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Engel curves and price elasticity in urban Chinese Households☆

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ABSTRACT

On the basis of local concavity assumptions, Exact Affine Stone Index implicit Marshallian demand system is adopted to analyze Engel Curves and price elasticity for Chinese urban household. Our results show that a demand system rank can be polynomials or splines of any order which support the conclusion of Lewbel and Pendakur (2009). Engel Curves are affected by gender and education of householder, the number of minor children and adults. Budget shares of food, clothing and transportation–communication decrease, and other budget shares increase from 1995 to 2007. There are different influences between all categories of price elasticities, most notably dwelling price. In addition, the quickly rising price and slow growth spending hamper improvement of welfare from 2002 to 2012.

1. Introduction

Since 1978, economic reforms in China have significantly increased household income and improved the standard of living. The annual disposable income of an urban household increases to 24,565 yuan per capita in 2012, a 71-fold increase in the last 35 years. As household incomes rise, consumers demand not only food, but also clothing, durables, recreation and transportation. Differing income responses for quantity and quality demanded mean that Engel curves of households have changed. Besides income, demographic characteristics and prices are significant factors that impact the Engel curves of a household. Banks et al. (1997) show the diversity in the Engel curve for food as the household size varies. Blacklow et al. (2010) report the effect of household size and composition changes, along with price changes, on expenditure allocation. Moreover, Engel curves of a household is used to analyse household welfare in recent development of research (Norris and Pendakur, 2013; Ree et al., 2013).

The literature of Engel curves is based on the Almost Ideal Demand System (Deaton and Muellbauer, 1980), which satisfied the axioms of choice exactly, and aggregated perfectly over consumer without invoking parallel linear Engel curves. The contribution of Deaton and Muellbauer (1980) and Jorgenson et al. (1982), should be making the integration of the Working–Leser Engel curve and integrable consumer theory. Gorman (1981) investigates the shape of Engel curves and their consistency with consumer theory detailedly. Some focus on unobserved preference heterogeneity and model error terms (Brown and Walker, 1989; McFadden and Richter, 1990; Blundell et al., 1998). Lewbel (2001) justifies the connection between the rationality of individual demand functions **d** and the rationality of statistical demand functions **D**. Blundell et al. (2001) reveal preference theory to consumer demand; Blundell et al. (2007) develop the IV approach to estimation under endogeneity for semi-nonparametric Sharp-Invariant Engel curves. To address the issues above, Lewbel and Pendakur (2009) introduce the Stone log price index Stone (1954) to model the Exact Affine Stone Index (EASI) class of cost function. In contrast to the AIDS system, the EASI demand system also allows for flexible interactions between prices and expenditures, permits almost any functional form for Engel curves, and allows error terms in the model to correspond to unobserved preference heterogeneity random utility parameters.

The main Engel curve research focuses on the structure of food expenditure in China. For example, Wan (1996) demonstrates the superiority of the proposed model against the conventional approach utilizing an unexploited set of data from China. Gao et al. (1996) use rural household microdata from Jiangsu province of China to evaluate economic and demographic effects on Chinese rural household demand. The results indicate that the slow growth of food consumption in China during the latter half of the 1980s is a result of income stagnation rather than consumption saturation. Using Chinese household survey data for urban households (China NBS, 2002–2005), Huang and Gale (1996) apply a unique approach to measure income, quality, and nutrient elasticities within the same framework of Engel relationship. They find that the income elasticities diminish as income rises.

There is much less attention paid to Engel curve of all expenditure categories for a Chinese household. Still less attention is paid to the various demographic characteristics and prices affecting a Chinese

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household's Engel curve. The principal motivation of this study is to provide such evidence. We employ the Exact Affine Stone Index class of cost function (Lewbel and Pendakur, 2009) to estimate Chinese consumer demands under local concavity assumptions. Using data from Chinese Household Income Project Series (1995, 2002) and the survey on Rural–Urban Migration in China (RUMiC, 2008), we find Chinese evidence that rejects both the liner and quadratic demand specification in favour of those with higher-order terms in total expenditure. The household budget share and demand are influenced by the variety of demographic characteristics and price. We further examine the change of household welfare which is related to price inflation and growth of household expenditure. The result shows that there is no significant improvement from 2002 to 2012.

The layout of the paper is as follows. Section 2 contains Data Sets and Summary Statistics. In Section 3, Methodology is presented. Section 4 presents the Empirical Results of our estimation. Section 5 is the conclusion.

2. Datasets and summary statistics

We study Engel Curve and Demand System with three datasets: the 1995 and 2002 waves of Chinese Household Income Project Series (CHIPS), and the 2008 wave of a survey on Rural–urban Migration in China (RUMiC). They are used to measure and estimate the distribution of personal income and related economic factors in both rural and urban areas of the People's Republic of China, and both sampled from the Chinese Urban household Survey. CHIP survey is conducted by the Institute of Economics, Chinese Academy of Social Sciences, with assistance from the Asian Development Bank and the Ford Foundation. It has advantages over other data sources in that the samples were chosen from significantly larger samples drawn by the National Bureau of Statistics of China (NBSC). The survey also covers a large scale of variables to reflect socioeconomic variables, demographic characteristics, migration history, and the family situation before leaving the home village. RUMiC 2008 is used to replace CHIP 2007 to analyse Engel Curve and Demand System (CHIP 2007 is only partly publicly available). The 2008 wave of RUMiC is a large-scale household survey conducted in China. It is initiated by a group of researchers at the Australian National University, the University of Queensland and the Beijing Normal University with support from the Institute for the Study of Labour (IZA) (Cui et al., 2013). The household data used in this paper come from urban household parts of CHIPS (1995, 2002) and RUMiC (2008). The CHIP 1995 data is sampled from eleven provinces, namely: Beijing, Shanxi, Liaoning, Jiangsu, Anhui, Henan, Hubei, Guangdong, Sichuan, Yunnan, and Gansu. The CHIP 2002 data is sampled from one more province than the CHIP 1995 data, namely: Chongqin. The RUMiC 2008 data is sampled from nine provinces, namely: Shanghai, Jiangsu, Zhejiang, Anhui, Hubei, Guangdong, Chongqin, and Sichuang. Based on information on the provinces, price data is annualy taken from the China National Bureau of Statistics (1996, 2003, 2008). We use the consumer price index to construct the price IV. These data contain the consumer price index in expenditure categories: food, clothing, transportation–communication, dwelling, education–recreation, durables, and medical care, yielding seven expenditure share equations to be estimated. Prices are normalized so that price vector facing national prices index in 2002 (1, 1, …, 1). We remove 1% highest and lowest abnormal total expenditures and income data in every cross-sectional data. Our sample for estimation consists of observations of household that has non-negative expenditure for food, clothing, transportation–communication, dwelling, education–recreation, durables, and medical care. We only keep the information of householder whose age is between 20 and 60 living in the city in our sample. We add observable demographic characteristics in our model: (1) the gender of householder; (2) the marriage status dummy equal to one if householder is single now; (3) the age dummy of householder equal to one if the age of householder is more than 39; (4) the education dummy equal to one if the education level of householder is equal or higher than senior school; (5) the number of minor children; (6) the number of adults; and (7) the year dummy equal to one if the sample is collected in 2002, equal to two if the sample is collected in 2007. Table 1 gives summary statistics for our estimation sample.

3. Methodology

3.1. The demand model

In order to solve the linear problem of Engle Curve, we employ substituting implicit utility into the Hicksian budget shares which yields the implicit Marshallian budget shares Lewbel and Pendakur (2009):

$$w^j = \sum_{r=0}^{i} b_r y^r + Cz + Dzy + \sum_{l=0}^{L} z_l A_l p + Bpy + \varepsilon \tag{1}$$

Table 1
Data descriptives.

Variable		Mean	Std. dev.	Min	Max
Budget shares	Food	0.472	0.149	0.0407	0.947
	Clothing	0.129	0.0819	0	0.658
	Transportation–communication	0.0781	0.0689	0	0.633
	Dwelling	0.0764	0.0739	0	0.806
	Education–recreation	0.125	0.12	0	0.847
	Durables	0.0637	0.0823	0	0.715
	Medical care	0.0556	0.0728	0	0.847
Log-price	Food	0.074	0.14	−0.0651	0.327
	Clothing	−0.00981	0.037	−0.12	0.0392
	Transportation–communication	−0.0332	0.0304	−0.078	0.0129
	Dwelling	0.131	0.126	−0.0222	0.343
	Education–recreation	0.0333	0.0481	−0.0408	0.181
	Durables	0.0403	0.0741	−0.0471	0.182
	Medical care	−0.0457	0.103	−0.241	0.0554
Demographics	Gender	0.328	0.469	0	1
	Marital	0.658	0.474	0	1
	Age dummy	0.445	0.497	0	1
	Edu dummy	0.0388	0.193	0	1
	Child	0.659	0.56	0	3
	Adult	2.425	0.746	1	8
	Year	1.002	0.736	0	2
Log-expenditure	x	9.787	0.564	8.524	11.58