, 1% of price hike in each respective good like “clothing”, “transportation and communication,” “other expenditures” causes 0.9%, 1.7% and 2.6% of

increase in the corresponding expenditure share in “housing.” “Housing” and “medical care” are net complement goods, in which the expenditure share in “housing” decreases 1.5% when the price of “medical care” increases 1%.

Compensated cross-price elasticity of demand for “education, culture and recreation” with respect to “food,” “transportation and communication,” “other expenditures” is statistically significant, respectively. The elasticity of each pair of goods is -0.4033, 1.9364, and 1.8159, respectively. These estimated results suggest that “education, culture and recreation-food” are net complement goods on the one hand. “Education, culture and recreation” with respect to “transportation and communication,” “other expenditures” are net substitute goods. The expenditure share in “education, culture and recreation” decreases 0.4 % when the price of “food” increases 1%. Conversely, the expenditure share in “education, culture and recreation” increases 1.9 % and 1.8 % when the respective price of “transportation and communication” and “other expenditures” increases 1%.

It is worth noting that the substitution effects for “food-housing,” “food-education, culture and recreation,” “clothing-housing,” “clothing-medical,” “household utensils-transportation and communication,” “housing-clothing,” “housing-medical care,” “housing-other expenditures,” “education, culture and recreation-transportation and communication,” “education, culture and recreation-other expenditures” and “other expenditures-transportation and communication” are positive. Theoretically, a substitution effect is assumed to be negative if marginal rate of substitution (MRS) is diminishing. For a substitution effect to take a positive value then it means MRS is increasing. This situation implies that there is an abundance of one good in each pair of goods. For example, because “food-housing” is a net substitute (i.e., $\varepsilon_i^h{}_j > 0$) therefore if the housing’s price increases then the expenditure share of food increases. This substitution takes place where there is an abundance of food availability

so that increase in consumption expenditure in “food” reduces its marginal utility but it causes the rise of marginal utility of the consumption expenditure in “housing.” Similar explanation applies to all other pairs that are in this context.

Table 6-8 summarizes the relationship between good i and good j in terms of a net complementary good and a net substitute good.

Table 6-9 The relationship between good i and good j in compensated cross-price elasticity of demand

	1	2	3	4	5	6	7	8
1	COPE***	-	-	Net sub.	-	Net comp.	Net sub.	Net comp
2	-	COPE***	Net sub.	Net sub.	Net sub.	-	Net comp.	-
3	-	-	-	Net comp.	-	Net sub.	Net comp.	
4	-	Net sub.	-	COPE***	Net comp.	Net sub.	-	Net sub.
5	-	-	-	-	-	-	-	-
6	-	-	-	-		-	-	-
7	Net comp.	-	-	-	-	Net sub.	COPE**	Net sub.
8	-	-	-	Net comp.	-	Net sub.	-	-

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

Note 2: Net sub.=Net substitute good, Net comp.=Net complementary good.

Note 3: COPE=compensated own-price elasticity of demand that is statistically significance; “***” and “**” denotes t-statistics at 1% and 5%, respectively; “-“=statistically insignificance ($H_0: \varepsilon_i^h{}_j = 0, \forall i \neq j$).

6-5. Overall discussion

From the analytical results, we can reveal three characteristics in terms of the consumer behavior in Changchun City. Firstly, the consumer behavior in Changchun differs from the law of demand in three major expenditure items. “Food” and “education, culture and recreation” are necessity goods for the people in Changchun. The former constitutes 31.0% while the latter represents 13.2% of mean expenditure share, respectively. Both groups of goods comprise 44% of total expenditure share in our 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, the estimated income elasticity of demand for “housing” shows that although it is a luxury good, it is also a Giffen good because its expenditure share rises with the increase in its price. This can be interpreted that their real incomes are adjusted in terms of

income effect in order to maintain same level of utility to offset the change in prices of the goods concerned. It is plausible to argue 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.

Secondly, our estimated compensated cross-price elasticities of demand indicate that the theoretical assumption of a diminishing MRS does not hold for our data set. Based on these evidences, it is reasonable to contend that—in the case of Changchun—for the consumption expenditure shares in those net substitute goods, whereas consuming one good reduces its own marginal utility but also caused the marginal utility of its substitute good to rise.

Thirdly, expenditure share in "medical" is not influenced by the change in disposable income. Neither is this expenditure item affected by the change in its own price prices of other goods (i.e., compensated own- and cross-price elasticities of demand are statistically insignificance). We contend that this phenomenon is the result of the government dominance of the medical/healthcare sector in China. In other words, although the Chinese economic system is a market-based one, it still has a relatively strong socialist characteristic particularly in the medical/health sector. Most of the hospitals, clinics and medical/health facilities are state owned and publicly operated. As such, the supply of medical/health goods and services is constrained in spite of the continuous rise in income in the last few decades. As a consequence, out data set shows that people's demand in "medical" is not being influenced by its price and people's disposable income.

6-6. Summary

This analysis has focused on Changchun City that has 7.6 million inhabitants as a case study for examining the consumer behavior in a Chinese urban area. Similar to Chapter 5, this case

study also used AIDS model for the estimation of three variants of elasticity, viz., the income elasticity of demand, uncompensated own-price and cross-price elasticity of demand, compensated own-price and cross-price elasticity of demand.

The analytical results suggest three salient characteristics of the consumer behavior in China. First, although "food" and "education, culture and recreation" are necessity goods/services, they are also Giffen goods. Second, "housing" is a luxury good but it is at the same time a Giffen good. Third, consumption expenditure share in "medical" is not influenced by the change in disposable income.

Chapter 7 Summary and Conclusion

7-1. Summary

In the last three decades, China's urbanization has expanded along with its extraordinary growth in gross national income per capita. This persistent trend is likely to continue albeit at a slower pace. It should be recognized that the lower economic growth rate in China in the coming period will still be significant because of the sheer size of its economy[35]. Thus this thesis has reasoned that continuous urbanization and growth in per capita income will have considerable influence on individuals' or households' consumption patterns in Chinese urban areas. Equally crucial, another rationale for this empirical study is the inevitable change in the engine of growth in China. The law of diminishing returns in capital formation was already quite obvious since the late 2000s but unsuccessful transformation from investment-led to domestic demand-led growth has caused an abnormal distortion in saving-investment environment in China. In fact, this weakness was the cause and consequence of the failed 4 trillion RMB worth of stimulus plan launched in 2008-09. Instead of replacing investment strategy with a new strategy that would have stimulated private consumption, that plan had caused extraordinary rise of prices in the property or housing and foodstuff. From this perspective, this study argues that private consumption is the new locomotive for growth in China and hence it is essential to grasp the reality of individuals' or households' consumption expenditures from empirical evidences based on consumer demand theory. Such understanding is necessary because empirical evidences of consumers' choices with respect to changes in price and disposable income are useful for better policy making in stimulating the

[35] The nominal GDP in 2015 is 67.7 trillion RMB, which is about USD 10.3 trillion. Hence even 1% GDP growth rate means USD 100 billion worth of value-added being expanded in a year.

expansion of domestic demand. This new path to economic growth is not only desirable to China itself but is also to other countries.

Against this backdrop of rationales, this study has attempted to elucidate how households' or individuals' choices for consumption expenditures respond to changes in their disposable income and changes in prices of those goods and services that they desire to consume. For this purpose, this study has applied AIDS model formulated by Deaton-Muellbauer (1980a) in conducting this empirical investigation. AIDS model is chosen because of its linearity, flexibility in terms of the econometric approaches for individuals/household and aggregate consumption expenditures, and uncomplicated use of Stone's price index and Slustky equation to estimate income effect and substitution effect for real consumption expenditures. Essentially, the analytical focus of this model specification is based on the duality of Marshallian and Hicksian demand functions.

For the econometric analyses, this study used the following three data sets. Firstly, a time series aggregate data set from 1992 to 2012 compiled for disposable income and consumption expenditure of eight major categories of goods and services. Secondly, a cross section data set collected from questionnaire survey responses given by 1,485 individuals in Beijing, Shanghai, Tianjin and Qingdao (BSTQ) with regard to their disposable income and consumption expenditures. For the purpose of clarifying the consumer behavior in different income level, this data set was also decomposed into five income strata. Thirdly, a time series cross sectional data set pertain to disposal income and consumption expenditure from January 2009 to December 2010 compiled from household surveys of 300 households in Changchun City. The eight major consumption expenditure categories of goods and services are "food," "clothing," "household utensils," "housing," "medical," "transportation and communication,"

"education, culture and recreation," and "other expenditures.[36]" In addition, this study also conducted empirical analysis of the average and marginal propensity to consume for the aggregate time series data set and questionnaire survey data set.

The analytical results obtained from the econometric estimation are summarized below.

(1) Average and marginal propensity to consume

Regarding the average propensity to consume (APC), the estimated results show that it is 0.77 in Chinese urban areas (CUA), whereas the mean APC in BSTQ is 0.65. This implies BSTQ have a higher saving proportion to the disposal income. The analytical evidences from income strata of BSTQ show that Quintile 1 (i.e., with disposable income between 26,000 and 48,000 RMB) has the highest APC of 0.8, which is about 3% higher than CUA. Thus it is plausible to explain that the disposal income in the lowest quintile in BSTQ is lower than that in CUA. Moreover, the analytical findings show the value of APC becomes smaller as the disposable income becomes larger (i.e., from Quintile 2 to Quintile 5).

Regarding the marginal propensity to consume (MPC), its value is 0.59 in CUA but it is 0.20 in BSTQ. These evidences suggest that for every 100 RMB increment of disposable income, averagely an individual or a household in CUA spends 40 RMB more than his/her counterparts in BSTQ. In other words, individuals or households in BSTQ incline to channel bigger share of their additional disposable income to saving. Among the income strata in BSTQ, quintile 2 has the highest value of MPC while that value becomes smaller in higher income groups (i.e., quintiles 3, 4 and 5). It is noteworthy that the MPC for lower 60% (i.e., quintiles 1-3) is quite close to that in CUA, ranging from 0.53 to 0.66. Put differently, an

[36] As noted in Chapter 1, "medical" includes health related goods/services and "education, culture and recreation" is also expressed as "education."

individual or a household that has a disposable income from 26,000 RMB to 91,000 RMB inclines to spend about 55-65 RMB of his/her additional income of 100 RMB. On the contrary, the MPC in the highest 20% is about 0.03, which means for every 100 RMB increment in disposable income 97 RMB is directed to saving.

From BSTQ respondents, this study has substantiated that the lowest 20% (Quintile 1) has the smallest saving ability while the savings increase as the income strata moves upward. The income gap between the highest 20% and the lowest 20% is more than 5 times, which is larger than the income gap between urban and rural households (about 3.3 times)[37]. This suggests that the disparity within urban areas is more severe than that between urban and rural areas. Similarly, the gap for savings between the highest 20% and the lowest 20% is 12.8 times, whereas urban and rural is 10.5 in 2010. Thus the disparity within urban areas does not confine only to income but also in savings too.

(2) Income elasticity of demand

The estimated results of income elasticity of demand reveal that while "food," "clothing," "housing utensils," "education and culture" and "other expenditures" are necessity goods in CUA but "food," "housing" and "medical" are necessity goods in BSTQ. Furthermore, while "transportation and communication" is a luxury good in CUA, "clothing," "housing utensils," transportation and communication," "education" and "other expenditures" are characterized as luxury goods in BSTQ. In terms of income strata, the evidences show "transportation and communication" is a luxury good across all quintiles in BSTQ's sample. "Education and culture" is a necessity good in CUA but it becomes a luxury good for people in the income group of 67,000-91,000 RMB and 129,000-980,000 RMB in the whole BSTQ's sample.

[37] This comparison is for 2010 because the survey conducted in BSTQ was in 2010.

“Housing” is a necessity good in BSTQ’s sample as well as for those people in quintiles 3 and 5, but it becomes a luxury good in quintiles 1 and 2. The difference can be explained by the affordability based on the level of disposable income.

The households in Changchun City treat ”food” and “education, culture and recreation” as necessity goods. The mean expenditure share is 31.0% and 13.2%, respectively. These two categories of consumption expenditure took up 44% of total expenditure share. Moreover, expenditure share in “medical” is not influenced by the change in disposable income in Changchun City’s sample.

(3) Own price elasticity of demand

Regarding the estimated compensated own-price elasticity of demand in BSTQ, the results have verified that the demand of “food,” “clothing” and “medical” is influenced positively by changes in its own prices in lower income strata. It is worth noting that the rise in disposable income has a negative influence on “housing” in the whole BSTQ’s sample as well as for people with disposable income ranged between 26,000-48,000 RMB (Quintile 1) and 49,000-68,000 RMB (Quintile 2). However, similar situation caused a positive influence for people in higher disposable income, viz., in Quintile 4 and 5. 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.

For the households in Changchun City, the empirical evidences suggest “food,” “housing” and “education, culture and recreation” are Giffen goods because their expenditure shares rise even with the increase in the respective own prices. This can be interpreted that their real incomes are adjusted in terms of income effect in order to maintain same level of utility to

offset the change in prices of the goods concerned. These evidences suggest it is plausible 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 categories of consumption expenditure.

Especially although the provision of education is free from primary school to junior high school level, households in BSTQ with disposable income higher than 67,000 RMB (i.e., Quintile 3) seem to emphasize on the quality of education of their children (BSTQ's sample mean age is 38.3). This affinity is also confirmed by the estimated own-price elasticity of demand in "education, culture and recreation," in which the empirical evidences suggest that people in Changchun spend more on education in order to acquire a higher quality of education despite price increases.

(4) Cross-price elasticity of demand

The empirical evidences from the estimation of BSTQ data set indicate that cross-price elasticity of demand of one expenditure category with another one changes accordingly with the level of disposable income. Specifically, "clothing" and "housing," "housing" and "food," "medical" and "housing" changed from a pair of net complementary goods to a pair of net substitute goods, respectively. On the other hand, the shift from net substitute goods to a pair of net complementary goods was evident for "housing" and "education," "education" and "food" when the disposable income has increased.

The estimated cross-price elasticities of demand in Changchun City suggest that various pairs of goods like "food" and "housing," "food" and "education and culture," "clothing" and "housing," "clothing" and "medical" do not satisfy the theoretical assumption of a diminishing marginal rate of substitution (MRS)[38]. Based on these evidences, it is reasonable

[38] The MRS of good X and good Y is the amount of good Y that a consumer is willing to give up in order gain one additional unit of good X in the same indifference curve (same utility). The MRS diminishes as the consumer moves down in an indifference curve.

to contend that—in the case of Changchun City—for the consumption expenditure shares in those net substitute goods, whereas consuming one good reduces its own marginal utility but also caused the marginal utility of its substitute good to rise.

7-2. Conclusion and policy recommendation

The empirical evidences derived from a time series aggregate data set of CUA, a cross section data set from BSTQ, and a panel data set from Changchun City deduce the following conclusions with respect to consumer behavior in Chinese urban areas.

First, the value of APC in BSTQ except the lowest 20% (i.e., Quintile 1) is smaller than that in CUA. People who live in BSTQ have disposable income in the highest 20% also have the highest MPC (i.e., 0.03), whereas those in the lower 60% of disposable income incline to spend about 50-65 RMB more than the highest quintile. The gap in terms of MPC is the result of income disparity within urban areas, as evidenced from the empirical results from BSTQ respondents. This income disparity is more severe within urban areas than that between urban and rural areas.

As reiterated in the outset of this chapter, one of the rationales that motivated this empirical inquiry is related to the Chinese government's intent in stimulating private consumption in 2008-09. The resources for that stimulus have instead caused the rise in property or housing prices and foodstuff prices since the mid-2000s. It is plausible to relate the extremely low value of MPC to the real estate bubble. The anticipation of the ceaseless elevation of housing prices has motivated households—especially those individuals or households who have income shares in the highest 40%—to restrain consumption expenditures but save more in order to invest in housings because the expected capital gains

from the property investments would be extremely worthwhile. Consequently, a phenomenon created by quantities of residences that were bought for investment, which are then left unused for several years after being bought.

The housing wealth not only restrains the household consumption expenditure as a whole but also brings no effect in increasing spending on "housing" and "housing utensils" in household consumption expenditures. The two categories mainly comprise the expense on utility like electricity, gas, water, and furniture and the like. The estimated results show that the income elasticity for demand in disposable income less than 67,000 RMB in major cities is positive. But for disposable income higher than 67,000 RMB, the results show that if disposable income increased, households reduce their spending share on these items. In fact, if a family even considers controlling the utility consumption, its living standard would become lower. This observation is also consistent with a study conducted by Blazquez, Heimsch, and Filippini (2013) who find that there is a positive relation between the growth rate of disposable income and residential electricity consumption in the majority of the provinces of Spain under economic crisis.

Second, the econometric estimated results from BSTQ's and Changchun City's samples did not show convincing evidences for the effect of consumption stimulation in household sector, although Chinese government implemented 4 trillion RMB worth of stimulus program to minimize the impact of the global financial crisis in 2008 and subsequent years. Instead this stimulus had boosted the bubble of the real estate prices and as well as the price hike especially in foodstuff. The analyses show a few unexpected results, which suggest that expenditure items of "food," "education, culture and recreation" and "housing" indicate a characteristic of Giffen goods, which differs from the law of demand. For "education, culture and recreation," there are likelihoods that households spend substantially in enhancing

education quality of their children's through after-school learning or supplementary instructions at informal organized learning centers or/and private tutoring lessons at home. It is not easy to deduce a convincing reason to explain why as the price rises in "education, culture and recreation" the spending also increases. However, we must not deny there exists other factors—beside income and price—that could have influenced this phenomenon.

Third, for the consumption expenditure in "medical," the analytical results confirmed that this category is a necessity good in Chinese urban areas in general. However, if this category was examined in terms of income strata, "medical" is a luxury good for income group earning less than 49,000 RMB. One of the plausible reasons for this stark difference is that the disposable income level of 26,000-48,000 RMB is not high enough to pay for adequate attention on medical and healthcare services. Although the provision in medical and healthcare services in China is subsidized but it remains as a luxury item for the people in lower income groups. More importantly, however, the results show that disposable income above 49,000 RMB, expenditure share in "medical" is not influenced by the change in disposable income. In fact, neither is this expenditure item affected by the change in its own price or prices of other goods (i.e., compensated own- and cross-price elasticities of demand are statistically insignificance). We contend that this phenomenon is the result of the government dominance of the medical/healthcare sector in China. In other words, although the Chinese economic system has become a market-based one, it still has a relatively strong socialist characteristic particularly in the medical/healthcare sector. Most of the hospitals, clinics and medical/healthcare facilities are state-owned and publicly operated. As such, the supply of medical/healthcare related goods/services is inelastic (i.e., the supply curve in terms of quantity and disposable income or price), and this constrained individuals to receive sufficient supply in spite of the continuous rise in income in the last few decades. Another conceivable explanation is that personal relationships with medical/hospital personnel

influence patients' ability to receive medical or healthcare. As a consequence, our data set shows that people's demand in "medical" is not being influenced by its price and their disposable income.

From the conclusions discussed in preceding paragraphs, this study suggests the following policy recommendations for stimulating private consumption, in which their outcomes are also the means for rebalancing the distorted relation between saving and investment.

First and foremost, from the evidences of econometric analysis of APC and MPC, in order to stimulate a higher level of domestic household consumption expenditures, the government has to focus on the mitigation of income disparity within urban areas. The inverse relationship between disposable income and MPC implies that if the gap between the highest and the lowest income groups is reduced, the result certainly induces more consumption expenditures. This does not mean urban and rural inequality is not important. Income gap between urban and rural is presently smaller than that in urban areas. Overtime, according to Kuznets' hypothesis, inequality in the country level (i.e., between urban and rural) will improve when per capital income has risen beyond a certain threshold level. However, it is unclear if Kuznets curve will also be applicable to urban areas. In this context, policy priority on reducing income gap in urban areas is higher than that of between urban and rural areas.

Secondly, the high level of thrift demonstrates by individuals or households in urban areas above 93,000 RMB inhibits more spending. One underlying reason is the precautionary saving being exhibited by higher income groups is weak social security systems in China. In this regard, Chinese government needs to accelerate its efforts in putting in place an effective social security system that is universal throughout the country. The social security system is crucial at least on two aspects: medical and healthcare for low-income group; social security systems for retirement benefits so that individuals can allocate more of their disposable

income to consumption expenditure instead of saving for livelihood in retirement.

Furthermore, as mentioned earlier, the high marginal propensity to save is related to individuals' time preference to forgo present consumption expenditures for higher expected returns to be gained from investing in housing. Thus government ought to limit investment in housing that are not for self-residential purpose. To a certain extent, Chinese authorities have intervened in this area in recent years but they are not sufficient[39]. In this connection, government supports in facilitating the acquisition of affordable housings in urban areas need to focus on disposable income level of less than 67,000 RMB.

Thirdly, with regard to the expenditure category in "education," it is crucial for the government to examine how to enhance education quality especially to those households in the low income stratum. Quality education is a passport for poorer young generations to gain chances in improving their economic status, which in turn helps to strengthen their upward social mobility. From this perspective, government interventions in providing better and equal access to quality education has the potential of creating and also enhancing equal opportunities for upward social mobility in the Chinese society.

Last but not least, Chinese government ought to undertake a thorough reform of the household registration system or the *hukou* system. By and large, rural-urban migrations had indeed intensified the process of urbanization. While this phenomenon was unavoidable because people flow from the subsistence rural areas to higher income urban areas, but the migrants were the source for low cost labor inputs in the industrialization and modernization of the Chinese economy as postulated by the Lewis' two-sector development model. Although the Lewisian turning point was achieved at the end of 2000s, the urban *hukou* system still is

[39] For example, real estate sales tax was introduced to prevent speculative investment in housing; big city like Beijing has restricted two homes for its native residents and one home for non-native residents; higher amount of down payment is required for purchasing second home and the like.

the most critical impediment for millions of migrant-residents in achieving better socioeconomic wellbeing in urban areas. For a migrant-resident in the city, the deprivation of a formal household registered status has restrained his/her propensity to consume because of uncertainty. Moreover, the denial is also the obstruction for millions of migrants to acquiring own residences in cities. This reality has indeed become a crucial factor that has exacerbated the inequality inside urban areas. Equally critical, the *hukou* system has not only deprived equal opportunities for migrants' children to seek an education that is of better quality in urban areas, but it has also constrained the access of medical/healthcare services too. If these problems are not addressed imminently, the disparity inside urban areas will undoubtedly be worsened and also be converted into a multi-dimensional problem.

7-3. Contribution, limitation and future research direction

This empirical inquiry has analyzed individuals' and households' consumption expenditures from two levels. Firstly, from a time series aggregate level of consumption expenditures in China's urban areas. Secondly, from a micro level where the analytical focus was three-fold: a cross sectional analysis of individuals/households consumption expenditures based on the sample of 1,485 individuals in Beijing, Shanghai, Tianjin and Qingdao (BSTQ); a cross sectional analysis based on five different income strata derived from BSTQ's sample; a panel data analysis of household consumption expenditures of 300 households in Changchun City. These comparative econometric estimations are more exhaustive than previous studies. The analytical evidences from the duality approach have helped to explain the substitution effect and income effect of individuals and households consumption expenditures with respect to changes in their income and prices of eight major categories of goods/services in China's urban areas. Earlier studies of this kind in China are limited and their focus was mainly

concentrated on the demand systems of a few selected items of consumption expenditure in rural areas. Hence this dissertation not only add a new chapter to the literature pertains to this field of empirical investigations, it also complements previous studies by illustrating how AIDS model is indeed suitable to use for explaining consumer behavior in China's urban areas. Thus this aspect is the thesis' research originality. Additionally, the analytical results have supported the making of a set of policy recommendations for promoting more private consumption expenditures in China. In these contexts, this study has contributed much in strengthening empirical understandings of unusually low consumption expenditures in China as well as in identifying key areas of focus for policy interventions in rectifying those shortcomings.

On the other hand, this study also has its limitations. Firstly, in the econometric estimations of aggregate consumption expenditures in CUA's data set as well as the individuals' consumption expenditures in BSTQ's sample, they were confined to the compensated elasticity of demand in terms of net complementary and net substitute goods among the expenditure categories 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.

Secondly, the estimated income elasticity of demand is the determinant of whether an expenditure category is a necessity or a luxury good/service. However, it should be noted that an expenditure category such as "food" comprises a variety of foodstuff. For instance, meat is differentiated into chicken, pork, beef, lamb and others; a staple food can be rice, maize, wheat, potatoes, soybean and others. More specifically, for the purpose of illustration, if an estimated result has determined an expenditure category (e.g., "food") to be a necessity good,

a particular item inside that expenditure basket (e.g., “beef”) can also be a luxury good. In this regard, for the purpose of clarifying the property of each item inside a specific expenditure category or a basket of goods, the AIDS model specification can be extended to this field of inquiry.

Thirdly, econometric analysis of Changchun City’s sample was based on the first-order autoregressive model [AR(1)] for panel data with fixed effects. Regardless households or individuals in a society, demographic structure is an important factor that affects the consumer preferences. This viewpoint also coincides with Modigliani’s theory of life cycle hypothesis. Furthermore, whereas China is approaching to the aging of population, this study did not include demographic determinants into consideration in our empirical analysis due to data limitation. In fact, the household wealth is also an important factor that can bring a considerable influence to household consumptions. On this point, this thesis research could not avoid this limitation either. Hence we plan to provide an analysis of the dynamic effect to the household consumption produced by the household wealth in future studies. In other words, considering these heterogeneous factors that affect household consumption, we plan to examine these parameters in the future research.

Fourthly, the second independent variable represents real disposable in our model specification. In reality, for the avoidance of “accountability or legitimate reason,” many individuals or households do not reveal the actual amount of their total income. In other words, there is a certain amount of hidden income—income being concealed from making responses to the household consumption expenditure survey. As such, the disposable income used in this empirical inquiry might be lower than the actual amount. This influences the magnitude of the income elasticity of demand, which could have impaired the estimated results. In this regard, it is imperative to examine the individuals/households disposable income from another type of micro-data survey such as household finance survey.

Finally, future studies can give more attention on utilizing a set of models for comparison, since different models may produce different elasticities, which can be used to observe the problems of applying different models in conducting empirical analysis of consumer behavior in China.

Appendix I

Questionnaire Survey of Household Income and Consumption Expenditure in Beijing, Shanghai, Tianjin and Qingdao (BSTQ)

Questionnaire Survey of Household Income and Consumption Expenditure

Code Number of Respondent	Gender	Age	Final Education
Family Composition	Household Income（yuan）	Per Capita Income	Total Expenditure
Expenditure of Each Consumption Item			
Food	Clothing	Housing Utensils	Housing
Medical and Health	Transportation and Communication	Education and Entertainment	others

Area of Survey: ( ) District ( ) City

★ This investigation just needs your anonymous answer and is only for economics research.

★We pledge your answers will never be used as reference to taxation. Thanks for your cooperation.

Appendix Ⅱ

The Details of 8 Expenditure Categories

Food
Grain, Starches and Tubers, Beans and Bean Products, Oil and Fats, Meat, Poultry and Related Products, Eggs, Aquatic Products, Vegetables , Condiments, Sugar, Tobacco, Liquor and Beverages, Dried and Fresh Melons and Fruits, Nuts and Kernels, Cake, Milk and Its Products, Other Food, Dining Out, Food Processing Service Fees.
Clothing
Garments, Clothing Materials, Shoes, Tailoring and Laundering Service Fees.
Housing Utensils
Durable Consumer Goods, Room Decorations, Bed Articles, Household Articles for Daily Use, Furniture Materials, Household Services.
Medical
Health Care and Medical Services.
Transportation and Communication
Transport, Communications.
Education and Culture
Recreation Articles, Education, Recreation Services.
Housing
House, Water, Electricity, Fuels and Others.
Other Expenditures
Miscellaneous Goods, Services.

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