



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

An Empirical Study of the Relationship between the Fixed Assets Investment and Urban-rural Income Gap during the Transition Period

Yingliang ZHANG^{1*}, Xingxi LIU², Fang YANG¹, Yongbin GUAN³

1. The Research Center of Rural Economics and Management, Southwest University, Chongqing 400716, China; 2. The School of Law, Southwest University, Chongqing 400716, China; 3. College of Geography & Tourism, Chongqing Normal University, Chongqing 400047, China

Abstract As the gap in income between urban and rural residents bigger and bigger, based on the data from 1978 to 2007, this paper makes an empirical study of the dynamic relation between the fixed assets investment and the difference in income between urban and rural residents. The outcome from the study indicates a long-term balance exists between the investment rate of the fixed assets and the difference in income between urban and rural residents. A short-term deviation from the balance can be adjusted through long time. To a certain extent, city-oriented fixed assets investment policy is the main cause of the big gap in income between urban and rural residents. The big gap in income between urban and rural residents in turn reinforces their social status, thus further strengthening the city-oriented instead of countryside-oriented fixed assets investment policy. Based on that, this paper puts forward some suggestions on adjusting the fixed assets investment policy so as to shorten the difference in income between urban and rural residents and realize the goal of harmonious development between city and countryside.

Key words Fixed assets investment, Income gap between urban and rural residents, Dual structure

1 Introduction

The income gap between urban and rural residents is prevalent in the world during the process of industrialization. This gap will be automatically overcome in the process of a country or region's economic restructuring, industrial policy support, tax system reform and financial system innovation, but this may last for a very long time. Since the reform and opening up, China has achieved remarkable economic growth performance, but the urban and rural development is unbalanced, and the income gap between urban and rural residents has not been effectively reduced.

In the period 1980–1985, the income gap between urban and rural residents showed a rapid narrowing trend; in the period 1986–1989, the income gap between urban and rural residents was expanded rapidly; in the period 1989–1990, the income gap between urban and rural residents tended to slightly decline again; in the period 1991–1994, the income gap between urban and rural residents was expanded; in the period 1995–1997, the income gap was narrowed again; in the period 1998–2007, the income gap between urban and rural residents was widened again. From 2002, the urban-rural income ratio started to exceed 3:1, and the urban-rural income ratio reached 3.21:1, 3.22:1, 3.28:1, and 3.33:1 in 2004, 2005, 2006 and 2007, respectively; the absolute income gap reached 9 645.4 yuan.

From the difference coefficient of urban and rural residents'

income, the income gap is very obvious. Experts believe that when $S > 0.5$, it means that the urban and rural areas are in the state of dual structure; when $0.2 < S \leq 0.5$, it means that the urban and rural areas are in the period of transition from dual structure to urban-rural integration; when $S \leq 0.2$, the urban-rural integration is basically completed. The degree of income gap between the urban and rural residents is judged by this standard. We believe that when $S > 0.5$, it means that the income gap between urban and rural residents is too large; when $0.2 < S \leq 0.5$, it means that the income gap between urban and rural residents is in the stage of transition from too large income gap to reasonable state; when $S \leq 0.2$, it means that the income gap between urban and rural residents is in a reasonable state.

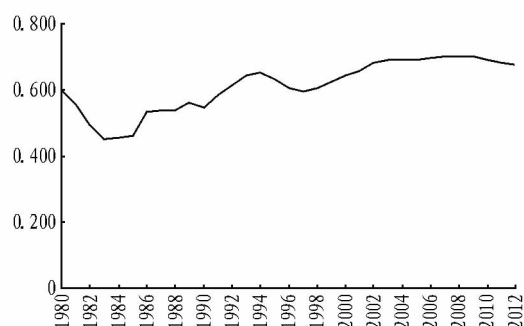


Fig. 1 The difference coefficient of urban and rural residents' income in the period 1980–2012

As can be seen from Fig. 1, the difference coefficient of urban and rural residents' income in China was less than 0.5 from 1982 to 1985, but in other years, it was greater than 0.5, and

Received: April 1, 2014 Accepted: May 2, 2014

Supported by Major Humanities and Social Sciences Project of Southwest University (12XDSK002); Key Humanities and Social Sciences Project in Chongqing City (13SKB002); Fundamental Research Funds for the Central Universities in 2014 (SWU1409321).

* Corresponding author. E-mail: yinglz@swu.edu.cn

from 1998, there was a continued increasing trend, fully indicating that the income gap between urban and rural residents in China is too large and shows typical "dual characteristics".

The too large income gap between urban and rural residents and the uncoordinated urban and rural development, will ultimately affect the growth rate and the quality of the national economy. Therefore, narrowing the income gap between urban and rural residents is a problem to be urgently solved in the economic development of China. Both the academic world and the politicians are constantly exploring the policies and recipe to narrow the income gap between urban and rural residents.

However, in the process of exploring the causes of the income gap between urban and rural residents as well as the governance approaches, we still need to grasp the dynamic changes in the income gap between urban and rural residents, and find the mechanism of action between the income gap between urban and rural residents and the government's economic policy, in order to provide recommendations for the government to promulgate the relevant policies to bridge the urban and rural income gap.

2 Literature review

The foreign scholars make few direct studies on the relationship between the fixed assets investment and income gap between urban and rural residents, but there are many researches on the issues concerning income gap between urban and rural residents.

In the early 19th century, David Ricardo in his *On The Principles of Political Economy and Taxation* interpreted the income gap between urban and rural resident from the perspective of properties of agriculture and industry (Zhang Hongyu, 2004). In the mid-20th century, Colin Clark used the concepts and theories of three industries to demonstrate the necessity of the existence of income gap between urban and rural residents from the perspective of changes in output value of various industries and employment.

Some scholars believed that the income gap between urban and rural residents in China was mainly caused by the government's impartial policies (Yang, 1999; Cai, Wang and Du, 2002; Fleisher and Wang, 2004; Johnson, 2002). The analysis results of Li, Squire and Zou (1998) on the inter-period income gap in 49 countries showed that the perfect capital markets could reduce the income gap and contribute to poverty eradication. Siang N. and Yew - Kwang N. (2000) confirmed that the formation of income gap between urban and rural residents was not only caused by the urban-rural split, but also caused by the government policy; the financial development help narrow the income gap between urban and rural residents by promoting the economic growth.

Joshua Levin (2001) thought that China's huge rural-urban gap was the result of long-term implementation of urban-biased policies, and this policy was conducive to speeding up the development of industry and utilization of foreign investment, but extremely detrimental to agricultural development. T. Scarlett Epstein, David Jephson (2001) believed that the Third World Economies gathered the superior resources for the development of urban

industry, and this urban-biased policy would inevitably lead to serious disaster.

S. Guillaumont Jeanneney, P. Hua (2001) analyzed the influence of the real exchange rate on the income gap between urban and rural residents, and the results showed that the exchange rate appreciation from 1994 helped narrow the income gap between urban and rural residents. Clark, Xu & Zou (2003) used the panel data on 91 countries from 1960 to 1995 to carry out the empirical analysis of the relationship between financial intermediary development and income inequalities, and the results found that the income inequality would be significantly reduced with financial development.

In recent years, the domestic research has achieved fruitful results on issues concerning income gap between urban and rural residents include the manifestation of income gap between urban and rural residents, institutional root causes of the gap, the policies for bridging the gap and other areas. The studies from the perspective of the dynamic relationship between fixed assets investment and income gap between urban and rural residents have also made some progress.

Li Shi, Zhao Renwei, Zhang Ping (1997) affirmed that the expanding urban-rural income disparity from the mid-1980s to the mid-1990s was closely related to the "policy inertia" under the original system to a large extent. Cai Fang (2003) held that the relationship between urban and rural areas in many developing countries was mandatory, and the income gap between urban and rural residents arising from the urban-biased policies was a common phenomenon in developing countries.

Song Hongyuan (2003) believed that the existence and expansion of income gap between urban and rural residents were the result of investment, finance, banking, distribution policy and other policy factors working together. Wang Dewang, He Yupeng (2005) believed that the gap between urban and rural areas was essentially the result of distorted allocation of resources, income distribution tilt and the imbalance in technological advances between sectors. Meng Sujie (2007) stated that enhancing the scale of fixed assets investment in rural areas was conducive to narrowing the urban and rural residents' income gap.

The study of Zhang Rui (2007) showed that from 2006 to 2020, the investment constantly grew in urban and rural areas, and the investment gap between urban and rural areas continued to shrink. The study of Cheng Kaiming (2008) indicated that the income gap between urban and rural residents was positively correlated to the share of urban investment in the total social fixed assets investment, and if the urban bias in fixed assets investment and fiscal spending was more obvious, the gap between urban and rural areas would be greater.

Ma Bin (2008) came to the conclusion that the physical capital gap per capita between urban and rural areas had a positive impact on the income gap between urban and rural residents. Li Wei and Wang Shaoguo (2009) used urban-rural Gini coefficient to represent the income gap between urban and rural residents,

and the studies showed that the structural effects of income were the main cause of expanding income gap between urban and rural residents, while the distribution effects had a more obvious impact on the income gap between urban and rural residents from 1981.

In summary, we see that different research methods have been employed by the academic world based on different perspectives, to carry out thorough and systematic study on issues concerning income gap between urban and rural residents and fixed assets investment, and there have been a number of compelling conclusions.

However, these studies rarely discuss the relationship between fixed assets investment and income gap between urban and rural residents in the context of the transitional economy of China, and many of them are based on a certain period. There are individual studies analyzing the institutional root cause of formation of income gap between urban and rural residents within a long time from the general level, but whether the income gap between urban and rural residents in turn will affect the non-farm bias in the government spending?

In view of this, the paper on the basis of previous studies uses the dynamic modeling of time series with "urban-rural fixed assets investment ratio" as the proxy explanatory variable of "urban bias", to carry out the empirical analysis of the dynamic relationship between urban-biased economic policies and income gap between urban and rural residents.

This study suggests that the dynamic relationship between urban-biased policies and the income gap between urban and rural residents in the context of transitional economy of China must be demonstrated and interpreted, in order to find the right way to narrow the income gap between urban and rural residents and regulate the national economic policies.

3 Model setting and data sources

3.1 Econometric model Vector autoregression (VAR) is an econometric model used to capture the linear interdependencies among multiple time series. VAR models generalize the univariate autoregression (AR) models by allowing for more than one evolving variable. All variables in a VAR are treated symmetrically in a structural sense (although the estimated quantitative response coefficients will not in general be the same); each variable has an equation explaining its evolution based on its own lags and the lags of the other model variables.

VAR modeling does not require as much knowledge about the forces influencing a variable as do structural models with simultaneous equations: The only prior knowledge required is a list of variables which can be hypothesized to affect each other intertemporally. In this paper, we use the vector autoregression (VAR), with "urban-rural fixed assets investment ratio" as the proxy explanatory variable of "urban bias", to carry out the empirical study on the dynamic relationship between the urban-biased economic policies and income gap between urban and rural residents.

An estimated VAR model can be used for forecasting, and

the quality of the forecasts can be judged, in ways that are completely analogous to the methods used in univariate autoregressive modeling.

The mathematical expression of VAR(p) model is as follows:

$$y_t = A_0 + A_1 y_{t-1} + \dots + A_p y_{t-p} + B_1 x_t + \dots + B_q x_{t-q} + \varepsilon_t \quad (1)$$

where y_t is the endogenous variable vector; x_t is the exogenous variable vector; A_0, A_1, \dots, A_p and B_1, \dots, B_q are the parameter matrix to be estimated; the endogenous variables and exogenous variables have p -order and q -order lags, respectively; ε_t is the random disturbance term.

We mainly analyze the dynamic effects of fixed assets investment and income gap between urban and rural residents, and establish the following VAR econometric model:

$$\ln GAPI\text{NGCO}_t + \alpha_0 + \sum_{i=1}^n \alpha_{1i} \ln GAPI\text{FCIV}_{t-i} + \sum_{i=1}^n \alpha_{2i} \ln GAPI\text{NCO}_{t-i} + \varepsilon_i \quad (2)$$

where $GAPI\text{NGCO}_t$ is the ratio of real per capita income of urban residents to real per capita income of rural residents in period t ; $GAPI\text{FCIV}_t$ is the ratio of fixed assets investment in urban areas to fixed assets investment in rural areas in period t , and in view of the non-linear relationship possibly existing between the variables, and in order to examine the elasticity between variables, we take the logarithm of $GAPI\text{NCO}_t$ and $GAPI\text{FCIV}_t$, namely $\ln GAPI\text{NCO}_t$ and $\ln GAPI\text{FCIV}_t$; i is the lag of related endogenous variables, with value ranging from 1 to n , and in order to simplify the analysis, for different endogenous variables, the final value of i is assumed to be the same in this paper; α_0, α_{1i} and α_{2i} are the parameters to be estimated.

3.2 Data sources The variables and data involved in this paper mainly include the two major aspects: income gap between urban and rural residents, and fixed assets investment. For the measurement of the income gap between urban and rural residents, we choose the ratio of urban residents' per capita disposable income to rural residents' per capita disposable income, and the greater the ratio, the greater the income gap between urban and rural residents.

Since the rural consumer price index Pt before 1985 is not released by the official, this paper uses the urban consumer price index (100 in 1978) to replace it, and the rural consumer price index after 1985 is derived by multiplying the index released by the official (100 in 1985) and 1.342. This indicator building method is from Gale Johnson (2002).

Fig.2 shows the changes in the income gap between urban and rural residents during the period 1980 – 2012. For the fixed assets investment data, in order to reflect the Government's preference for fixed assets investment, we select the ratio of urban fixed assets investment to rural fixed assets investment for study. Fig.3 shows the trend of the ratio of urban fixed assets investment to rural fixed assets investment during the period 1980 – 2012.

The data involved in this study are from *China Statistical Yearbook* (1981 – 2012) and *Fifty Years of New China Statistical Information* (China Statistics Press, 2005).

3.3 Empirical research methods For the time-series data, in

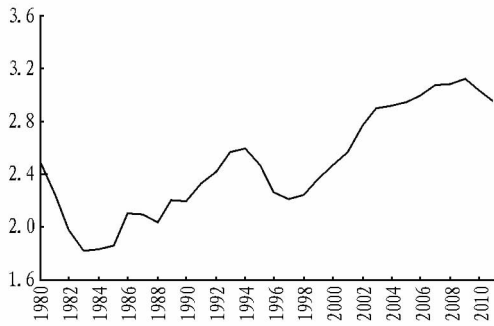


Fig. 2 Changes in the income gap between urban and rural residents during the period 1980 – 2012

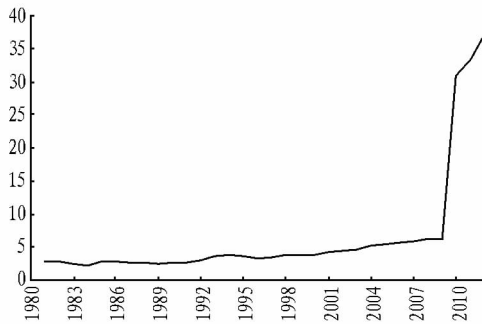


Fig. 3 Trend of the ratio of urban fixed assets investment to rural fixed assets investment during the period 1980 – 2012

order to avoid spurious regression in the model, we first use the ADF unit root test method proposed by Dickey and Fuller (1979) to test the stationarity of variables, and use difference method to process the non-stationary variables to make them become stationary time series. Then we build VAR model to determine the long-term stable relationship between fixed assets investment and income gap between urban and rural residents.

On the basis of VAR model, we use impulse response function to study the dynamic effects of fixed assets investment on the income gap between urban and rural residents, in order to determine the long-term stable relationship between fixed assets investment and income gap between urban and rural residents. The advantage of the impulse response function is that it can reflect the impact of one standard deviation from the random disturbance term on the current value and future value of endogenous variables, thus better depicting the dynamic interaction between the variables.

In order to determine whether there is a short-term causal relationship between fixed assets investment and income gap between urban and rural residents, we choose Granger causality test method. A time series X is said to Granger-cause Y if it can be shown, usually through a series of t -tests and F -tests on lagged values of X (and with lagged values of Y also included), that those X values provide statistically significant information about future values of Y . Since the Granger causality test results are affected by lag P ,

we choose Schwarz Criterion (SC) to determine the optimal lag.

4 Empirical test results and analysis

4.1 Unit root test Since most of the time series of economic variables are non-stationary series and they do not have the statistical characteristics of variance homogeneity and constant mean, it is necessary to carry out the unit root test of stationarity of series. We use ADF statistic to judge the stationarity of variables. By test it is found that the variables $\ln\text{GAPINCO}$ and $\ln\text{GAPFCIV}$ are non-stationary variables.

In this study, we mainly use the difference method for the processing of non-stationary variables, and the results are shown in Table 1. $D\ln\text{GAPINCO}$ and $D\ln\text{GAPFCIV}$ are the first-order differential value of $\ln\text{GAPINCO}$ and $\ln\text{GAPFCIV}$, respectively. The test results show that the series after being processed are all integrated of order one, or $I(1)$, with stationarity.

Table 1 ADF unit root test of the ratio of urban fixed assets investment to rural fixed assets investment and the income gap between urban and rural residents

Series	ADF test	Test type	Lag order	Significance level (critical value)
$\ln\text{GAPINCO}$	-1.185 7	Containing the intercept	1	1% (-3.711 5)
$D\ln\text{GAPINCO}$	-3.216 2**	Containing the intercept	1	5% (-2.981 0)
$\ln\text{GAPFCIV}$	-1.502 8	Containing the intercept	1	1% (-3.699 9)
$D\ln\text{GAPFCIV}$	-9.019 4***	Containing the intercept	1	1% (-3.711 5)

Notes: ***, ** mean that the null hypothesis is rejected under 1% and 5% significance levels, respectively.

4.2 Long-term equilibrium analysis The estimation results of VAR model are shown in Table 2. According to the research needs, this paper lays great emphasis on studying the long-term equilibrium relationship between the ratio of urban fixed assets investment to rural fixed assets investment and the income gap between urban and rural residents. From Table 2, it is found that the long-term equilibrium relationship estimated by VAR model is as follows:

$$\begin{aligned} \ln\text{GAPINCO}_t = & 0.093\ 6 + 1.161\ 4\ln\text{GAPINCO}(-1) - \\ & 0.329\ 6\ln\text{GAPINCO}(-1) + 0.236\ 3\ln\text{GAPFCIV}(1-) - \\ & 0.176\ 7\ln\text{GAPFCIV}(-2) \end{aligned} \quad (3)$$

From the VAR estimate model of equation (3), it is found that the ratio of urban residents' income to rural residents' income in the previous period has a great influence on the current income gap, and the degree of influence reaches 1.1614, indicating that the widening income gap will become an important reason for new round of income gap expansion, that is, there will be "Matthew effect" in the income distribution between urban and rural residents.

The impact of the ratio of urban fixed assets investment to rural fixed assets investment on the income gap between urban and rural residents is positive in the previous period, that is, the ratio of urban fixed assets investment to rural fixed assets investment is

positively correlated with the income gap between urban and rural residents, indicating that the impact of fixed assets investment on the income gap between urban and rural residents has a certain lag, and expands the income gap between urban and rural residents. Since the variables are in logarithmic form, these coefficients also reflect the long-term elasticity.

Table 2 Long-term analysis results of the ratio of urban fixed assets investment to rural fixed assets investment and income gap between urban and rural residents

Variable	LnGAPINCO	LnGAPFCIV
LnGAPINCO (-1)	1.161 406 (0.168 62) [6.887 58]	0.651 033 (0.321 96) [2.022 11]
LnGAPINCO (-2)	-0.329 632 (0.177 78) [-1.85420]	-0.359 731 (0.339 43) [-1.059 80]
LnGAPFCIV (-1)	0.236 250 (0.090 34) [2.615 05]	0.880 054 (0.172 49) [5.101 96]
LnGAPFCIV (-2)	-0.176 699 (0.062 72) [-2.817 34]	-0.068 382 (0.119 75) [-0.571 04]
C	0.093 578 (0.044 81) [2.088 31]	-0.012 779 (0.085 56) [-0.149 36]
R-squared	0.959 361	0.935 181
Adj. R-squared	0.951 620	0.922 834
F-statistic	123.935 5	75.744 65
Log likelihood	48.496 69	31.681 16

Note: The values in the brackets below each estimated parameter value are the standard deviation of estimated coefficient and test statistic.

From equation (3), it can also be found that since the reform and opening up, the long-term coefficient of elasticity of dynamic impact of the ratio of urban fixed assets investment to rural fixed assets investment in the previous period on the income gap between urban and rural residents is 0.2363, that is, for each additional one percentage point of the ratio of urban fixed assets investment to rural fixed assets investment, the income gap between urban and rural residents will increase by 0.2363 percentage points.

Although the long-term coefficient of elasticity is -0.1767 at the first two stages, the ratio of urban fixed assets investment to rural fixed assets investment in the first period has a greater positive impact on the income gap between urban and rural residents, thereby expanding the income gap between urban and rural residents in general. This fully shows that the urban-biased policies of fixed assets investment has resulted in the income gap between urban and rural residents.

4.3 Impulse response analysis The non-stationary VAR model can not be used for the impulse response function analysis, so we first carry out the stationarity test of VAR model. As can be seen from Fig. 4, the reciprocal value of all characteristic roots of VAR model is within the unit circle, indicating that the VAR model built based on the ratio of urban fixed assets investment to rural fixed assets investment and income gap between urban and rural residents is in line with the stationarity criteria.

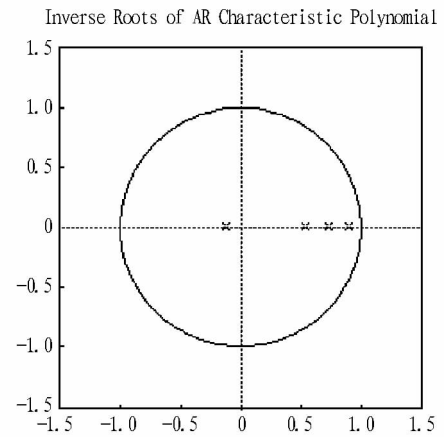


Fig. 4 Stationarity test of VAR model

Therefore, based on VAR model, we further use the impulse response function to examine the dynamic effects of fixed assets investment on the income gap between urban and rural residents.

The impulse response function is used to measure the locus of impact of one standard deviation of the random disturbance term on the current and future values of other variables, and then visually depict the dynamic response of endogenous variables to random disturbance, and display how the random disturbance of any variable influences other variables through the model and give feedback to itself.

Fig. 5 shows the impulse response of the ratio of urban fixed assets investment to rural fixed assets investment to income gap between urban and rural residents.

(i) The response of income gap between urban and rural residents to the standard information generated by itself is positive. It reaches the maximum of 0.0586 in the third period, and then declines slowly at the response level of 0.01 and tends to be stabilized at the ninth stage.

(ii) The impact of the standard information generated by the ratio of urban fixed assets investment to rural fixed assets investment on the income gap between urban and rural residents is positive. The impact at the first stage is very weak, the impact at the second stage is 0.017258, and the impact peaks at the fourth stage. Then it begins to decline, but the positive impact is always on. This conclusion is basically consistent with the long-term equilibrium analysis results.

(iii) The response of the ratio of urban fixed assets investment to rural fixed assets investment to the standard information generated by income gap between urban and rural residents is positive. It is 0.0316 at the first stage, and reaches the maximum of 0.0756 at the fifth stage, and then the positive impact is always on. So it can demonstrate that the expansion of income gap between urban and rural residents has gradually solidified the pattern of interests between urban and rural areas, thereby strengthening the "non - agricultural bias" feature of fixed assets investment.

4.4 Granger causality test The estimation results of VAR model indicate that in the period 1980 - 2007, there was a long-

term equilibrium relationship between the ratio of urban fixed assets investment to rural fixed assets investment and income gap between urban and rural residents. However, whether this equilibri-

um relationship will become the short-term causal relationship needs to be further verified.

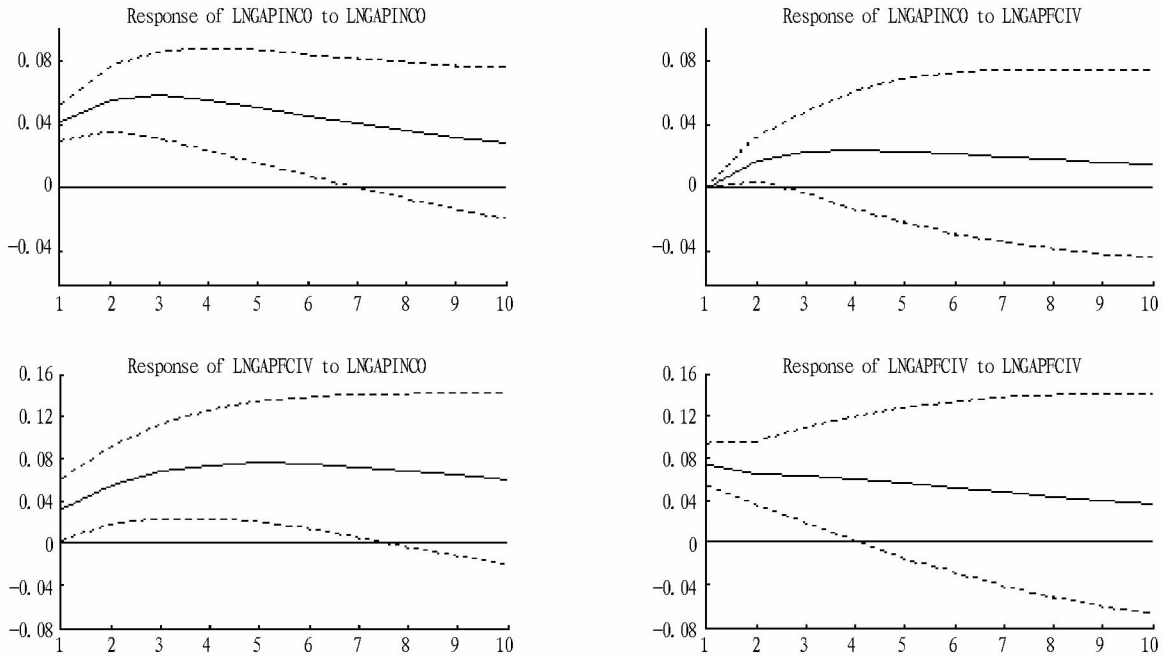


Fig. 5 The dynamic response of income gap between urban and rural residents and the ratio of urban fixed assets investment to rural fixed assets investment to the related impact

Based on this, this paper carries out Granger causality test of the ratio of urban fixed assets investment to rural fixed assets investment and income gap between urban and rural residents, in order to judge the short-term relationship between them.

The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another. Ordinarily, regressions reflect "mere" correlations, but Clive Granger argued that causality in economics could be reflected by some sort of tests. A time series X is said to Granger-cause Y if it can be shown, usually through a series of t -tests and F -tests on lagged values of X (and with lagged values of Y also included), that those X values provide statistically significant information about future values of Y .

Table 3 Granger causality test model of the ratio of urban fixed assets investment to rural fixed assets investment and income gap between urban and rural residents

The null hypothesis	Optimal lag	Number of samples	F statistic	P values
$DLnGAPFCIV$ does not Granger-cause $DLnGAPINCO$	2	26	2.88259	0.07943
$DLnGAPINCO$ does not Granger-cause $DLnGAPFCIV$	2	26	1.85989	0.18163
$DLnGAPFCIV$ does not Granger-cause $DLnGAPINCO$	3	25	5.69017	0.00692
$DLnGAPINCO$ does not Granger-cause $DLnGAPFCIV$	3	25	3.53706	0.03720

As can be seen from Table 3, in lag 2, 3, the ratio of urban fixed assets investment to rural fixed assets investment does Granger-cause the income gap between urban and rural residents at 10% and 1% significance levels, respectively, once again indicating that the long-term urban-biased fixed assets investment significant-

ly broadens the income gap between urban and rural residents.

In addition, we also find that in lag 3, the income gap between urban and rural residents also does Granger-cause the ratio of urban fixed assets investment to rural fixed assets investment at the 10% confidence level, which is consistent with the impulse

function analysis result.

Conspicuously, the urban-biased policy on fixed assets investment has resulted in the widening income gap between urban and rural residents, and it is an important reason for the widening income gap between urban and rural residents to some extent. The income gap between urban and rural residents is also the reason for the "urban bias" feature of fixed assets investment.

5 Conclusions and policy recommendations

5.1 Conclusions Through the establishment of a vector autoregression econometric model, based on the "dual economic and social structure" feature of China, this paper takes the ratio of urban fixed assets investment to rural fixed assets investment as the proxy explanatory variable of "urban bias", and carries out the empirical analysis of the dynamic relationship between the urban-biased economic policies and income gap between urban and rural residents. The results show that:

(i) The urban-biased policies on fixed assets investment lead to the widening income gap between urban and rural residents, which can be an important reason for the widening income gap between urban and rural residents to a certain extent. As can be seen from Fig. 3, the urban bias of fixed assets investment is very prominent, and might be exacerbated. When explaining the root causes of widening income gap between urban and rural residents, both the analysis from the industry property, and the demonstration from the government policy design, are closely related to country's policy preferences; especially the urban-biased fixed assets investment in the area of infrastructure building makes the urban and rural residents have different resource endowments, and thus the income gap between urban and rural residents is bound to widen. The empirical results of this paper, coupled with the conclusion of Peng Daiyang *et al.* (2003), have provided empirical explanation of the income gap between urban and rural residents.

(ii) The expansion of income gap between urban and rural residents has gradually solidified the pattern of interests between urban and rural areas, thereby strengthening the "non-agricultural bias" feature of fixed assets investment. With the widening income gap between urban and rural residents, rural residents' income is increasingly lower while urban residents' income is increasingly higher.

The government's public investment seems to be provided for urban and rural residents impartially, but urban and rural residents are different two interest groups, and the rural residents are always in a weak position, so there is a great disparity in the bargaining power between urban and rural residents in terms of fixed assets investment. As a result, it will inevitably lead to the urban bias of government's fixed assets investment. Therefore, the income gap between urban and rural residents is also the reason for the "urban bias" feature of fixed assets investment.

5.2 Policy recommendations The urban-biased policies on fixed assets investment are an important reason for the income gap between urban and rural residents, and the income gap between

urban and rural residents will also solidify the "non-farm preference" of fixed assets investment, then in the dual economic structure, adjusting the structure and scale of fixed assets investment, and strengthening the government financial support for agriculture, will be the policy orientation for narrowing income gap between urban and rural residents, and realizing the coordinated development of urban and rural areas. We put forth the following recommendations:

(i) With the coordinated development of urban and rural areas as the policy background, it is necessary to coordinate the urban and rural infrastructure and public services, and especially increase the supply of public goods for the backward rural areas, in order to achieve equalized resource allocation of the rural and urban public utilities and infrastructure, and improve rural backwardness and agricultural production conditions.

(ii) With the new rural construction as an opportunity, it is necessary to increase government financial transfer payment, improve rural infrastructure, and focus on solving the issues concerning rural water systems, rural power network and village road construction, to allow more modern consumer goods into farmer families, thereby creating hardware environment for stimulating the domestic demand and expanding the rural consumer markets.

(iii) It is necessary to reverse the government officials' performance evaluation standard, urge governments at all levels to promote public investment related to rural areas, adjust the structure and scale of fixed assets investment, reduce the growth rate of fixed assets investment for urban areas, and steadily increase the investment in agriculture to promote the agricultural and rural economic development.

(iv) With the relevant laws and regulations as the yardstick, it is necessary to establish the equitable development mechanism for urban and rural residents, transform the government functions, provide the normal channels for the majority of rural residents to respond to government decisions in a timely manner and express their will, and change the weak position of rural residents in the public policy formation, so that the public policies developed by the government can fully reflect the common will of all citizens.

References

- [1] LI S, ZHAO RW, ZHANG P. Change of income distribution in China's economic reform[J]. *Management World*, 1998(1): 43–56. (in Chinese).
- [2] LIU JQ, YU HC. The experimental analysis of the relationship between fixed assets investments and economic growth of China[J]. *Statistical Research*, 2002(1): 26–29. (in Chinese).
- [3] CAI F. The rural-urban income gap and critical points of institutional change[J]. *Social Sciences in China*, 2003(5): 16–25. (in Chinese).
- [4] PENG DY. The effect of the resistance to the immigration of rural labor to urban areas on rise in farmers' income and income difference between urban residents and farmers[J]. *Journal of Huazhong University of Science and Technology (Social Science Edition)*, 2003, 16(5): 58–62. (in Chinese).
- [5] ZHANG HY. Inhibiting mechanism for urban-rural income gap[J]. *Management World*, 2004(4): 9–21. (in Chinese).
- [6] LU M, CHEN D. Economic policy for urbanization and city-tendency as well as urban-rural income gap[J]. *Economic Research Journal*, 2004(6): 50–58. (in Chinese).

of substitution, namely $\delta \leq \frac{1}{2}$), the enterprises with high cost parameters will choose the lowest level of investment in innovation and the lowest quality level, while the enterprises with low cost parameters will choose the quality higher than the lowest level; if the product differentiation is small (high degree of substitution, namely $\delta \geq \frac{1}{2}$), the enterprises with high cost parameters will choose the lowest quality level, while the enterprises with low cost parameters will choose the highest quality level, namely $C_i = \frac{3}{2}$.

When the two enterprises are faced with the high-cost parameters, each enterprise will produce the products with the lowest quality, and the enterprises' investment in innovation will be in the "stationary" state.

References

- [1] Harhoff D, Regibeau P, Rockett K. Some simple economics of GM food [J]. *Economic Policy*, 2001, 16(33): 263–299.
- [2] Lavoie, B.F. 2004. Real options and the management of R&D investment: An analysis of comparative advantage, market structure, and industry dynamics in biotechnology[J]. Unpublished PhD Dissertation, The Ohio State University.
- [3] Sheldon I. The Biotechnology Sector: "Bounds" to market structure[C] //
- [4] LIN GB. Hierarchy, market economy and the enlargement of urban-rural income gap[J]. *Management World*, 2004(4): 30–40. (in Chinese).
- [5] LIU YY. The extent, cause and adjusting of policy about income difference between the urban and the rural in China[J]. *Problems of Agricultural Economy*, 2004(3): 56–58, 77. (in Chinese).
- [6] WANG DW, HE YP. The essence, versatility and policy implication of differences between the urban and the rural[J]. *China Rural Survey*, 2005(3): 25–37. (in Chinese).
- [7] FU Y. Urban-rural disparity, quantity paradox and policy deviation[J]. *Comparative Economic and Social Systems*, 2005(4): 22–27. (in Chinese).
- [8] CHEN ZX, ZHANG W, ZHAO YF. The experimental analysis of the relationship between fixed assets investments and macroeconomy[J]. *Industrial Technology & Economy*, 2005, 24(6): 130–132. (in Chinese).
- [9] YU XD. Reasons for continuous expansion of differences between city and countryside and its solutions[J]. *Rural Economy*, 2006(6): 46–49. (in Chinese).
- [10] ZHANG R, LI ZF, GUAN K. Study on the scale and optimization for urban-rural investment in fixed assets of China[J]. *Systems Engineering Theory · Methodology · Applications*, 2007, 16(4): 401–406. (in Chinese).
- [11] MA B, ZHANG FR. Empirical analysis on income gap determinants between urban and rural residents [J]. *Chinese Rural Economy*, 2008(2): 53–59. (in Chinese).
- [12] LI W, WANG SG. Source decomposition of urban-rural resident income inequality's periodical fluctuation[J]. *Journal of Northwest Sci-Tech Uni-*

- versity of Agriculture and Forestry(Social Science)*, 2009, 9(3): 54–59. (in Chinese).
- [13] CHENG KM. From city-biased development to harmonious urban-rural development—Evidence from the panel data of the influence of city – biased policy on urban – rural gap[J]. *Economist*, 2008(3): 28–36. (in Chinese).
- [14] MIN J, ZHANG AL, WU ZY, *et al.* Scale effect analysis of driving mechanism of rural-urban land conversion[J]. *Journal of Natural Resources*, 2008, 23(5): 808–820. (in Chinese).
- [15] LI SX. Income gap from the angle of finance[J]. *Sichuan Public Finance*, 2002(8): 15–17. (in Chinese).
- [16] ZHU QW. *China Daily*. (North American ed.). New York, N. Y.: Apr 20, 2007. pg. 1; *Beijing Review*. Beijing: Apr 11, 2002, 15(45): 1.
- [17] SU B. Retail sales on the up as incomes rise[N]. *China Daily*. (North American ed.). New York, N. Y.: Nov 15, 2005, 11(15): 10.
- [18] Dong Tao. Analysis of fixed asset investments in the first half of 2007[J]. *CHINA CHEMICAL REPORTER*, 2007, 11(6): 20–23.
- [19] China business insider, Beijing simplifies procedures for fixed asset investment projects, page 6;
- [20] Implementation of the 2001 Plan for National Economic and Social Development *Beijing Review*. Beijing: Apr 11, 2002, 45(15).
- [21] John F McDonald , The Q theory of investment, the capital asset pricing model and real estate valuation, a synthesis, *Journal of Real Estate Literature*; 2005; 13, 3[J]. *Academic Research Library*, 2005, 13(3): 271.
- [22] LI XS. Wuhan achieves social, economic progress[N]. *China Daily*. (North American ed.). New York, N. Y.: Mar 12, 2007: 7.
- [23] 2008 Annual Meeting, July 27–29, 2008, Orlando, Florida. American Agricultural Economics Association (New Name 2008: Agricultural and Applied Economics Association), 2008 (6078).
- [24] Schimmelpennig DE, Pray CE, Brennan MF. The impact of seed industry concentration on innovation: A study of US biotech market leaders[J]. *Agricultural Economics*, 2004, 30(2): 157–167.
- [25] Marco A C, Rausser G C. The role of patent rights in mergers: Consolidation in plant biotechnology[J]. *American Journal of Agricultural Economics*, 2008, 90(1): 133–151.
- [26] Kalaitzandonakes N G, Hayenga M L. Structural change in the biotechnology and seed industrial complex: Theory and evidence[R]. *Regional Research Project NE-165 Private Strategies, Public Policies, and Food System Performance*, 2000.
- [27] Goodhue R E, Rausser G C, Scotchmer S, *et al.* Biotechnology, intellectual property and value differentiation in agriculture[J]. 2002.
- [28] Shi G. Bundling and licensing of genes in agricultural biotechnology[J]. *American Journal of Agricultural Economics*, 2009, 91(1): 264–274.
- [29] LV LC, LUO GF. Modern biotechnology in agriculture and the public administration: An overview of research[J]. *Journal of Agrotechnical Economics*, 2004(6): 2–8. (in Chinese).
- [30] HAN YQ, WANG HL. Agricultural biotechnology R&D market structure in the developed countries and the enlightenment to our country[J]. *Science and Technology Management Research*, 2010, 30(4): 15–17, 14. (in Chinese).
- [31] PANG JF, QI Y, FENG F, *et al.* Protection and development of agro-biotechnology intellectual property rights [J]. *Biotechnology Bulletin*, 2013(6): 232–234. (in Chinese).

(From page 17)

- [7] LIN GB. Hierarchy, market economy and the enlargement of urban-rural income gap[J]. *Management World*, 2004(4): 30–40. (in Chinese).
- [8] LIU YY. The extent, cause and adjusting of policy about income difference between the urban and the rural in China[J]. *Problems of Agricultural Economy*, 2004(3): 56–58, 77. (in Chinese).
- [9] WANG DW, HE YP. The essence, versatility and policy implication of differences between the urban and the rural[J]. *China Rural Survey*, 2005(3): 25–37. (in Chinese).
- [10] FU Y. Urban-rural disparity, quantity paradox and policy deviation[J]. *Comparative Economic and Social Systems*, 2005(4): 22–27. (in Chinese).
- [11] CHEN ZX, ZHANG W, ZHAO YF. The experimental analysis of the relationship between fixed assets investments and macroeconomy[J]. *Industrial Technology & Economy*, 2005, 24(6): 130–132. (in Chinese).
- [12] YU XD. Reasons for continuous expansion of differences between city and countryside and its solutions[J]. *Rural Economy*, 2006(6): 46–49. (in Chinese).
- [13] ZHANG R, LI ZF, GUAN K. Study on the scale and optimization for urban-rural investment in fixed assets of China[J]. *Systems Engineering Theory · Methodology · Applications*, 2007, 16(4): 401–406. (in Chinese).
- [14] MA B, ZHANG FR. Empirical analysis on income gap determinants between urban and rural residents [J]. *Chinese Rural Economy*, 2008(2): 53–59. (in Chinese).
- [15] LI W, WANG SG. Source decomposition of urban-rural resident income inequality's periodical fluctuation[J]. *Journal of Northwest Sci-Tech Uni-*

- versity of Agriculture and Forestry(Social Science)*, 2009, 9(3): 54–59. (in Chinese).
- [16] CHENG KM. From city-biased development to harmonious urban-rural development—Evidence from the panel data of the influence of city – biased policy on urban – rural gap[J]. *Economist*, 2008(3): 28–36. (in Chinese).
- [17] MIN J, ZHANG AL, WU ZY, *et al.* Scale effect analysis of driving mechanism of rural-urban land conversion[J]. *Journal of Natural Resources*, 2008, 23(5): 808–820. (in Chinese).
- [18] LI SX. Income gap from the angle of finance[J]. *Sichuan Public Finance*, 2002(8): 15–17. (in Chinese).
- [19] ZHU QW. *China Daily*. (North American ed.). New York, N. Y.: Apr 20, 2007. pg. 1; *Beijing Review*. Beijing: Apr 11, 2002, 15(45): 1.
- [20] SU B. Retail sales on the up as incomes rise[N]. *China Daily*. (North American ed.). New York, N. Y.: Nov 15, 2005, 11(15): 10.
- [21] Dong Tao. Analysis of fixed asset investments in the first half of 2007[J]. *CHINA CHEMICAL REPORTER*, 2007, 11(6): 20–23.
- [22] China business insider, Beijing simplifies procedures for fixed asset investment projects, page 6;
- [23] Implementation of the 2001 Plan for National Economic and Social Development *Beijing Review*. Beijing: Apr 11, 2002, 45(15).
- [24] John F McDonald , The Q theory of investment, the capital asset pricing model and real estate valuation, a synthesis, *Journal of Real Estate Literature*; 2005; 13, 3[J]. *Academic Research Library*, 2005, 13(3): 271.
- [25] LI XS. Wuhan achieves social, economic progress[N]. *China Daily*. (North American ed.). New York, N. Y.: Mar 12, 2007: 7.