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The influences of urbanization on consumption structure from the perspective of general grey relational analysis

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ABSTRACT

The increasing urban population results in great changes of consumption structure of urban and rural residents through increased urbanization, a necessity for the national economic progress. Taking the data from 2002 to 2012 in Guangxi as an example, this paper analyzes the trend of consumption structure and the differences between consumption structure of urban and rural residents with the usage of chart qualitative analysis and general grey correlation analysis. Urbanization has most closely affected both household appliances and service, transportation and communication among urban consumption; and entertainment education and cultural service consumption, housing, transportation and communication among rural consumption. The analysis above indicates that: To begin with, urban-rural residents' consumption develops at a high speed with the progress of urbanization. Furthermore, with the development of urbanization the proportion of food consumption has descended gradually. Urban-rural consumption structure changes significantly – a shift from food consumption to transportation and communication, rural consumption structure changes to cultural, education and health care. There are obvious differences in the consumption structure of urban and rural residents. According to the conclusions, author gives advice at the end of the article.

KEYWORDS

Grey relational analysis; General grey relational analysis; Urbanization; Consumption structure; Urban-rural differences.



INTRODUCTION

Urbanization is a gradual historical progress from agriculture-based traditional rural society to modern urban society which is based on industry, service industry, hi-tech industry and information industry. Domestic scholars have done a lot on its influences on consumption structure. Urbanization does good to the improvement of residents' income, the changes of industry structure, stronger consumer demand so as to further facilitate the aggregate demand^[1]. There are striking differences between various ways of urbanization and the urbanization level of consumption habits and consumption structure.^[2,3] In recent years scholars have begun to analyze relational quantitative model of urbanization and consumption structure. For example, the VAR model analysis shows that urbanization stimulates consumption^[5]. And some scholar has analyzed the influences of urbanization on rural consumption structure with the usage of the linear regression method.^[6] All of these studies tell an inevitable impact of urbanization on consumption structure.

With the economic development and the government's massive support for Beibu Gulf Economic Zone, Western Guangxi resource region and Xijiang economy, Guangxi urbanization improves greatly from 28.30% in 2002 to 43.53% in 2012. Rural-urban migration, accompanied by a rising standard of urbanization, brings about a corresponding flow of natural resources and other elements. Guangxi urban and rural residents now are able to consume more so that the traditional consumption structure changes. Guangxi, an agricultural province, is somewhat slow in the process of urbanization, which leads to comparatively fewer researches that are mostly quantitative rather than qualitative analysis and a lack of research on discrepancy between urban-rural consumption structure.

CONTENT

The data selection of urbanization and consumption structure

This paper analyzes the sample data about Guangxi urban-rural consumption structure (2002-2012) selected from *Guangxi Statistical Yearbook* (2005-2013). The urban-rural consumption structure is an analysis, without taking factors such as price into consideration, which extracts the largest solution including food consumption X_1 , dress consumption X_2 , household appliances and service X_3 , health care consumption X_4 , transportation and communication consumption X_5 , entertainment education and cultural service consumption X_6 , housing consumption X_7 , miscellaneous goods and service consumption X_8 and urbanization rate X_0 . The specific data is divided into urban-rural consumption structure data (see TABLE 1) and rural consumption structure data (see TABLE 1).

TABLE 1 : Guangxi urbanization rate and urban-rural consumption structure from 2002-2012 Unit: yuan, %

year	urbanization rate	Expenditure for Consumption of Urban Households	food	dress	household appliances and service	health care	transportation and communication	Entertainment education and cultural service	housing	miscellaneous goods and service
2002	28.30	5413.44	40.67	7.55	6.70	4.46	11.21	16.06	10.20	3.15
2003	29.06	5763.48	40.01	6.48	6.54	5.60	10.55	13.84	13.90	3.08
2004	31.70	5862.20	44.02	6.38	5.72	6.25	9.84	13.92	10.52	3.35
2005	33.62	6424.24	42.50	7.31	5.90	5.94	10.08	13.48	11.46	3.33
2006	34.64	6791.94	42.07	7.03	5.31	5.90	11.56	12.53	12.17	3.42
2007	36.24	8151.26	41.69	8.06	6.02	6.65	11.44	12.88	9.85	3.40
2008	38.14	9627.40	42.41	8.02	6.27	5.50	14.29	11.23	9.26	3.01
2009	39.20	10352.38	39.89	8.26	7.29	5.20	15.44	10.73	9.86	3.32
2010	40.11	11490.08	38.06	8.06	7.43	5.44	17.17	10.82	10.16	2.86
2011	41.8	12848.37	39.50	7.93	6.89	6.06	15.57	11.70	9.63	2.72
2012	43.53	14243.98	38.98	8.05	7.90	6.20	14.56	11.42	9.67	3.12

Data source: guangxi bureau of statistics: *guangxi statistical yearbook* (2005-2013)

TABLE 2 : Guangxi urbanization rate and rural consumption structure from 2002-2012 Unit: yuan, %

year	urbanization rate	Expenditure for Consumption of Urban Households	food	dress	household appliances and service	health care	transportation and communication	Entertainment education and cultural service	housing	miscellaneous goods and service
2002	28.30	1686.11	51.90	3.78	3.85	3.93	6.78	10.27	17.11	2.38
2003	29.06	1751.23	51.34	3.46	3.64	4.27	6.94	10.02	18.46	1.84
2004	31.70	1928.60	54.32	3.34	3.36	4.34	7.27	9.27	16.15	1.95
2005	33.62	2349.60	50.51	3.38	4.06	5.26	9.11	9.63	16.16	1.89
2006	34.64	2413.93	49.54	3.31	4.56	5.13	9.92	8.21	17.6	1.72
2007	36.24	2747.47	50.18	3.16	4.09	5.42	8.95	6.28	20.17	1.75
2008	38.14	2985.03	53.52	3.05	4.15	5.17	9.77	5.79	17.94	1.70
2009	39.20	3231.14	48.68	2.84	4.89	6.35	8.53	5.96	20.98	1.78
2010	40.11	3455.29	48.49	3.20	5.58	6.63	8.98	5.28	20.04	1.80
2011	41.8	4210.89	43.81	2.94	5.74	7.15	9.14	5.19	24.19	1.83
2012	43.53	4877.63	42.76	3.21	5.63	7.87	9.29	4.39	24.62	2.23

Data source: guangxi bureau of statistics: *guangxi statistical yearbook (2005-2013)*

Trend analysis of Guangxi urbanization and consumption structure

Scatter diagram for TABLE 1 and TABLE 2, see Figure 1 and Figure 2

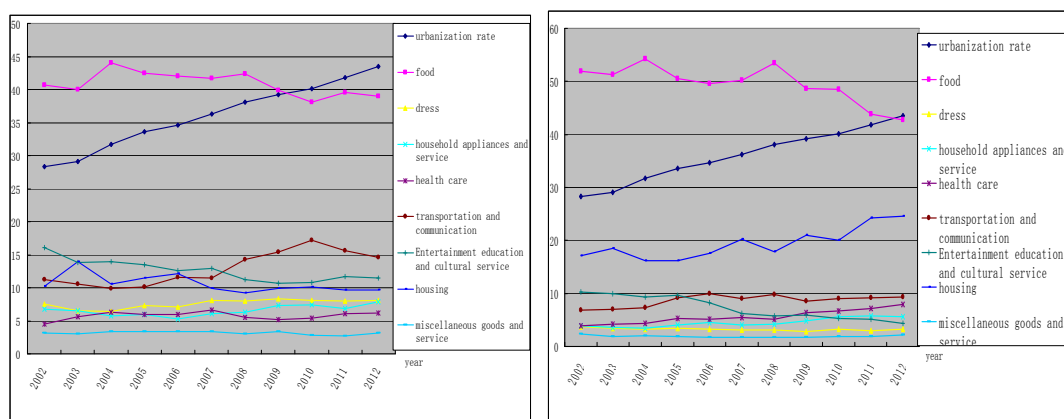


Figure 1 : Guangxi urbanization rate and urban-rural consumption structure from 2002-2012

Seen from TABLE 1 and Figure 1 Guangxi urbanization proceeds continuously from 28.3% in 2002 to 43.53% in 2012 and the general urban-rural consumption increases as much as 163.12% consequently from 5413.44 yuan per capita in 2002 to 14243.98 yuan per capita in 2012 which amounts to an increase of 14.83% per year. The consumption structure trends are as follows:

Firstly: Food consumption and entertainment education and cultural service consumption predominate urban consumption. Food consumption is inching down with the increase of urbanization rate from 40.67% in 2002 to 38.98% in 2012; meanwhile, entertainment education and cultural service consumption declines fast together with increased urbanization rate.

Secondly: Housing consumption, transportation and communication consumption, dress consumption, household appliances consumption, healthcare consumption takes up a low percentage of urban residents' consumption, among which housing consumption decreases slowly, transportation and communication consumption increases on a large scale, dress consumption, household appliance consumption and healthcare consumption remains nearly the same.

Seen from TABLE 2 and Figure 2, the general rural consumption increases as much as 189.28% from 1686.1 yuan per capita in 2002 to 4877.63 yuan per capita in 2012 which amounts to an increase of 17.2% per year. The consumption structure trends are as follows:

Firstly: Food consumption and housing consumption predominate urban consumption. Food consumption declines sharply from 51.9% in 2002 to 42.67% in 2012; meanwhile, housing consumption race up which amounts to 24.62% in 2012 from the original 17.11% in 2002.

Secondly: Entertainment education and cultural service consumption, transportation and communication consumption, dress consumption, household appliance consumption and healthcare consumption do not take up a lot of rural residents' consumption, among which entertainment education and cultural service consumption descends quickly; household appliance consumption, transportation and communication consumption and healthcare consumption rise quickly, and dress consumption shows no significant changes.

Grey relational analysis on the influences of growth rate on urban-rural consumption structure

All the above chart analyses are qualitatively confined to a simple subjective explanation of the influences of growth rate on urban-rural consumption structure without the concerns of quantitative analysis. Grey Relational Analysis method can be used to considerably reduce the heavy loss brought about by information asymmetry and requires no high-level data. Therefore, it is adopted to make a quantitative analysis on the impacts of urbanization rate on food consumption, dress consumption, household appliances consumption, healthcare consumption, transportation and communication consumption, entertainment education and cultural service consumption, housing consumption, miscellaneous goods and service so as to reflect the internal relationships between urbanization rate and consumption structure. The steps are as follows:

Urbanization rate X_0 is set as reference sequence

all the rest of food consumption X_1 , dress consumption X_2 , household appliances consumption X_3 , healthcare consumption X_4 , transportation and communication consumption X_5 , entertainment education and cultural service consumption, X_6 , housing consumption X_7 , miscellaneous goods and service consumption X_8 as contrast sequences, marked as: $X_i = (X_i(1), X_i(2), \dots, X_i(11)), i = 0, 1, \dots, 8$. All numbers in the round brackets refer to 11 years from 2002 to 2-12.

Dimensionless method is used to analyze the reference sequence and the contrast sequences owing to different data units, marked as

$$Y_i = (Y_i(1), Y_i(2), \dots, Y_i(11)) = \left(\frac{X_i(1)}{X_i(1)}, \frac{X_i(2)}{X_i(1)}, \dots, \frac{X_i(11)}{X_i(1)} \right), i = 0, 1, \dots, 8$$

The first differences are counted one by one

$$\Delta_i(k) = |Y_0(k) - Y_i(k)|, i = 1, 2, \dots, 8, k = 1, 2, \dots, 11$$

$$M = \max_{i=1}^8 \max_{k=1}^{11} |Y_0(k) - Y_i(k)| \quad m = \min_{i=1}^8 \min_{k=1}^{11} |Y_0(k) - Y_i(k)|$$

The connection coefficients are measured as

$r_{0i}(k) = \frac{m + \xi \cdot M}{\Delta_i(k) + \xi \cdot M}, k = 1, 2, \dots, 11$, among which ξ is the discrimination coefficient with the range of (0,1). The smaller the ξ , the greater the discrepancies of relational coefficients, the stronger the distinguish ability and usually ξ is set as 0.5.

The grey relation is accounted by

$$r_{0i} = \frac{1}{11} \sum_{k=1}^{11} r_{0i}(k)$$

The correlation varies from weak, medium, strong, and extremely strong when it comes to (0,0.35], (0.35,0.65], (0.65,0.85], and (0.85,1] separately.

The grey relation is ranked and evaluated.

According to previous calculation procedures, the results are shown in TABLE 3 and TABLE 4.

TABLE 3 : The grey relation analysis of Guangxi urbanization rate and urban consumption structure from 2002 to 2012

Consumption structure	Food	Dress	Household appliances and service	Healthcare	Transportation and communication	Entertainment education and cultural service consumption	Housing	Miscellaneous goods and service consumption
correlation	0.6629	0.6266	0.6141	0.7352	0.7657	0.5117	0.6438	0.6642

TABLE 4 : The grey relation analysis of Guangxi urbanization rate and rural consumption structure from 2002 to 2012

Consumption structure	Food	Dress	Household appliances and service	Healthcare	Transportation and communication	Entertainment education and cultural service consumption	Housing	Miscellaneous goods and service consumption
correlation	0.6802	0.6102	0.8476	0.8065	0.8576	0.5676	0.8017	0.5689

It can be seen from TABLE 3 that the influences of urbanization on urban consumption are stated as transportation and communication > healthcare > miscellaneous goods and service > food > housing > dress > household appliances > entertainment education and cultural service.

Seen from TABLE 4, the influences of urbanization on rural consumption are like transportation and communication > household appliances > healthcare > housing > food > dress > miscellaneous goods and service > entertainment education and cultural service.

The general grey relation analysis of growth rate on urban-rural consumption structure

In the above calculation of grey relation analysis, the acquired correlation result is not unique because of dimensionless method and various discrimination coefficients. In order to ensure the uniqueness of results, the concept of absolute correlation in general relation is introduced in this paper with the following calculation method:

$$(1) X_i = (X_i(1), X_i(2), \dots, X_i(11)), i = 0, 1, \dots, 8$$

$$Y_i = (Y_i(1), Y_i(2), \dots, Y_i(11)), i = 0, 1, \dots, 8 \quad Y_i(k) = X_i(k) - X_0(k), k = 1, 2, \dots, 11$$

$$(2) |S_0| = \left| \sum_{k=2}^{10} Y_0(k) + \frac{1}{2} Y_0(11) \right|, |S_i| = \left| \sum_{k=2}^{10} Y_i(k) + \frac{1}{2} Y_i(11) \right|$$

$$|S_i - S_0| = \left| \sum_{k=2}^{10} (Y_i(k) - Y_0(k)) + \frac{1}{2} (Y_i(11) - Y_0(11)) \right|$$

(3) The absolute correlation of X_0 and X_i is calculated as

$$\varepsilon_{0i} = \frac{1 + |S_0| + |S_i|}{1 + |S_0| + |S_i| + |S_i - S_0|}$$

Absolute correlation meets the demands of standardization, symmetry and proximity in grey relation axioms. Grey absolute correlation is good enough to explain original data better.

(4) The grey relation is ranked and evaluated.

According to previous calculation procedures, the results are shown in TABLE 5 and TABLE 6.

TABLE 5 : The grey relation analysis of Guangxi urbanization rate and urban consumption structure from 2002 to 2012

Consumption structure	Food	Dress	Household appliances and service	Healthcare	Transportation and communication	Entertainment education and cultural service consumption	Housing	Miscellaneous goods and service consumption
Correlation	0.6099	0.5918	0.7403	0.5709	0.6385	0.5876	0.5762	0.5866

TABLE 6 : The grey relation analysis of Guangxi urbanization rate and rural consumption structure from 2002 to 2012

Consumption structure	Food	Dress	Household appliances and service	Healthcare	Transportation and communication	Entertainment education and cultural service consumption	Housing	Miscellaneous goods and service consumption
Correlation	0.6041	0.5926	0.6391	0.6458	0.7605	0.8792	0.8045	0.7522

TABLE 5 shows that the influences of urbanization on urban consumption are stated as household appliances > transportation and communication > food > dress> entertainment education and cultural service> miscellaneous goods and service > housing >healthcare.

TABLE 6 tells that the influences of urbanization on rural consumption are like entertainment education and cultural service > housing > transportation and communication > miscellaneous goods and service >healthcare > household appliances > food > dress.

RESULT AND DISSCUSS

The results quoted above demonstrate that the household appliances service has the largest influence on urban consumption, then it comes to transportation and communication, and food plays the least role. The household appliances consumption structure is mainly affected by national policies and advanced technologies: the greater the urbanization, the higher the consumption. A close correlation between transportation and urbanization rate implies the higher expenditure on transportation and communication with the development of urbanization; whereas, a distant correlation of healthcare and entertainment education and cultural service that reflect developing consumption means urban residents do not consume much on spiritual living and their own health protection.

On the contrast, the analysis of rural consumption structure shows that the biggest influences on rural consumption comes from entertainment education and cultural service, housing and transportation and communication. Healthcare also reveals a comparatively high correlation, which proves that rural residents pay more attention to their own health and spiritual living owing to the promotion of new cooperative medical system and the procedure standardization of medicine market so that healthcare consumption develops fast. A close correlation between housing and urbanization points to a quick progress of rural housing expenditure such as the rent of migrant workers. Yet the loose correlation of food indicates a rapid increase of rural residents' income.

CONCLUSIONS AND SUGGESTIONS

The analysis above indicates that: To begin with, urban-rural residents' consumption develops at a high speed with the progress of urbanization. Furthermore, with the development of urbanization the proportion of food consumption has descended gradually. The higher the Engel coefficient (the proportion of residents' food expenses of the living expenses), the lower the income; the lower the Engel coefficient, the higher the income. Thus it can be concluded that Guangxi residents' income per capita increases rapidly. Next, urban-rural consumption structure changes significantly – a shift from food consumption to transportation and communication. At last, Urban-rural disparity leads to a pronounced gap of average consumption between urban and rural residents and their consumption structure vary a lot from each other.

By all accounts, Guangxi urbanization progress have a striking impact on urban-rural consumption structure. So the corresponding suggestions are as follows:

1. To expedite infrastructure construction such as public transportation, health and culture etc. and guide urban-rural residents to consume more.
2. To transfer rural surplus labor force and improve the Income from Household Business Operation and property income of rural residents.

3. To increase investment of science and technology, expand finance subsidy and encourage residents' consumption.

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