International Business and Management
Vol. 1, No. 1. 2010, pp. 62-68
www.cscanada.net

ISSN 1923-841X [PRINT]
ISSN 1923-8428 [ONLINE]
www.cscanada.org

The Analysis of Influential Factors of Residents' Consumption based on Panel Data Model[1]

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Abstract: Investment, consumption and exports are regarded as the 'three carriages' to enhance the economic growth in which consumption is of great importance. The influencing factors of consuming were analysed with the applications of EVIEWS6.0 and panel data model. In the analysis, the level of consumption was treated as the dependent variable and per capita income and the price level as independent variables. The data such as the per capita income, the level of consumption and the price level were extracted from the Chinese Statistical Yearbook published by Chinese National Statistical Bureau. After the analysis, the results were compared among the eastern, central and western part of China. Finally, the corresponding policies to improve the level of consumption were brought up.
Key words: panel data model; residents' consumption; average income; price index

PREFACE

How to maintain economic growth has become the focus of attention since the financial crisis in 2009.Investment, consumption and exports are called three carriages driving the growth of a country's economic. Economists generally believe that investment is a strategy for emergency and to promote consumption will bring long-term growth momentum in China. Premier Wen Jiabao said in the government work report at the Eleventh National People's Congress the second meeting that in 2010, we should actively expand domestic demand especially consumer demand, and strengthen domestic demand effect on economic growth. Therefore, to make clear the role and the size of each factor was conducive to fiscal policy and monetary policy to promote economic development sound and fast.

[1]**Acknowledgement: Shandong Institute of Applied Statistics key research project (2010YYTJ001) 2010, Shandong Statistical research key project (KT1054).**
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*Received 20 August 2010; accepted 2 November 2010

In this paper, panel data of different province at different time are used as the sample observations. So that we can analyse both the macroeconomic situation and policy on consumption also can analyze the effect of level of economic development in different provinces on consumption levels.

1. SIGNIFICANCE AND METHODS

1.1 Significance of research

As consumers of different provinces have different cultural backgrounds, and income levels, which are important factors to affect consumer behavior. So it is necessary to segment the consumer according to the province respectively to identify suitable factors of consumers in different provinces. Also, because there is region gap of economics among eastern, central and western regions which affect consumption, it is necessary to divide the country's 31 provinces and cities into eastern, central and west part respectively, to estimate and compare the difference among them.

1.2 Research methods and data sources

In this paper, we use data from *China Statistical Yearbook* in 2002 to 2008 of National Bureau of Statistics of China. And the variables are the per capita income level (INS), the level of consumption (CONS) ,the price level (WJSP) and other data to use panel data model to analyze by EVIEWS6.0 software.

2. MODELING AND PARAMETER ESTIMATION

2.1 Model

As the data of provinces and cities to study, we should choose a fixed effects model. Also consider the differences in provincial and municipal basic consumption, we should choose variable intercept model. According to the theory, consumption is not only impacted by current income but also the size of previous spending, which is known as the "ratchet effect". (YI, 2008) Therefore, the data model is established using $CONS1$ as previous consumption variable. So the model

$$CONS_{it} = \alpha_{it} + \beta_1 CONS1_{it} + \beta_2 INC_{it} + \beta_3 WJSP_{it} + u_{it} \quad (1)$$

In the above formula, α_{it} is the constant; β_1, β_2, β_3 are parameters, i means number of cross-section units $(i = 1,2,\ldots,31)$, t is the time variable $(t = 2002,2003\ldots,2008)$, μ_{it} is Independent of each other, zero mean and same variance.

Assume that time series parameters satisfy homogeneous and time consistency, which means the parameter value does not vary with time. Then the model (1) can be written as

$$CONS_{it} = \alpha_t + \beta_1 CONS1_{it} + \beta_2 INC_{it} + \beta_3 WJSP_{it} + \mu_{it} \quad (2)$$

2.2 Parameter Estimation

Using fixed effects estimation, Cross-section weight and GLS to reduce the cross-section data caused the impact of heteroscedasticity. The analysis results are as follows:

Table 1: Fixed Effects Variable Intercept Model

Variable	Coefficent	Std. Deviation	T statistic	Probability
C	-6173.426	1296.849	-4.760329	0.0000
CONS1	0.812503	0.044697	18.17808	0.0000
INC	0.122682	0.011879	10.32762	0.0000
WJSP	56.36783	13.35008	4.222285	0.0000
Fixed Effect of Intercept		Fixed Effect of Intercept		
BJ--C	-779.9010	HUB--C	322.3543	
TJ--C	-1399.111	HUN--C	424.7380	
HEB--C	-237.0333	GD--C	78.99526	
SX--C	68.38906	GX--C	384.6803	
NMG--C	-158.5929	HIN--C	243.1669	
LN--C	-212.3431	CQ--C	857.3122	
JL--C	161.2980	SIC--C	415.9323	
HLJ--C	-142.6918	GZ--C	573.3102	
SH--C	-1222.354	YN--C	233.2730	
JS--C	-572.3161	XIZ--C	-56.12339	
ZHJ--C	-293.0710	SXI--C	328.3264	
AH--C	477.1129	GS--C	464.3244	
FJ--C	-156.5723	QH--C	47.32712	
JX--C	300.7127	NX--C	390.1204	
SD--C	-368.9254	XJ--C	-237.6132	
HEN--C	65.27490			

Note: Taking the first letter of each province as the representative, such as BJ on behalf of Beijing, Shanxi behalf of SX, SXI behalf of Shaanxi.

The coefficients 0.8125, 0.1227 and 56.3678 in table 1 are the estimated values of β_1, β_2 and β_3,which represent previous consumption, income and price level. The three later estimated are standard error, t statistic and accompanying test probability, from which we can see regression coefficient is not 0 significantly. It shows that raise people's income is one of the important means to increase consumption .

The lower half of the table shows intercept estimates in the regions, in which a negative value indicates on the average income level in the country and the present price level, consumption is negative after substract the average. Its absolute value can be approximated seen as the savings of the residents, which shows that average income in the region is above the national average, so there is surplus after subtract the average consumption. A positive value means the average income is less than the national average income, so their consumption is lower than the national average consumption. For example, Beijing residents per capita consumption can be expressed as:

$$CONS\_BJ = -799.90 + 0.8125 \times CONS1\_BJ + 0.1227 \times INS\_BJ + 56.3678 \times WJSP\_BJ$$

Shanxi residents per capita consumption can be expressed as:

$$CONS\_SX = 68.3891 + 0.8125 \times CONS1\_SX + 0.1227 \times INS\_SX + 56.3678 \times WJSP\_SX$$

So the residents of Beijing have 799.90 yuan savings per year after deduction of the average consumption

under the average income and price level; Whine residents of Shanxi must have an additional 68.389 yuan income to meet average consumption. Other parts of model and so on.

From the intercept in table 1, intercept is different between eastern regions of Beijing, Tianjin, Hebei, Shanghai, Shandong and so on with Guangxi, Chongqing, Guizhou, Yunnan, Tibet and other western regions. Obviously this is due to the different economic development levels among different regions. So we divide the country into three parts as eastern, central and western regions according to regional distribution and economic development level to analyze.

Table 2: Effects Results

Effects Results
Intercept fixed (dummy variables)

Table 2 shows fixed effect model is used.

Table 3: Model Test Results

Weighted statistics			
R^2	0.984143	average	8335.447
Adj. R^2	0.980700	standard deviation	4414.711
standard deviation of regression	530.1041	Sum	42713580
F statistic	285.8601	D.W.	2.200407
Probability	0.000000		
Unweighted statistics			
R^2	0.984698	average	5884.892
Residual sum of squares	45774463	D.W.	2.653443

The results in table 3 show that the adjusted R^2 is 0.9807, so fit goodness of the model is very high. $D.W.$ is 2.20 shows residual is not auto-related. As a whole, the model is well-fitted.

2.3 Sub-regional research

According to the Fourth Session of the Sixth National People's Congress, the eastern region includes Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan 11 provinces (cities); the central region includes Shanxi, Inner Mongolia, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan and Guangxi 10 provinces (autonomous regions); the western region includes Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang and Chongqing 10 provinces (autonomous regions).

Take the per capita income level (INS_?), the level of consumption (CONS_?)and the price level (WJSP_?) from China eastern, central and western regions of 2002 to 2008.The model is as following:

$$CONS_{it} = \alpha_t + \beta_1 CONS1_{it} + \beta_2 INC_{it} + \beta_3 WJSP_{it} + \mu_{it} \quad (3)$$

In the above formula, α_{it} is the constant; β_1, β_2, β_3 are parameters, i means number of cross-section units $(i = 1,2,3)$, t is the time variable $(t = 2002,2003\ldots,2008)$, μ_{it} is Independent of each other, zero mean and same variance. $CONS1$ is the previous consumption.

Using fixed effects estimation, Cross-section weight and GLS to reduce the cross-section data caused the impact of heteroscedasticity. The analysis results are as follows:

Table 4: Fixed Effects Variable Intercept Model

Variable	Coefficent	Std. deviation	T statistic	Probability
C	-5564.878	5263.478	-7.050263	0.0000
CONS1	0.726113	0.285612	2.542306	0.0258
INC	0.120256	0.063423	3.896100	0.0023
WJSP	53.01482	25.44939	3.973653	0.0000
Fixed Effect of Intercept				
DB--C	-492.5069			
ZB--C	205.1873			
XB--C	287.3196			

***Notes*:** DB,ZB and XB is on behalf of the eastern, central and western region respectively.

The coefficients 0.726113、0.120256 and 53.01482 in table 1 are the estimated values of β_1, β_2 and β_3,which represent previous consumption, income and price level. The three later estimated are standard error, t statistic and accompanying test probability, from which we can see regression coefficient is not 0 significantly. It also shows that raise people's income is one of the important means to increase consumption.

The lower half of the table has the same meaning with table 1.

So the eastern, central and western residents per capita consumption can be expressed as: $CONS\_DB = -492.51 + 0.7261 \times CONS1\_DB + 0.1223 \times INS\_DB + 53.015 \times WJSP\_DB$

$CONS\_ZB = 205.19 + 0.7261 \times CONS1\_ZB + 0.1223 \times INS\_ZB + 53.015 \times WJSP\_ZB$

$CONS\_XB = 287.32 + 0.7261 \times CONS1\_XB + 0.1223 \times INS\_XB + 53.015 \times WJSP\_XB$

The eastern, central and western regions have intercept of -492.51, 205.19 and 287.32 respectively. So substract the average consumption, eastern region people have savings while central and the western parts have not.

This shows that the eastern, central and western regions have significantly different basic income. And consumption in central and western regions is clearly higher than in the eastern region of the same income. so if you want to increase the level of income to increase consumption, pay attention to central and western regions is more effective. More, Intercept of the central region is smaller illustrates economy is slightly developed than in the western region.

Table 5: Effects Results

Effects Results
Intercept fixed (dummy variables)

Table 5 shows fixed effect model is used.

Table 6: Model Test Results

Weighted statistics			
R^2	0.988058	average	6537.620
Adj. R^2	0.983082	standard deviation	2220.077
standard deviation of regression	385.1419	Sum	1780011.
F statistic	198.5726	D.W.	2.660463
Probability	0.000000		
Unweighted statistics			
R^2	0.989070	average	6067.019
Residual sum of squares	1812989	D.W.	2.821469

The results in table 6 show that the adjusted R^2 is 0.983082, so fit goodness of the model is very high. $D.W.$ is 2.66 shows residual is not auto-related. As a whole, the model is well-fitted.

3. DISCUSSION AND RECOMMENDATIONS

From the above results, the level of income and price level really affect the consumption level. And the consumption situation is of significant regional difference. Therefore, the most important aspects to increase the consumption should be as following: (XU, 2000)

3.1 Increase income and consumption rate

Consumption is a function of income, so income is the main variable to determine the consumption. Consumption is low in China is mainly a result of the low income levels. So we should increase income especially low-income groups to increase the consumption.

3.2 Control price and lower taxes

Tax will make the price of goods remains high. All taxes are passed on to consumers. Moreover, high tax rates hurt the enthusiasm of the labors, hindering the individual and corporate savings and investment. This will inevitably lead to slower productivity growth, production sluggish, and then goods in short supply, prices rise.

3.3 Different policies in different regions

Imbalances in regional economic growth in developing countries mainly are due to the scarcity of production factors and resource endowments of the different provinces. Pareto improvement should transfer factors of production from areas with low efficiency to areas with high efficiency. To achieve balanced growth of regional economy, we should be clear on the marginal contribution to the GDP of each factor and the proportion, so that we could guide the flow of resources in the most efficient place according to the elasticity of resources to economic growth.

3.4 Develop new consumption hot spots and increase consumption gradually by level

(1) Establish and complete the social security system, and enhance consumer confidence. (2) Develop consumption hot spots and expand areas of consumption.(3)Eliminate the disparity and polarization, narrow regional and urban-rural gap.(4) increase consumption gradually by level. On the one hand, China has a huge domestic market. On the other hand, China has a distinct urban-rural dual economic structure between urban and rural residents.

REFERENCES

Carmen Camacho.Benteng Zou and Maya Briani. (2007). On the dynamics of capital accumulation across space. *European journal of operational research, 4*: 21-25.

LU Fang, Yuan Lumin. (2009). Panel-data model in China's consumption structure of rural residents. *Statistics and Management,28 (1)*: 122-127.

XU Xin. (2000). China's Consumption Status,Causes and Countermeasures. *Statistics and Decision, 8 (128)*: 35-36.

YANG Chao. (2003). Application of Panel-data model in consumption of urban residents in China. *Statistics and Information Forum, 18 (1)*: 58-60.

YANG Chao. (2003). Application of Panel-data Model of Urban Household Consumption in China. *Statistics and Information Forum, 18 (1)*: 58-60.

YI Danhui. (2008). *Data Analysis and EVIEWS Application.* Beijing: Renmin University Press: 293-391.

ZHU Shaoge, Wang Yuankai. (2009). Time Series Fixed Effect Analysis of Consumption - Based on the Provincial Panel Data Analysis. *Statistics and Information Forum, 24 (6)*: 65-70.