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Empirical Analysis on the Role Rural Urbanization in Promoting Economic Growth by Expanding Consumption

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Abstract Urbanization construction is a historical mission of China's modernization construction, and is also the largest potential for expanding domestic demand. Actively promoting rural urbanization is favorable for expanding consumption and boosting economic growth. Through building VAR model using data of urbanization level and consumption in 1978–2012, this paper made Granger causality test, impulse response analysis, and variance decomposition analysis on the relation between urbanization and economic growth. In addition, from comparing the effect of urbanization on expanding rural consumption and urban consumption, it is known that the effect of growth of urbanization rate on urban consumption is lower than rural consumption in short term, but urbanization level has a greater contribution to growth of urban consumption in the long run.

Key words Rural urbanization, Consumption, Impulse response, Variance decomposition

1 Introduction

The financial crisis of 2007 is considered to have been the worst financial crisis. Due to influence of economic globalization, the spread area of this financial crisis is larger than the crisis in the 1990s. In 2009, China's economic growth rate showed recovery tendency. The GDP growth rate reached 8.9%. In 2012, Premier Li Keqiang asked to properly deal with the relation between growth rate, structure, and price, to create favorable environment for further implementing the strategy of expanding domestic demand in the process of reform and opening-up.

Domestic demand is fundamental force for China's economic development. Since the 1990s, China's economy keeps growing, but the contribution of consumption to economic growth is dropping, which is mainly because constantly decline in consumption rate of residents. At present, expanding domestic investment enters a bottleneck period. Without sufficient demand, increase in domestic investment will give rise to overcapacity in some industries. Therefore, to get out of the dilemma, promoting constant growth of consumption is a fundamental approach. Urbanization is a powerful engine for sound and sustainable economic development, while the greatest potential of expanding domestic demand lies in urbanization, as indicated in *State Plan for Development of New Type of Urbanization* (2014–2020).

2 Literature review

Foreign countries have started studying the relation between urbanization and economic growth for a long time. For example, Keynes (1936) introduced the principle of effective demand and held that demand is a fundamental force for economic growth. Later, Habbakuk (1963) stated that the key for economic growth lies in ex-

pansion of quantity of cities, development of more cheap and higher efficient communication, growth of domestic market, and expansion of foreign demand. Murphy (1989) believed that domestic demand is dominant in output growth (especially in countries with large population), and economic growth has to rely on domestic consumption demand when the demand for exports declines. Apart from theoretical researches, many scholars considered that there is significantly positive correlation between urbanization level and economic growth. Berry (1965) made principal components analysis on 43 variables through selecting 95 countries and proved that there is significant positive correlation between economic growth and urbanization level; Chenery (1975) came up with general relation between urbanization rate and per capita GDP through model regression. Henderson (2000) calculated related data and obtained correlation coefficient between urbanization level and per capita GDP logarithm variables is up to 0.85; Fujita *et al* (2000) and Venables (1996) analyzed micro mechanism of influence of urbanization on economic growth; urbanization will promote economic growth through agglomeration effect and scale effect.

China's scholars also made extensive researches and believed that urbanization will boost economic development through different mechanisms. Zhou Yixing (1995) reached the conclusion that it takes on a logarithmic curve relation between urbanization and economic growth using related data of 157 countries and the correlation coefficient is up to 0.907. Chen Zongsheng (1994, 2004) stated that urbanization can influence economic growth through narrowing the income gap. Zhang (2002) proposed raising economic growth rate through reducing fertility rate and promoting accumulation of human capital. Qian Chen and Shi Jinchuan (2006) analyzed the relation between urbanization and agricultural production and held that urbanization can improve agricultural productivity and thus promote economic growth on the basis of urban and rural area theories. Duan Ruijun and An Husen (2009) found,

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through Granger causality test, state space model and vector autoregression (VAR) model, found that urbanization greatly promotes economic growth, while the influence of economic growth on urbanization is limited, thus it is feasible to promote economic growth through expanding domestic demand. The research team of Development Research Center of the State Council (2010), with the aid of theoretical frame of urban residents, migrant workers and rural residents, reached the conclusion that it is able to boost balanced economic growth through helping migrant farmers to become citizens, narrowing urban and rural income gap, expanding city size, and increasing human capitals. As to urbanization promoting economic development through expanding domestic demand, domestic scholars show different opinions. Liu Yirong (2008) stated that urbanization can increase income of urban and rural residents, change consumption habit of residents, and produce cumulative effect on resident consumption, and proposed developing large and medium-sized cities to promote development of small towns. In the opinion of Luo Jun and Zhong Cheng (2012), urbanization level made little contribution to consumption rate of urban residents; Gu Shengzu and Li Huayi (2010) stated that urbanization can stimulate investment, promote consumption demand, increase consumption level, drive urban and rural coordinated development, and promote optimization of industrial structure, it is a powerful engine for realizing sustainable economic development and also powerful force supporting China's economic development.

3 Theoretical analysis about effect of rural urbanization on expanding consumption

In this study, rural urbanization mainly refers to rural population urbanization, namely, the concentration of rural population in urban areas. Rural urbanization is the process of rural residents changing to urban residents, urban population constantly increasing, so as to promoting constant increase and accumulation of resident consumption. Based on the documentary overview, we considered that major paths and mechanisms for urbanization promoting consumption lie in following four aspects.

(i) Agglomeration effect of urbanization promotes work division of labor, while increase of productivity will directly increase income of residents. Specifically, increase of urban population is helpful for expanding demands for agricultural products, promoting increase of rural residents' income. Surplus rural labor changes to urban population and could increase income through working in secondary and tertiary industries. Under the premise of marginal consumption tendency, increase of income and total demands will stimulate consumption.

(ii) Demonstration effect of urban residents will affect people's consumption ideas and change residents' consumption behavior, and promote consumption growth. In addition, urbanization will accelerate upgrade of urban resident consumption structure, improve consumption environment, and form the cyclical phenomenon of "new urban population imitating original urban

population, original urban population imitating international consumption standard, and new urban population imitating original urban population again". In this process, it will rapidly expand consumption.

(iii) Rural residents changing to urban residents will produce huge consumption cumulative and agglomeration effect, and expand consumption, because urban consumption level is 3 times the rural consumption level, rural residents moving to cities will change original income expectation and consumption behavior and accordingly increase consumption.

(iv) Urbanization can optimize urban industrial structure, and high concentration of industries will reduce input cost for consumption environment, increase transaction efficiency, and finally promote consumption.

In all, huge difference between rural and urban consumption level mainly comes from consumption environment, ideas, structure and income. Through promoting urbanization of rural population, it is able to create a relatively fair and harmonious consumption environment. However, consumption willingness of rural residents after going to cities is influenced by many factors, including urban and rural dual structural system and household registration system. For the consideration of children education and medical security, they will be forced to increase deposit, which will obviously inhibit consumption growth.

4 Data selection and variable setting

China's urbanization process can be divided into two distinct stages with reform and opening-up (1978) as the division line. Before 1978, the urbanization was stagnant and grew at low rate; after 1978, urbanization started accelerating. Considering low level, high fluctuation, slow process of urbanization before 1978, and some variables being not persuasive, following the systematic, scientific, representative, and available principles, we made empirical analysis with the aid of data on the relation between urbanization and consumption growth issued in *China Statistical Yearbook* 2012. In this study, we took the proportion of urban population to total population as urbanization rate (%), denoted as U ; per capita resident consumption as consumption indicator (actual value converted by CPI), denoted as AC ($AC = \text{total consumption of whole residents} / \text{total population} / \text{CPI}$; $UC = \text{rural resident consumption} / \text{rural population} / \text{rural CPI}$; $PC = \text{urban resident consumption} / \text{urban population} / \text{urban CPI}$), and per capita rural resident consumption and urban resident consumption denoted as UC and PC respectively. When making econometric analysis, we made treatment of natural log form for variables, because log form has following merits: conforming to general form of economic growth theory (such as Cobb-Douglas production function) and eliminating possible heteroscedasticity. Thus, the first order difference of variables $\ln U$, $\ln AC$, $\ln UC$ and $\ln PC$ stand for growth rate of urbanization rate, per capita resident consumption, per capita rural resident consumption, and per capita urban resident consumption respectively.

5 Empirical analysis

5.1 Unit root test To test stationarity of time series, we must conduct unit root test for the above four series. Methods for unit root test generally include DF test, ADF test, and PP test. In this study, we employed ADF method to test the variables. ADF test refers to augmented Dickey-Fuller test. It is proposed by Dickey and Fuller for ensuring white noise feature of stochastic error in DF test. These are completed mainly through three models (in this study, model setting and theory are selected from Li Zinai and Ye Azhong).

$$\text{Model 1: } \Delta X_t = \delta X_{t-1} + \sum_{i=1}^m \beta_i \Delta X_{t-i} + \varepsilon_t$$

$$\text{Model 2: } \Delta X_t = \alpha + \delta X_{t-1} + \sum_{i=1}^m \beta_i \Delta X_{t-i} + \varepsilon_t$$

$$\text{Model 3: } \Delta X_t = \alpha + \beta t + \delta X_{t-1} + \sum_{i=1}^m \beta_i \Delta X_{t-i} + \varepsilon_t$$

All null hypotheses are H_0 : series have unit root, namely, series are not stationary. Test results are listed in Table 1. It can be seen that natural log form of urbanization rate, per capita resident consumption, per capita rural resident consumption, and per capita urban resident consumption does not reject original hypothesis at 5% significance level. In other words, they are not stationary. After first order difference, four variables reject original hypothesis at 5% significance level and become stationary variables. Four variables are first order integrated series.

Table 1 ADF test results

	Variables	Test type (C, T, K)	ADF statistics	ADF critical value (5% level)	Conclusions
1	lnU	(C, T, 1)	-1.607	-3.553	Not stationary
2	lnAC	(C, T, 5)	-2.044	-3.574	Not stationary
3	lnUC	(C, T, 5)	-1.931	-3.574	Not stationary
4	lnPC	(C, T, 1)	-2.031	-3.553	Not stationary
5	dlnU	(C, T, 0)	-4.29	-3.553	Stationary
6	dlnAC	(0, 0, 1)	-2.315	-1.952	Stationary
7	dlnUC	(C, T, 1)	-3.643	-3.558	Stationary
8	dlnPC	(C, 0, 1)	-3.123	-2.957	Stationary

Notes: 1. Test types C, T, K denote that there is constant, trend variable, and lag order in test models. 2. Critical values are selected from software EVIEWS7.0, 1-5 lag order is determined as per AIC criterion, and 6-8 lag order is set fixed value 1; 3. The letter d denotes first order difference.

5.2 Setting and estimation of VAR model Vector Autoregression model (VAR) is a non-structural model. It determines dynamic structure of economic system through practical economic data rather than economic theory. It is not necessary to propose theoretical hypothesis when building models, but distinguish hypotheses using information supplied by times series. This just fits for our study. In existing economic theories, there is no strict definition of dynamic relation between urbanization rate and per capita consumption, so it is impossible to study their relation through establishing structural models. VAR(P) model containing k variables is denoted as $Y_t = \mu + A_1 Y_{t-1} + \dots + A_p Y_{t-p} + \varepsilon_t, t=1, 2, \dots, T$.

where Y_t is k dimensional vector of endogenous variable, p is lag order, and T is number of samples. A_1, \dots, A_p is $k \times k$ dimensional coefficient matrix. ε_t is k dimensional disturbance vector. They can be contemporaneously correlated, but not correlated with lag value and not with variables in right side of models.

According to the above unit root test results, dlnU, dlnAC, dlnUC and dlnPC do not have unit root, are stationary series, and satisfy precondition of establishing VAR model. We separately built VAR models for growth rate of urbanization rate and growth rate of per capita resident consumption, growth rate of urbanization rate and per capita rural resident consumption, and growth rate of urbanization rate and per capita urban resident consumption. Number of variables k in all these three models is 2. The largest lag order p is 2 determined by likelihood ratio (LR) test. Estimation results of VAR (2) model 1 for dlnU and dlnAC: $dlnU = 0.213dlnU_{t-1} + 0.43dlnU_{t-2} - 0.1dlnAC_{t-1} + 0.117dlnAC_{t-2} + 0.01$

$$\begin{aligned} R^2 &= 0.436 & AIC &= -6.36 & SC &= -6.131 \\ dlnAC &= 0.186dlnU_{t-1} - 1.752dlnU_{t-2} + 0.954dlnAC_{t-1} \\ &- 0.586dlnAC_{t-2} + 0.082 \\ R^2 &= 0.656 & AIC &= -3.674 & SC &= -3.445 \end{aligned}$$

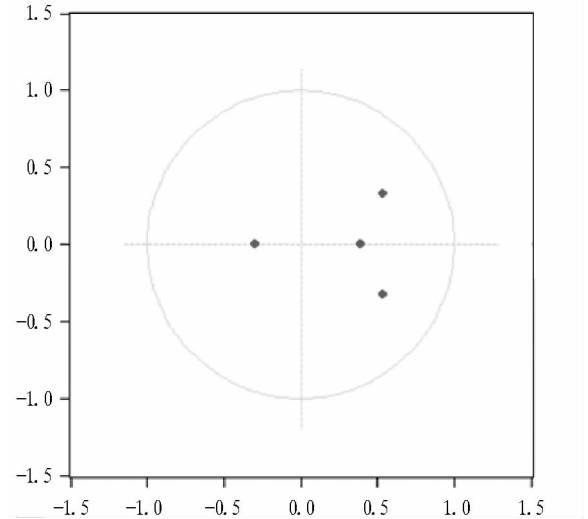


Fig.1 Inverse roots of AR characteristic polynomial

The goodness of fit for two equations is high. Most t statistics are significant at 5% significance level, and some statistics are not significant due to multicollinearity resulted from several lag items of the same variable.

Stationarity test for VAR model 1 indicates that inverse roots are lower than 1 and situated within the unit circle. In other words, VAR models are stationary. Then, we made further im-

pulse response and variance decomposition analysis.

Similarly, estimation results of VAR (2) model 2 of $\ln U$ and $\ln UC$ are as follows:

$$\ln U = 0.246\ln U_{t-1} + 0.397\ln U_{t-2} - 0.084\ln UC_{t-1} + 0.109\ln UC_{t-2} + 0.01$$

$$R^2 = 0.418 \quad AIC = -6.328 \quad SC = -6.1$$

$$\ln UC = -0.158\ln U_{t-1} - 1.479\ln U_{t-2} + 0.772\ln UC_{t-1} - 0.503\ln UC_{t-2} + 0.089$$

$$R^2 = 0.55 \quad AIC = -3.507 \quad SC = -3.278$$

Estimation results of VAR (2) model 3 of $\ln U$ and $\ln PC$ are as follows:

$$\ln U = 0.193\ln U_{t-1} + 0.46\ln U_{t-2} - 0.088\ln PC_{t-1} + 0.1\ln PC_{t-2} + 0.01$$

$$R^2 = 0.413 \quad AIC = -6.32 \quad SC = -6.091$$

$$\ln PC = 0.475\ln U_{t-1} - 2.174\ln U_{t-2} + 0.931\ln PC_{t-1} - 0.546\ln PC_{t-2} + 0.086$$

$$R^2 = 0.633 \quad AIC = -3.479 \quad SC = -3.25$$

The purpose of establishing three VAR models is to make

comparison of response path and variance decomposition results of urbanization rate growth to rural and urban resident consumption growth. Three VAR models are established on the basis of urbanization rate and per capita consumption. EViews individual test shows results are consistent.

5.3 Granger causality test Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another, first proposed in 1969. Sims (1972) expanded this method: whether x causes y depends mainly on to what extent the existing y can be explained by past x , and whether the added lagged value of x can raise the degree of explanation. If x is helpful in the forecast of y , or if the correlation coefficient between x and y is significant, it can be deemed as "y is caused by x Granger". Granger test is completed through restricted F test, original hypothesis H_0 is: the coefficient of all variables are 0. Based on existing VAR models, we tested whether there is significant Granger causality between variables, and the test results are listed in Table 2.

Table 2 Results of Granger causality test

Original hypothesis	F statistics	P value	Test results
$\ln U$ does not Granger cause $\ln AC$	4.467	0.021	Reject original hypothesis
$\ln AC$ does not Granger cause $\ln U$	4.147	0.027	Reject original hypothesis
$\ln U$ does not Granger cause $\ln UC$	2.947	0.07	Reject original hypothesis
$\ln UC$ does not Granger cause $\ln U$	3.596	0.041	Reject original hypothesis
$\ln U$ does not Granger cause $\ln PC$	5.351	0.010	Reject original hypothesis
$\ln PC$ does not Granger cause $\ln U$	3.461	0.046	Reject original hypothesis

The above results indicate that for rural resident consumption, urban resident consumption, and per capita consumption of total residents, the urbanization rate growth and consumption growth are mutual Granger cause. Thus, we reach the preliminary conclusion that urbanization level has positive pull for expanding consumption, and expanding consumption is favorable for promoting urbanization process.

5.4 Impulse response analysis Main functions of VAR models are not to explain regression coefficient, but to explain the influence of a new variable impact to its endogenous variables. Thus, it is necessary to make further analysis using impulse response function. Fig. 2 and Fig. 3 illustrate the impulse response path of urbanization rate growth to per capita rural and urban resident consumption growth, *i.e.* the influence of a standard deviation of stochastic disturbance item of urbanization rate on current value and future value of rural and urban resident consumption growth. (Abscissa denotes tracing period of response function, axis of ordinates denotes response degree of dependent variable to independent variables, and the tracing period in the model is 15 years.)

From Fig. 2, it can be seen that in the earliest 8 years, promoting population urbanization and ensuring growth of urbanization rate take on inverse response, and the inverse response constantly increases in 5 years and reaches the peak value 0.01% in the fifth year. In actual economic condition of China, in the process of ur-

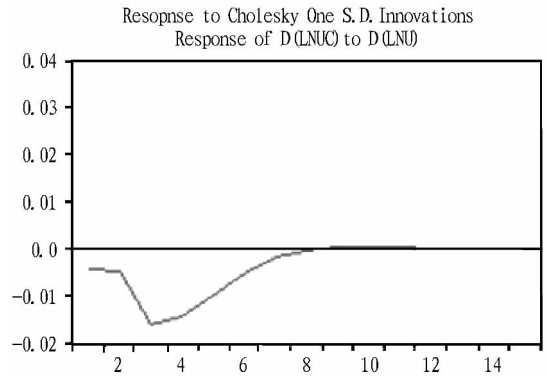


Fig. 2 Impulse response path of rural resident consumption growth

banization, family member with higher willingness to become a citizen is generally a young person, while old people in rural areas have deeply rooted consumption ideas and it is difficult to change their consumption ideas. This is consistent with actual situation. However, from the ninth year, urbanization starts positively pulling growth of rural resident consumption, and such positive effect lasts till the 12th year. From the figure, we know that urbanization has greater negative effect on rural consumption growth, but with impact of a long time, the pull of urbanization for consumption growth is relatively stable.

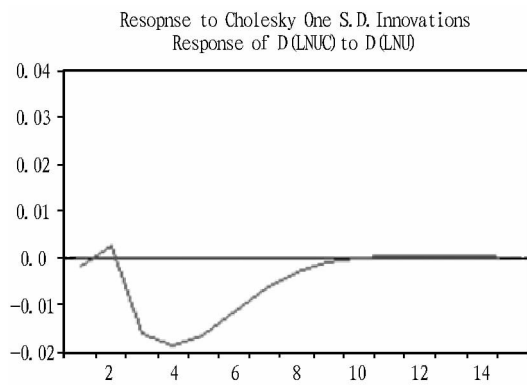


Fig. 3 Impulse response path of urban resident consumption growth

From Fig. 3, we know that urbanization negatively influences urban resident consumption growth in the first year, but from the second year, it turns to positive influence, from the third

Table 3 Results of variance decomposition

Time	Results of dlnAC variance decomposition		Results of dlnUC variance decomposition		Results of dlnPC variance decomposition	
	dlnU	dlnAC	dlnU	dlnAC	dlnU	dlnAC
1	0.133	99.867	1.235	98.765	0.259	99.741
2	0.080	99.920	1.735	98.265	0.382	99.618
3	7.875	92.125	11.069	88.931	8.300	91.700
4	16.730	83.270	17.284	82.716	17.200	82.800
5	21.591	78.409	19.521	80.479	22.597	77.403
6	22.991	77.009	19.936	80.064	24.651	75.349
7	23.162	76.838	19.960	80.040	25.236	74.764
8	23.125	76.874	19.955	80.045	25.343	74.657
9	23.123	76.877	19.956	80.044	25.348	74.652
10	23.142	76.858	19.958	80.042	25.345	74.655
11	23.155	76.845	19.958	80.042	25.346	74.654
12	23.158	76.842	19.958	80.042	25.347	74.653
13	23.159	76.841	19.958	80.042	25.349	74.651
14	23.158	76.842	19.958	80.042	25.349	74.651
15	23.158	76.842	19.958	80.042	25.349	74.651

reform and opening-up, rural social security system is not as perfect as urban social security system, and thus farmers' idea of deposit is higher than urban residents. Rural consumption environment is not as open and free as cities.

5.5 Variance decomposition analysis The impulse response function describes influence of impact of each endogenous variable in VAR model to other endogenous variables. To analyze the contribution of each structural impact to changes of endogenous variable, and evaluate importance of different structural impact, we need establish variance decomposition model. Variance decomposition is to analyze the contribution of each structural impact to changes of endogenous changes and further evaluate importance of different structural impact.

From Table 3, it can be seen that, consumption growth is not only subject to self change, but also subject to urbanization rate growth. AC, UC and PC are per capita consumption amount based on different population structure. It can be seen that urbanization

year to the tenth year, the consumption growth declines, and it reaches the peak value in the fourth year, dropping about 0.019%. Similar to rural resident consumption growth, urbanization is a long process and it produces positive pull effect on urban resident consumption growth from the 11th year. This is possibly because industrial development and agglomeration effect of urban areas is a long process, and it takes a certain period for positive effect of optimizing industrial structure to act on individual resident. In general, impulse response path of rural and urban resident consumption growth is similar, but facing to impact of urbanization, the response time is different and duration is also different. Relative to rural consumption, the response to urban resident consumption is higher. This is possibly influenced by consumption environment and income. In China, population urbanization process is promoted through making migrant workers become citizens. Nevertheless, due to influence of household registration system, since the

rate has different contribution rate to each of them, and finally becomes stable at 23%, 20%, and 25% separately. In a short period, the urbanization rate growth to rural resident consumption growth is faster than urban consumption in the first 7 years. Even in the first year, the contribution rate is up to 1.235%, higher than the contribution to urban resident consumption growth (0.259%), and is close to the highest contribution rate (20%) in the fifth year. However, in the long run, the contribution rate of urbanization rate growth to urban resident consumption growth is basically the same as the rural consumption, and is close 25% in the seventh year. This shows that urbanization promoting urban resident consumption is larger than rural resident consumption. This is consistent with analysis results of impulse response.

6 Conclusions

Through establishing VAR models for urbanization level and per capita consumption, we made Granger causality test and the re-

sults show that urbanization will promote consumption growth and the consumption growth will promote urbanization process. Impulse response analysis and variance decomposition analysis results indicate that growth of urbanization in short period will exert reverse response to resident consumption growth, but urbanization will pull resident consumption and promote economic development in the long run. Besides, after a long time, the effect of urbanization process on urban resident consumption will be greater than rural resident consumption. In line with the above conclusions, we came up with following recommendations:

(i) Increasing income of residents. The key for expanding consumption lies in increasing income of residents. Thus, the key for promoting China's population urbanization lies in solving employment problem and increasing income. To fundamentally influence or even change consumption ideas of rural residents, it is required to solve poverty problem of farmers. Once wealth increases, but the absolute value of deposit will not be changed, the relative value will drop and consumption will rise.

(ii) Practically implementing various social security policies. Social security is an essential lever for coordinating social economic development in the process of urbanization. It plays an important role in ensuring rural farmers to enjoy equal development rights. At present, there are great difficulties in eradicating urban and rural dual structure. Only when their social security problem is solved, may they reduce deposit and expand consumption, and

accordingly promote economic growth.

(iii) Attaching great importance to long term and promoting benign urbanization process. Urbanization is not solely moving rural people to cities, but more important, it is to solve the worry of farmers. The key for urbanization lies in people, thus absorbing rural surplus labor and solving their employment, children education, and medical care problems are key works of local government, rather than pursuing short-term benefit and launching image projects.

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