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Research on Consumption Structure of Rural Residents in Gansu Province Based on ELES Model

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Abstract By using cross-section data on consumption structure of rural residents in Gansu Province in 2007 and 2008, this paper adopts ELES model to conduct empirical analysis on consumption structure of rural residents in Gansu Province. It indicates that in the current consumption structure of rural residents in Gansu Province, food expenditure is still at the most important and basic level; the overall consumption level of rural residents in Gansu Province is not high; at present, the consumption of rural residents in Gansu Province still hinges in a large measure on income, vulnerable to the price fluctuation. Consequently, increasing farmers' income and stabilizing the level of commodity price, turns out to be a foundation as well as an important approach to improve consumption structure of rural residents in Gansu Province.

Key words ELES model, Consumption structure, Rural residents, Gansu Province, China

In recent years, with the continuous economic development of Gansu Province, the income and consumption levels of rural residents are incessantly rising, and at the same time, their consumer attitudes and consumption patterns also change dramatically. In order to reveal the status quo of living and consumption of rural residents in Gansu Province in current stage, we adopt cross-section data on consumption structure of rural residents in Gansu Province in 2007 and 2008, and use ELES (Extended Linear Expenditure System) to conduct empirical analysis on consumption structure of rural residents in Gansu Province in recent two years. From the marginal propensity to consume, income elasticity of demand, price elasticity, price elasticity compensated by income and other indicators, this paper analyses the quantitative performance of consumption behaviour of rural household in Gansu Province, so as to provide reference for Gansu Province to formulate policies of stimulating rural residents' consumption.

1 Data source and research method

1.1 Data source On the basis of consumption structure data of rural households in 2007 and 2008 from *Gansu Statistical Yearbook*, the consumer products of the households are divided into 8 types of consumer goods: food, clothing, residence, household appliance and services, healthcare, transportation and communications, cultural, educational and entertainment goods and services and other items.

1.2 ELES model Extend Linear Expenditure System model (ELES) is extended from Linear Expenditure System established by Stone (1954). In the absence of price data, the former can indirectly estimate linear expenditure system, so it is widely used internationally to establish the consumer model. Extended linear expenditure system views the consumer spending as the function of price and income. If we do not consider

some subtle differences between the extended linear expenditure system models based on the theory of different incomes^[1], but study only from general perspective of income, we can write the basic expression of extended linear expenditure system as follows:

$$P_i X_i = P_i X_i^0 + \beta_i (Y - \sum P_i X_i^0) \quad (1)$$

Where $P_i X_i$ is consumers' consumer spending on commodity or service i ; Y is consumers' income; P_i is the market price of commodity or service i ; X_i^0 is basic demand for commodity or service i ; β_i is the marginal propensity to consume of commodity or service i ; $\sum P_i X_i^0$ is the total basic expenditure for purchasing various commodities or services.

The merit of ELES mode lies in that it can use cross-sectional data. Moreover, $P_i X_i^0$ and $\sum P_i X_i^0$ are all constant here. Now we transform expression (1), to make it concise. Let

$$b_i = P_i X_i^0 - \beta_i \sum P_i X_i^0 \quad (2)$$

Thus, expression (1) can be written as follows:

$$P_i X_i = b_i + \beta_i Y \quad (3)$$

It can be easily seen that expression (3) is a simple linear regression model, and we can estimate the parameter of b_i and β_i of various commodities.

By applying this model, we can further calculate the basic consumer spending.

Sum up the two sides of expression (2) and solve the following expression:

$$\sum P_i X_i^0 = \sum b_i / (1 - \sum \beta_i) \quad (4)$$

Substitute expression (4) into expression (2), get the following expression:

$$P_i X_i^0 = b_i + \beta_i [\sum b_i / (1 - \sum \beta_i)] \quad (5)$$

According to expression (5), we can calculate the expenditure of basic demand for various commodities^[2].

2 Results and analysis

2.1 Estimated results of model According to relevant data of Gansu Province in 2007 and 2008, we use econometric software to calculate the estimation results of model, which can be

shown in Table 1. From *t* test statistic in the table, we know that under the given significance level of 0.05, the regression equation passes statistical test. It indicates that for the residents in rural areas of Gansu Province, the disposable income has significant impact on consumption of 8 types of commodi-

ties; from the goodness of fit R^2 , we know that more than 96% of rural household consumption in Gansu Province depends on farmers' income. This result shows that the regression line fits well with the sample observation value, which can be used in the following analysis.

Table 1 Parameter estimated value and statistical parameter value of rural residents' various consumer goods in Gansu Province in 2007 and 2008

Item	Year	b_i	β_i	$P_i X_i^0 // \text{Yuan}$	$P_i X_i // \text{Yuan}$	t_{β_i}	R^2
Total expenditure	2007	631.931	0.595	1 560.32	2 017.64	75.457	0.999
	2008	833.005	0.576	1 964.63	2 401.91	28.447	0.996
Food	2007	551.15	0.169	814.84	944.74	26.892	0.996
	2008	674.589	0.168	1 004.65	1 132.19	36.169	0.998
Clothing	2007	32.466	0.034	85.52	111.65	29.406	0.997
	2008	51.138	0.031	112.04	135.58	24.110	0.995
Housing	2007	37.034	0.111	210.23	295.54	21.922	0.994
	2008	39.281	0.128	290.75	387.93	9.584	0.968
Household appliance	2007	-14.671	0.045	55.54	90.13	9.483	0.968
	2008	-2.855	0.036	67.87	95.20	9.486	0.968
Transportation and communication	2007	19.023	0.072	131.37	186.71	22.184	0.994
	2008	57.177	0.065	184.88	234.22	20.153	0.993
Culture, education and entertainment	2007	1.388	0.089	140.26	208.66	10.925	0.975
	2008	13.965	0.082	175.07	237.32	14.102	0.985
Medical care	2007	6.488	0.062	103.23	150.88	11.058	0.976
	2008	-2.310	0.055	105.74	147.50	17.517	0.990
Others	2007	-0.848	0.013	19.44	29.43	12.789	0.982
	2008	2.020	0.011	23.63	31.98	9.722	0.969

2.2 Empirical analysis on consumption structure of rural residents in Gansu Province

2.2.1 Analysis of marginal propensity to consume. The result of Table 1 shows that the total marginal propensity to consume of rural residents in Gansu Province in 2007 and 2008 was 0.595 and 0.576 respectively, and the marginal propensity in 2008 to consume decreased slightly as against that in 2007; 57.6% of newly-added disposable income of residents during that time was used for living consumer spending, and the proportion of disposable income used for productive consumption and savings was as high as 42.4%, mainly in that unsound rural social security system strengthens the savings motive of the rural residents to some extent.

In expenditure of all kinds of consumer goods, the marginal propensity to consume of food is at the highest level in the two years, 0.169 and 0.168 respectively, followed by residence, culture, education and entertainment and, transportation and communication. Food is still in the first place. Because food is the most basic consumer material for survival and development of rural residents, and especially in the case of generally low level of rural residents' disposable income in Gansu Province, once the income increases, the first consideration of farmers is to improve the nutritional structure and improve the quantity and quality of food consumption. The expenditure of residence ranks No. 2, second only to food, indicating that housing is still a major content of rural residents' living consumption in Gansu Province, and a large portion of newly-added incomes are used to improve the living conditions. The expenditure of culture, education and entertainment ranks No. 3. This indicates that rural residents in Gansu Province pay more and more attention to investment of household human capital and fostering of children's education, and such spending is gradually becoming an important consumer spending. The ex-

penditure of transportation and communication ranks No. 4, which is related to that in recent years, telephone, mobile phones, motorcycles are increasingly popular in rural households, and rural residents work elsewhere more and more frequently. In terms of marginal propensity to consume, medical care, household appliance, clothing and miscellaneous items are in the last four places. The item of medical care is regarded as an important aspect of basic needs, of which the marginal propensity to consume is not high, indicating that the majority of rural residents are still in a state of passive consumption in medical care consumption, that is, unless it is absolutely necessary, they do not display great initiative in go to hospital. As for clothing and household appliance, being that at present, the rural residents in Gansu Province still remain in the stage of survival-oriented consumption, so there is still a long way to go before the rural residents pay attention to quality of life and the pursuit of high-end furniture.

2.2.2 Analysis of income elasticity of demand. Income elasticity of demand refers to the percentage of demand change of certain goods caused by an increase of 1% of income^[3]. The rural residents' income elasticity of demand of various consumer goods in Gansu Province can be shown in Table 2.

In Table 2, the income elasticity coefficient of all consumption items is greater than 0, that is, the consumer demand for various goods is proportional to income, indicating that the current income level is the main factor impacting rural residents' consumption scale and consumption level; income elasticity of demand of housing and health care tends to rise, with great sensitivity to income growth, and particularly the item of medical care has been incorporated into the rank of high-end goods consumed by rural households, which further reflects the urgency of establishing and improving social security system in rural areas, the medical insurance system and supply system

of public goods in rural areas; on the contrary, the income elasticity of demand of food, clothing, transportation and communication, culture, education and entertainment tends to decline, indicating that with incessant improvement of income level of rural household and implementation, popularization of free rural nine-year compulsory education, this type of consumer demand, on the whole, lags behind the income changes. The income elasticity of demand of food consumption is the lowest,

Table 2 Income elasticity of demand of rural residents' various consumer goods in Gansu Province in 2007 and 2008

Item	Food	Clothing	Housing	Household appliance	Transportation and communication	Culture, education and entertainment	Medical care	Others
2007	0.417	0.709	0.875	1.163	0.898	0.993	0.957	1.029
2008	0.404	0.623	0.899	1.030	0.756	0.941	1.016	0.937

2.2.3 Analysis of price elasticity of demand. Price elasticity reflects the impact of relative variation of price on relative change of demand, which can be divided into two categories: one is self-price elasticity, reflecting the percentage of change in self-demand of one commodity caused by 1% increase in price of another commodity; the other is mutual-price elasticity, reflecting the percentage of change in demand of one commodity caused by 1% increase in price of another commodity^[3]. Price elasticity of various consumer goods of rural residents in Gansu Province in 2008 can be seen in Table 3.

Each line of numerical value in Table 3 reflects the impact of price variation of certain commodity on the demand of other commodities, and each column of numerical value in Table 3 reflects the impact of price variation of other commodities on

Table 3 Price elasticity of various consumer goods in 2008

Item	Food	Clothing	Housing	Household appliance	Transportation and communication	Culture, education and entertainment	Medical care	Others
Food	-0.262	-0.230	-0.331	-0.380	-0.279	-0.347	-0.375	-0.346
Clothing	-0.017	-0.199	-0.037	-0.042	-0.031	-0.039	-0.042	-0.039
Housing	-0.043	-0.066	-0.346	-0.110	-0.081	-0.100	-0.108	-0.100
Household appliance	-0.010	-0.016	-0.022	-0.313	-0.019	-0.023	-0.025	-0.023
Transportation and communication	-0.027	-0.042	-0.249	-0.070	-0.262	-0.064	-0.069	-0.064
Culture, education and entertainment	-0.026	-0.040	-0.058	-0.066	-0.049	-0.323	-0.065	-0.060
Medical care	-0.016	-0.024	-0.035	-0.040	-0.029	-0.037	-0.323	-0.036
Others	-0.004	-0.005	-0.008	-0.009	-0.007	-0.008	-0.009	-0.269

In addition, in the consumer spending, apart from food and housing, the mutual-price elasticity coefficient of other consumer items is small, which indicates that in the consumer products, the price variation of food and housing has the greatest impact on the demand of other types of commodities. Rise in housing price will lead to decline in demand for other commodities, which is closely related to a large proportion of means of subsistence (especially food expenditure) in consumption structure of rural residents in Gansu Province currently.

2.2.4 Analysis of price elasticity of demand compensated by income. According to the literature [4], we can further calculate the rural residents' price elasticity of various consumer goods compensated by income in Gansu Province in 2008, as can be shown in Table 4. In Table 4, self-price elasticity compensated by income is above diagonal, and the rest is mutual-price elasticity compensated by income. Obviously, under the condition of being compensated by income, although the rural residents' self-price elasticity coefficient of various consumer

indicating that even if incomes rise, food consumption does not increase much; the income elasticity of demand of residents' household appliance and miscellaneous items is greater than 1. And the income exerts the greatest impact on household appliance, but their income elasticity of demand shows the trend of decline, the reason of which is that the spending power of rural residents is improved, making their consumption of luxury goods gradually divert to consumption of the necessities of life.

this type of commodity. Numerical value of diagonal reflects the impact of the impact of price variation of certain commodity on self-demand. It can be seen that in each column of data, the self-price elasticity of various kinds of goods is relatively big, while the mutual-price elasticity is generally small, indicating that the demand variation is mainly impacted by self-price, and it is not sensitive to the price variation of other commodities. The absolute value of self-price elasticity coefficient of rural household expenditure in Gansu Province is less than 1. The demand lacks elasticity to price variation. The main reason is that the current consumption in rural areas of Gansu Province is mainly basic expense, and farmers almost have no surplus income. Even if the farmers have surplus income, they use the income as expenditure for the necessities.

goods in Gansu Province in 2008 is still still negative, the absolute value greatly declines, indicating that under the condition of being compensated by income, the sensitivity of all kinds of consumer goods in response to price changes abates, and the actual demand increases to some extent. In the case of income compensation, mutual-price elasticity coefficient of various types of consumer goods declines in various degree, indicating that promoting the level of disposable income of rural residents in Gansu Province or providing consumption subsidy, will help alleviate the "crowding-out effect" of consumption of food, housing and other means of subsistence to spending on other aspects, which can play a positive role in driving rural residents' consumption and promoting the level of overall consumption.

3 Conclusion and discussion

First, the total marginal propensity to consume of rural residents in Gansu Province and marginal propensity to consume of food, clothing, household appliance, transportation and

communication, culture, education and entertainment, and medical care, tend to decline. The marginal propensity to consume of housing tends to rise. In the current consumption structure of rural residents in Gansu Province, food expenditure

is still at the most important and most basic level, indicating that the overall level of consumption of rural residents in Gansu Province, is still not high, and at low-level existence-oriented consumption stage.

Table 4 Price elasticity of rural residents' various consumer goods compensated by income in Gansu Province in 2008

Item	Food	Clothing	Housing	Household appliance	Transportation and communication	Culture, education and entertainment	Medical care	Others
Food	-0.192	-0.217	-0.278	-0.365	-0.252	-0.313	-0.352	-0.341
Clothing	-0.008	-0.198	-0.031	-0.041	-0.028	-0.035	-0.039	-0.038
Housing	-0.019	-0.062	-0.328	-0.105	-0.071	-0.089	-0.101	-0.098
Household appliance	-0.004	-0.014	-0.018	-0.311	-0.017	-0.021	-0.023	-0.023
Transportation and communication	-0.013	-0.040	-0.238	-0.067	-0.256	-0.057	-0.064	-0.063
Culture, education and entertainment	-0.011	-0.037	-0.047	-0.063	-0.043	-0.316	-0.060	-0.059
Medical care	-0.007	-0.023	-0.028	-0.038	-0.026	-0.032	-0.320	-0.036
Others	-0.002	-0.005	-0.006	-0.009	-0.006	-0.007	-0.008	-0.269

Second, the income elasticity of demand of eight categories of goods and services, is positive, indicating that with improvement of income level of rural residents in Gansu Province, farmers' consumer demand for various types of consumer goods will continue to increase. Thus, improving farmers' income level, is the key to expanding the rural market and improving purchasing power in rural areas. However, farmers' income has different impacts on increase of farmers' income and consumption of farmers. Therefore, the improvement of farmers' income will lead to the continuous adjustment of the consumption structure in rural areas.

Third, the consumer demand of rural residents' housing, household appliance, culture, education and entertainment, medical care and other aspects in Gansu Province, is most vulnerable to variation of their own price; the consumer demand for food, clothing and transportation and communication seldom fluctuates drastically due to the variation of their own price. Thus, by adjusting the price concerning housing, household appliance, culture, education and entertainment, medical care and enjoyment-oriented, development-oriented data, the effect of adjusting the corresponding consumer demand in rural areas is ideal; by adjusting the price of food, clothing, transportation and communication and other basic living expenses, the effect of adjusting the corresponding consumer demand in rural areas is poor.

Fourth, the impact of food price change on demand change of other types of consumer goods is significant, but the impact of price change of other commodities on consumer demand change of food in rural areas, is relatively weak. Thus, food price change spreads wide, with deep impact; adjustment of food price has evident effect to the regulation of the rural market. In this regard, we should require full attention and adopt prudent measures.

Fifth, improving the level of disposable income of rural residents in Gansu Province or providing cash subsidy and preferential price for daily consumption of residents, will not only help

increase the actual demand of rural residents' various consumer goods, but also alleviate "crowding-out effect" of consumption of food, housing and other means of subsistence on consumer spending on other aspects, and play a positive role in driving consumption of rural residents and promoting overall level of consumption.

Sixth, currently, the rural residents' consumption in Gansu Province is still determined by income, and residents' low-level disposable income, slow income growth and low marginal propensity to consume in Gansu Province, is the root cause of lack of residents' consumer demand. So in order to expand rural consumer market in Gansu Province to promote economic growth, we must study how to improve the income of rural residents.

Seventh, imperfect and unsound rural social security system, medical insurance system, the rural public goods supply system, is important factor responsible for rural residents' emphasis of living consumption on existence-oriented consumption. Compared with urban residents, the rural residents have low income, and have to assume heavy burden in pension, health care, education and other aspects. Therefore, gradually solving rural education, health care, social security and other issues is a necessary condition for increasing farmers' income, and vitalizing rural purchasing power.

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