GROWTH, INEQUALITY AND POVERTY REDUCTION IN RURAL CHINA

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A B S T R A C T

Based on the provincial data on the per capita annual net income, inequality and poverty headcount since 2000, this paper attempts to analyze the impacts of the income growth and distribution on poverty reduction in rural China and explore the situation and causes of rural income inequality by means of econometric model analysis and Gini coefficient decomposition. The results show that the income growth of China's peasants since 2000 still plays a significant role in reducing rural poverty, but the deterioration of income inequality will partially offset the positive effects of income growth on poverty reduction; the extent of income inequality in rural areas is obviously higher than that in urban areas; income from wages and salaries is one of the most important determinants which cause rural income inequality, followed by the income from household operations, but the ratio of contribution of the income from properties and transfers to inequality is relatively low..

Keywords: Growth; inequality; poverty reduction.

INTRODUCTION

Poverty reduction is the fundamental goal of the world economic development and is to be achieved through economic growth and income distribution. Therefore, the relationship between economic growth, income distribution and poverty reduction and its change law have been a concern of development economics. At present, a large number of theoretical and empirical studies have shown that economic growth can reduce poverty, but its capacity for poverty reduction is affected by the situation of income distribution. If the income gap widens along with the economic growth, the poor will benefit less from the growth compared to the non-poor. As a result, the poverty reduction effects of economic growth will be partially or completely offset by the increased inequality in income distribution (Datt and Ravallion, 1992; Kakwani,2000; Balisacan, 2004). Over the three decades since reform and opening up, China has made remarkable achievements in rural economic development and accelerated the poverty reduction process in rural areas. In 1980, the per capita

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net income of rural households was 191.3 Yuan. In 2010, this indicator value rose to 1,313.5 Yuan (1980 price), with an average annual growth of 6.6%. In the context of rapid economic growth, millions of rural residents have shaken off poverty and the rural poverty rate dropped from 26.8% in 1980 to 4.2% in 2008 with an average annual decline of 6.8%, almost at the level of the economic growth rate. Despite a significant reduction in rural poverty, the process of poverty reduction in rural areas showed obvious characteristics of volatility and slowing down, especially after the mid-1990s, the speed of poverty reduction in China is getting slow and it becomes increasingly difficult to alleviate poverty (Yifu, 2004).

After the 1990s, along with the slowing down of the process of poverty reduction in rural areas, China's income distribution inequality is worsening. The survey results show that China's Gini coefficient was close to 0.46. The top 5% of the people with the highest income occupied nearly 20% of the total income and the top 10% occupied nearly 32% of the total income. The bottom 5% of the population with the lowest income, however, only had less than 0.7% of the total income, and the bottom 10% had only 1.7% of the total income

(Li and Renwei, 2006). National Gini coefficient rose from 0.30 in 1978 to 0.38 in 1997 and 0.46 in 2002 and the rural Gini coefficient increased from 0.21 in 1978 to 0.37 in 2007 (UNDP, 2006). The widening gap between urban and rural areas and within the rural areas makes the poor further marginalized and unable to enjoy the fruits of economic growth proportionally. Of course, it is related to the characteristics of rural poverty. For example, the remaining poverty-stricken people are increasingly concentrated in the regions with harsh natural environment, remote areas and minority areas and in the vulnerable groups that can hardly participate in the economic growth, so the task of poverty reduction is more arduous in the future.

In the 21st century, China's rural poverty shows some new features. For example, poverty is no longer widespread and has become a regional problem, rural poverty gap is further widened and the inner inequality in rural areas is getting increasingly serious. In this context, what impacts income growth and rural income distribution will have on the rural poverty reduction in the new century and how we should continue the rural poverty reduction all need to be answered urgently in the new century. In view of that, this paper will not attempt to conduct a comprehensive and systematic study on the complex relationship between growth, distribution and poverty, but will explore the following issues based on the relevant data of the National Bureau of Statistics since 2000: (1) Rural income growth and distribution and rural poverty reduction process from a macro perspective since 2000; (2) Use the provincial panel data to conduct empirical analysis on whether the poor benefit from the economic growth in rural areas since 2000; (3) Income distribution in rural areas and the reasons for income inequality.

Data and empirical research methods

Data: The data used in this paper are all the national and provincial data since 2000, including the data of 2000. Sources of the national data: Per capita net income of farmers is from the previous "China Statistical Yearbook", the rural Gini coefficient is from "China Agricultural Yearbook 2008" and the number of the rural poor is from "China Rural Poverty Monitoring Report 2010". The provincial data are mainly from the previous "China Statistical Yearbook" and the relevant poverty and Gini coefficient data are provided by the Department of Rural Socio-Economic Survey of the National Bureau of Statistics. The provincial sample data

are the relevant data for the period from 2000 to 2008. Since 2008, the Chinese government has continuously improved the standard of poverty, so it is hard to obtain the latest official statistics of poverty rates. For each year, the provincial rural residents' income data include per capita net income of rural residents and the itemized income, i.e. the per capita net income, per capita wage income, per capita household operating income, per capita property income and per capita transfer income. The involved provincial urban residents' income refers to per capita disposable income.

Empirical research methods: Research methods are selected according to the research themes. The empirical research methods of this paper consist of two aspects. First, in the study of the impacts of income growth and distribution of rural residents on poverty reduction, the econometric model analysis method will be used. Second, in the analysis of the situation of income distribution of rural residents and the sources of income inequality, the Gini coefficient and its decomposition methods will be used.

Empirical model setting for rural residents' income growth, distribution and rural poverty reduction. In this paper, we mainly analyze the income growth elasticity and income distribution elasticity of poverty incidence through the establishment of a regression model. It not only helps make clear the relationship between the three, but also helps to understand the sensitivity of the incidence of poverty to economic growth and income distribution change. Base on the models of the existing studies (Yu, 2008), we set the model as follows:

$$\lg H_{it} = \beta_0 + \beta_1 \lg INC_{it} + \beta_2 \lg GINI_{it} + \alpha_i + \gamma Year_t + \varepsilon_{it}$$

Where, i represents the province. There are a total of 31 provinces in China. t represents the year. Nine years from 2000 to 2008 are involved. H_{it} is the poverty rate of No.i province in No.t year, INC_{it} is the rural per capita net income of No.i province in No.t year, and $GINI_{it}$ refers to the Gini coefficient of No.i province in No.t year. Lg is the logarithm of relevant variable. Logarithmic form setting itself can also appropriately eliminate the dynamic panel trend. Based on the above model setting, the economic implication of β_1 is the change in the incidence of poverty when there is a change of one percentage point to the income, i.e. the income growth elasticity of poverty incidence. β2 here refers to the change in the incidence of poverty when

there is a change of one percentage point to income distribution (measured by Gini coefficient), i.e. the income distribution flexibility of poverty incidence. The absolute value of β_2/β_1 is the marginal rate of substitution of income growth and distribution flexibility. It tells how much income growth is needed to compensate the increase in poverty rate caused by the growth of one percentage point in the distribution of income. In the model, α_i and YEARt are both related to the error term of panel data model processing. A very small dynamic panel of 31 provinces in nine years is used for regression and the error term is composed of two parts. One part is related to individual observations due to unchanged time. α_i is used in the model to summarize these factors, such as the geographic location, natural resources and some social systems of a province. The other part refers to unobservable factors changing with provinces and time. Among them, the unobservable factors changing with time but not with provinces can be controlled through introducing time dummy variables YEARt in the model, and the remaining unobservable factors are residual terms ε_{it}.

As for the endogeneity problem that may exist in the model, this paper will use Hausman test to check whether the explanatory variable Gini coefficient is a simultaneous phenomenon with the explained variable. If it is, we can use instrumental variables to solve the problem; if not, we do not need to deal with any problem of endogeneity.

Gini coefficient and its decomposition. As a fairly comprehensive income distribution indicator, Gini coefficient was put forward by Italian economist Gini based on the Lorentz curve and its calculation formula is $Gini = s_a/(s_a + s_b)$. Where s_a and s_b respectively represents the area enclosed by the Lorenz curve and the absolute average and the area enclosed by the Lorenz curve and definitely not average. The bigger the Gini coefficient, the higher the degree of inequality.

Gini coefficient can also analyze the difference of total revenue in itemized incomes. If the per capita income(m_i) of No.i family has F sources, the Gini coefficient canalso be decomposed into F parts. So we can make clear the difference in the income with different sources and the rates of contribution of various sources of income to the income difference. This paper mainly uses this method to analyze the contributions of income distribution and sources of income of rural residents to

income inequality and study the causes of rural income inequality.

Descriptive analysis of income growth, distribution and poverty reduction: Per capita net income of rural households since 2000 shows an uptrend in fluctuation, the situation of the income distribution in rural areas has not been significantly deteriorated, and the rural Gini coefficient has maintained 0.36. The per capita net income of rural residents increased from 2253.4 Yuan in 2000 to 5919 Yuan in 2010, with an average annual growth of 10.2%. Deducted the price factor, the average annual growth rate was about 6%, much lower than the growth rate of 13% of the rural per capita net income in the period from early 1980s to late 1990s. The growth rate in 2001, 2002, 2003 and 2009 was less than 10% and that in other years exceeded 10% (see Figure 1). At the same time, the situation of the income distribution in rural areas has not been significantly deteriorated. The rural Gini coefficient was 0.35 in 2000 and 0.37 in 2007, with an average annual growth of 0.7%. We can see from Figure 1 that the growth rate curve of rural Gini coefficient is almost impartial. Despite a substantial reduction in rural poverty since 2000, there are a large number of poverty-stricken people. Based on the poverty line set in 2008, the rural poor decreased from 94.22 million in 2000 to 35.97 million in 2009, with an average annual decline of 9.9%. The decline rate of poverty-stricken population in 2001, 2002, 2003 and 2008 was below 10% and this rate in other years exceeded 10%. Especially in 2007, the decline rate reached 24.2% (see Figure 1). Based on the latest poverty line – 2300 Yuan/year, of course, the number of the people living below the poverty line will be much bigger, reaching 120 million or so. The poverty line is increasingly close to the international standard. It shows that China still has a large poverty-stricken population and the task of poverty reduction is still arduous.

The macro data are used above to describe rural residents' income growth and distribution and rural poverty reduction since 2000. On the whole, the income growth rate is higher than the poverty reduction rate in this period and the situation of income distribution does not show an obvious trend of deterioration. Although the descriptive analysis discovers the negative correlation between income growth and poverty reduction, its role in the distribution of income is not clear. In the following part, the provincial panel data will be used to conduct empirical analysis on the relationship between the three.
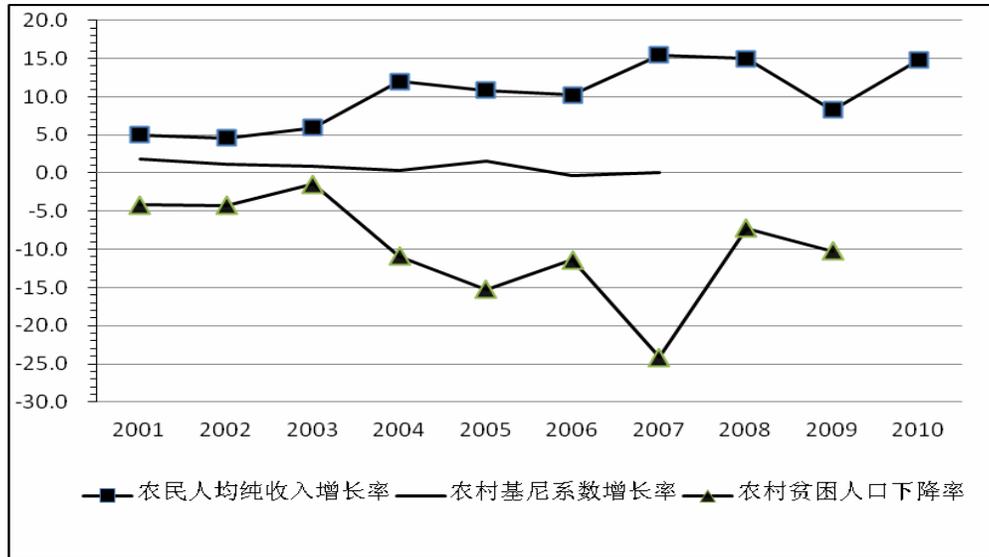
Figure 1. Rural residents' income growth, inequality and the rate of change of the rural poor

Source: calculation based on statistical data.

EMPIRICAL ANALYSIS RESULTS

Hausman test: For panel data estimation, two methods can be used, namely the fixed effects model and the random effect model. In this paper, we mainly determine what kind of model to be used through the Hausman test. The Hausman test principle is like this: when the fixed effects model is used, consistent estimates can be obtained regardless whether the null hypothesis of Hausman test is established or not; when the random effect model is used, if the null hypothesis is not established, the estimates are not consistent, otherwise, the consistent estimates can be obtained and be effective. According to test results of Stata report, chi2 = 9.91, Prob> chi2 = 0.0193, i.e. reject the null hypothesis and accept the alternative hypothesis at the level of 5%, and a fixed effects model should be used.

Likewise, we also conduct the Hausman test on the endogeneity that may existin IgGINI$_{it}$ mentioned earlier. The principle is the same, but the null hypothesis is that "the difference in the estimated parameters using instrumental variables and not using instrumental variables is not systematic". If the null hypothesis is true, then the endogenous model does not have endogeneity and no instrumental variables need to be used. According to the conditions for selection of instrumental variables – related to endogenous variables rather than the explained variables, many papers use the lagged variables of endogenous variables as instrumental variables, so this paper also uses the lagged variables of IgGINI$_{it}$ as instrumental variables in the test. The test results are: chi2 = 3.57, Prob> chi2 = 0.1678, that is: If the null hypothesis is accepted, there is no endogeneity in the model and no instrumental variables need to be used.

RESULTS OF ECONOMETRIC MODEL

Table 1 lists the final estimation results of the model. Seen from the regression results, the symbols of the variables in the model are consistent with the expectations, especially in the statistics. The F value of the overall significance test of the fixed effects model is 12.57 (Pr> F = 0.00), which indicates that the overall linear form of the model exists. The 3 R2 in the regression results are also goodness of fit in a general sense. R2 within R2 tells that the R2 can reach 0.685 if the fixed effects model regression parameters are used to match the within model of panel; the R2 can reach 0.931 if the between model is matched, and can reach 0.870 if the overall model is matched. The high matching degrees show excellent goodness of fit of the model. In this paper, we are concerned about the regression coefficients of two explanatory variables: per capita net income and the Gini coefficient. Among them, the per capita net income is negative, indicating the income growth is conducive to poverty reduction; and the Gini coefficient is positive, indicating the deterioration of income distribution will partially offset the poverty reduction effects of income growth.

Specifically, the elasticity of income growth on poverty reduction is -2.42 and the elasticity of distribution of income on poverty reduction is 1.32. This result suggests

that the increase of every one percentage point in per capita net income of rural residents will lead to a decrease of 2.42 percentage points in the incidence of poverty, and the increase of every one percentage point in Gini coefficient will result in an increase of 1.32 percentage points in the incidence of poverty. A large number of studies have shown that, for developing countries, the income elasticity of poverty incidence is generally between -2 to -3. The results in this paper are almost in line with it. As for the comparison of the poverty reduction effects of income growth and the negative role of income distribution in poverty reduction, we can obtain the results by calculating the marginal rate of substitution of the two. Calculated according to the formula, the estimated average marginal rate of substitution of income growth and income distribution elasticity is equal to 0.55. In other words, the increase in poverty incidence caused by the increase of one percentage point in the Gini coefficient needs to be offset by an increase of 0.55 percentage points in per capita net income.

Table 1.The effects of per capita net income & Gini coefficient on poverty.

	Lg (Incidence of poverty)
Lg(per capita net income)	-2.42***
	(-6.81)
lg (Gini coefficient)	1.32***
	(3.60)
Year	0.07*
	(1.93)
Intercept	-110.38*
	(-1.67)
Sample data	265
F value	12.57(Pr> F = 0.00)
R2_within	0.685
R2_between	0.931
R2_overall	0.870

Note: Figures in brackets are t values. *** indicates significant on the level of 1%, * indicates significant on the level of 10%.

An empirical model analyzed the poverty reduction effects of China's economic growth and distribution of income since 2000 and the results show that China's economic growth still plays a significant role in reducing rural poverty, but the negative role of income distribution in reducing poverty is also obvious. While improving farmers' living standards and reducing the degree of poverty by various measures, therefore, the government also has to take into account the possible negative effects of the increasing inequality. In fact, facing the new changes in farmers' income and the increasing income inequality since 2000, the government has issued many important documents on the "three rural issues" and developed a series of agriculture-benefiting policies: It cancelled the agricultural tax and provided direct grain subsidy; implemented the compulsory education policy and waived the tuition fees of normal university students; implemented the new rural cooperative medical system and rural minimum living security system, sent home appliances to rural areas and provided subsidies for the purchase of agricultural machinery. These policies were implemented to make the poor benefit more from the economic growth through regulating the re-distribution of income. However, the effectiveness and poverty reduction effects of these agriculture-supporting policies still need to be studied and evaluated.

Gini coefficient and its decomposition results: To further clarify the situation of rural income distribution, this paper uses provincial rural and urban income data to calculate the rural and urban Gini coefficient and, on this basis, conduct comparative analysis. The Gini coefficient is an indicator for comprehensive survey of the difference in income distribution among residents that reflects residents' income inequality. According to the calculation results, the degree of income inequality in rural areas is significantly higher than that in rural areas and the improvement of the income inequality in rural areas is slightly behind that in the city.

Table 2. Calculation results of rural and urban Gini coefficient.

Year	Rural	Urban
2000	0.2170	0.1398
2001	0.2222	0.1398
2002	0.2245	0.1327
2003	0.2222	0.1363
2004	0.2177	0.1398
2005	0.2261	0.1406
2006	0.2284	0.1419
2007	0.2204	0.1338
2008	0.2144	0.1351
2009	0.2147	0.1342
2010	0.2101	0.1342

Source: calculation by the author

In Table 2, the average rural Gini coefficient is 0.2198, while the urban Gini coefficient is 0.1371. The former is significantly higher than the latter. The average annual decrease in rural Gini coefficient is 0.2% but the average annual decrease in urban Gini coefficient is 0.7%. The decline rate of rural Gini coefficient is lower than that of urban Gini coefficient. At the same time, this paper attempts to explore the causes of rural income inequality by decomposing the rural Gini coefficient from the perspective of sources of income. Table 3 lists the rates of contribution of above itemized income to rural income inequality and the following conclusions can be drawn based on the data in the table.

Firstly, based on the absolute contribution rates, in the period from 2000 to 2010, wage income was the main factor affecting the income inequality in rural areas, followed by family operating income, property income and transfer income. The rate of contribution of the four itemized income to the inequality was respectively 69.1%, 18.6%, 5.6% and 6.7% (average figure). Wage income is more associated with the labors' level of education, age, ability and other personal factors. Comparatively speaking, the poor, particularly the rural poor are at a disadvantageous status in the ability and opportunity for obtaining wage income, so it is reasonable for wage income to become the main source of income inequality in rural areas.

Secondly, if seeing the trend of changes in the contribution rate, however, the conclusion is different. During this period, the rate of contribution of wage income and family operating income showed a downtrend, while that of transfer income and property income showed an uptrend. The rate of contribution of property income rose from 2.5% in 2000 to 7.9% in 2010, with an average annual growth of 11.7%; the rate of contribution of transfer income increased from 4.2% in 2000 to 11.2% in 2010, with an average annual growth of 10.5%, while the rate of contribution of wage income and family operating income respectively declined by 0.3% and 5.9% per year. The rise of the rate of contribution of property income to rural inequality is understandable because the poor rarely hold movable and immovable property compared to the rich. With the enhancement of the proportion of property income in farmers' net income, property income may exacerbate the income gap between rich and poor. However, the increasing rate of contribution of transfer income in rural income inequality is inconsistent with intuition because transfer income, especially the government transfer payment is provided to protect the vulnerable and ensure that farmers can share the outcomes of social development equitably, but the study in this paper shows that this political objective has not been achieved. The reasons might be the problems in system design or the effects of policy implementation, and more in-depth studies are needed to be conducted.

Table 3. Rates of contribution of different income to rural income inequality Unit: %

Year	Wage and salary	Income from household operation	Income from property	Income from transfer
2000	69.2	24.1	2.5	4.2
2001	71.3	21.9	2.7	4.0
2002	70.2	20.6	4.5	4.7
2003	70.2	20.6	4.5	4.7
2004	68.1	21.5	5.0	5.4
2005	69.2	18.1	5.9	6.8
2006	69.2	18.1	5.9	6.8
2007	68.0	17.8	6.7	7.6
2008	67.8	15.8	8.1	8.4
2009	68.3	13.7	8.0	10.0
2010	68.7	12.3	7.9	11.2

Source: calculation by the author

Conclusions and policy implications: On the basis of analyzing the rural residents' income growth and distribution and poverty reduction, this paper further demonstrates the situation and sources of rural income inequality by means of model analysis and Gini coefficient and its decomposition method and has come to the following conclusions:

Firstly, per capita net income of rural households since 2000 shows an uptrend in fluctuation, the situation of the income distribution in rural areas has not been

significantly deteriorated, and the rural Gini coefficient has maintained 0.36 according to official statistics. In this period, the income growth rate is higher than the poverty reduction rate. Based on the latest poverty line, however, there are still a large number of poverty-stricken people and the task of poverty reduction is still arduous.

Secondly, the empirical model analysis results show that the income growth of rural residents in China since 2000 still plays a significantly positive role in reducing rural poverty, but the negative role of distribution of income in reducing poverty is also obvious. In this period, income growth is conducive to poverty reduction, but the deterioration of distribution of income will partially offset the poverty reduction effects of income growth. The marginal rate of substitution of income growth and income distribution elasticity is 0.55. In other words, the increase in poverty incidence caused by the increase of one percentage point in the Gini coefficient needs to be offset by an increase of 0.55 percentage points in per capita net income.

Thirdly, based on the provincial income data, the Gini coefficient calculation results showed that the degree of income inequality in rural areas since 2000 is significantly higher than that in urban areas, and the improvement of income inequality in rural areas lags behind that in urban areas.

Finally, according to the decomposition and analysis of the Gini coefficient, wage income is the main factor affecting the income inequality in rural areas since 2000, followed by family operating income. The rate of contribution of property income and transfer income is relatively low. However, seen from the trend of changes in rate of contribution, the increasing rate of contribution of transfer income to rural income inequality is worth noting and further research needs to be conducted on this issue.

The above conclusions have the following implications on China's pro-poor policies and the policy evaluation. First of all, while improving farmers' living standards to reduce poverty by various measures, the government should take into account the possible negative role of the increasing inequality. If we only emphasize economic growth and ignore income inequality, such economic growth is likely to weaken the poverty reduction effect and even increase poverty. Secondly, we also need to attach importance to the income inequality in rural areas. The extent of income inequality in rural areas is even higher than that in urban areas. While implementing a series of pro-poor and agriculture-supporting policies to improve the situation of income distribution and control income inequality, we need to conduct assessment of the impacts of these agriculture-benefiting policies on various groups among rural residents. For example, we should take into account whether the poverty alleviation resources have been given to the rural poor and whether they really benefit the poor. Thirdly, as wage income is the main factor affecting rural income inequality, in the development of employment promotion policies, we should constantly improve the participation of the poor and make the poor involved in more economic activities and share the fruits of economic growth. Of course, due to the restrictions of access to human capital and market information of the poor, the government should increase investment in education, especially compulsory education in poverty-stricken areas to improve the education conditions and the quality of education so as to create conditions for young people in poor areas to break the vicious circle of poverty. At the same time, we should continue to increase fixed asset investment in rural areas and provide organized professional intermediary services to enhance the labor participation of poverty-stricken rural households.

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