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Why Does the Poor Become Poorer? An Empirical Study on Income Growth, Inequality and Poverty Reduction in Rural China Lerong Yu, Xiaoyun Li

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Based on the provincial data on annual per capita net income, inequality and poverty incidence since 2000, this paper attempts to analyze the impacts of the income growth and distribution on poverty reduction in rural China and further explores changes and causes of rural income inequality by means of econometric model and Gini coefficient decomposition. The results show that the income growth of China's peasants 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 wage and salary is one of the most important determinants which causes rural income inequality, followed by the income from household operations, but the ratio of contribution of the income from property and transfer to inequality is relatively low.



1. Introduction

The relationships among growth, inequality and poverty have been central issues in development economics ((Zaman et al., 2010a, Shorrocks and van der Hoeven, 2004). The debate center on whether there is a trade-off between growth and inequality, as exemplified by Kuznets's inverted U-hypothesis that suggests that inequality rises during the initial stages of development and then declines. Correspondingly, the roles of growth and inequality simultaneously playing in the poverty reduction have been examined in many studies. Unsurprisingly, these studies have confirmed that there is a strong correlation among these variables. However, the linkages among poverty, growth and inequality are highly complex (Zaman et al., 2012a). On one hand, a great number of empirical findings confirmed that economic growth is strongly associated with poverty reduction and accounts for a large share of the variance in performance against poverty (Ravallion and Chen 1997&2004; Dollar and Kraay 2002). However economic growth is not sufficient for poverty reduction. Other factors such as the nature, pattern and sources of growth, bad governance and great population influence whether the growth is more or less poverty reducing (Zaman et al., 2011b). Among which, equity is seen to be not only of intrinsic importance but also of instrumental importance through its impact on the rate at which economic growth converts into poverty reduction (Kalwij and Verschoor, 2007).

Over three decades since reform and opening up, China has made remarkable achievements in rural economic development and rural poverty reduction. It is showed that per capita net income of rural households increased from 191.3 Yuan in 1980 to 1,313.5 Yuan (1980 price) in 2010, with an average annual growth of 6.6%. In the context of rapid economic growth, hundreds of millions of rural poor people have moved out of poverty and the incidence of poverty 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 progress 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.

After the 1990s, along with the slowing down of poverty reduction in rural areas, China's income inequality has been rising. One 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 Zhao, 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 share benefits of economic growth proportionally. Basically, 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 process of 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 instance, 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 (Zuo et al., 2009). In this context, what impacts income growth and rural income distribution will have on the rural poverty reduction in the new century and how policy makers should promote further the rural poverty reduction all need to be answered urgently in the new century. In view of that, this paper will explore three issues based on the relevant data of the National Bureau of Statistics since 2000 following (i) what is the relationship between rural income growth and distribution and rural poverty reduction from a macro perspective and (ii) whether and how the poor benefit from the economic growth in rural areas since 2000 based on the analysis on provincial panel data; (iii)What is the status of income distribution in rural areas and what are determinants of income inequality.

The rest of the paper proceeds as follows. The next section introduces the data we used and puts forward the decomposition method and our econometric models. Section 3 examines the overall pattern and trend of income growth and distribution and poverty dynamics in rural China. We then discuss and explain estimation and decomposition results in Section 4 and offer concluding remarks and policy implications in Section5.

2. Data and Methodology

2.1 Data

The data used in this paper has two parts, one is national data and the other one is provincial data. Sources of the national data include per capita net income of farmers from China Statistical Yearbook, rural Gini coefficient from the China Agricultural Yearbook (year 2008) and the incidence of rural poverty from China Rural Poverty Monitoring Report (year 2010). The provincial data are mainly from China Statistical Yearbook and the data on the poverty incidence and Gini coefficient are provided by the Department of Rural Socio-Economic Survey of the National Bureau of Statistics. The time range of provincial data is from 2000 to 2008 including 2000. Why this paper only uses the data by 2008, one of reasons rests with changes of poverty line. Since 2008, Chinese government has continuously improved the standard of poverty line, so it is hard to obtain consistent official statistical data on poverty incidence after 2008. Besides, the provincial rural residents' income consists of four parts of income, income from wages and salaries, family operations, property and transfer respectively. The involved provincial urban residents' income refers to per capita disposable income.

2.2 Empirical Methodology

The empirical methodology of this paper adopts has two aspects. On one hand, econometric model is appropriate when we explain the relationship between income growth, distribution and poverty reduction. On the other hand, the Gini coefficient decomposition is reasonable when we consider the status of income distribution and causes of income inequality.

2.2.1. Econometric Model

In this paper, we mainly discuss two sorts of elasticity, the elasticity of poverty to income growth and the elasticity of poverty with respect to income distribution. Elasticity analysis not only helps make clear the relationship between the three variables, but also helps to understand the sensitivity of the poverty incidence to changes of economic growth and income distribution. Base on the models of previous studies proposed, we set the econometric model as follows (Yu et al., 2008).

 $lgH_{it} = \beta_0 + \beta_1 lgINC_{it} + \beta_2 lgGINI_{it} + \alpha_i + \gamma Year_t + \epsilon_{it}$

Where, character i represents the province. Character t represents the date. Nine years from 2000 to 2008 are involved. H_{it} is poverty incidence of number i province in number t year, INC_{it} is the rural per capita net income of number i province in number t year, and $GINI_{it}$ refers to the Gini coefficient of number i province in number t year. Ig is the logarithm of corresponding variables. Logarithmic form setting itself can also appropriately eliminate the dynamic panel trend. Based on the above model specification, the economic implication of β_1 is the percentage 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. $\beta 2$ here refers to the percentage 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 elasticity of poverty. The absolute value of β_2/β_1 is the marginal rate of substitution of two elasticity coefficients. It illustrates 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 regression. A dynamic panel data 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 factors of a province. The other part refers to unobservable factors changing over time and with provinces. Among which, the unobservable factors changing over 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 independent variable Gini coefficient is a simultaneous phenomenon with the independent variable. If it is, we can use instrumental variable to deal with endogeneity; if not, we do not need to consider any problem of endogeneity.

2.2.2. Gini Coefficient and Decomposition.

As a 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 equal. The bigger the Gini coefficient is, the higher the degree of inequality is. Furthermore, Gini coefficient decomposition can also help to understand the causes of income inequality. For example, if the per capita income (\mathbf{m}_i) of number i family has F sources, the Gini coefficient can also 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 incomes to the income inequality.

3. Pattern and Trend of Income Growth, Distribution and Poverty Dynamics

Generally per capita net income of rural households since 2000 shows an uptrend in fluctuation. The status of the income distribution in rural areas has not been significantly deteriorated, and the rural Gini coefficient has maintained at the level of 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 curve of income growth and the curve of Gini coefficient changes represent the trend of simultaneously change.

Despite a substantial reduction in rural poverty since 2000, there are still a large number of poverty-stricken people. Based on the poverty line set in 2008, the rural poor declined 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). According to the latest poverty line, 2300 Yuan per year, the number of the people living below the poverty line will be much bigger, reaching 120 million or so. It means that China still has a large poverty-stricken population and the task of poverty reduction is still arduous.

Basically, the income growth rate is higher than the poverty reduction rate in study period and the status of income distribution does not show a significant trend of deterioration. However to what extent which income distribution affecting poverty reduction is still not clear though we see the negative correlation between income growth and poverty reduction by means of above descriptive analysis. So next we will use the econometric model to explain the direction and extent of income growth and distribution influencing poverty reduction based on the provincial panel data.

4. Empirical Analysis Results

4.1 Hausman Test

We mainly use the Hausman test to determine fixed effect model or random effect model will be used in the paper. According to test results of Stata10(chi2 = 9.91, Prob> chi2 = 0.0193), it means that we can reject the null hypothesis and accept the alternative hypothesis at the significant level of 5%, and a fixed effects model should be used.

Similarly, we also conduct the Hausman test dealing with the endogeneity that may exist in $lgGINI_{it}$ mentioned earlier. The null hypothesis here is that the parameters difference between with instrumental variable and without instrumental variable is not systematic. If the null hypothesis is true, then the model does not have endogeneity and no instrumental variables need to be used. In this paper we use the lagged variables of $lgGINI_{it}$ as instrumental variable in the test. The test results are like this, chi2 = 3.57, Prob> chi2 = 0.1678. It means that the null hypothesis is accepted and there is no endogeneity in the model and then no instrumental variables need to be used.

4.2 Results of Econometric Model

The results of regression are listed in the Table1. We are mainly concerned about the regression coefficients of two independent variables, per capita net income and the Gini coefficient. Among them, the coefficient of per capita net income is negative, indicating the income growth is favourable 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 poverty to income growth is -2.42 and the elasticity of poverty to income distribution 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.

The results further 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 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' (*San Nong* Issues) and developed a series of agriculture-benefiting policies. For instance, the government cancelled the agricultural tax and provided direct grain subsidy; implemented the compulsory education policy and did not charge the tuition fees of normal university students; conducted the new 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 redistribution of income. However, the effectiveness and poverty reduction effects of these agriculture-supporting policies still need to be studied and evaluated.

4.3 Gini Coefficient and Its Decomposition Results

We also uses provincial rural and urban income data to calculate the rural and urban Gini coefficient and, on this basis, conduct comparative analysis. 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. 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.

Another thing this paper attempts to explore is to find the causes of rural income inequality through decomposing the rural Gini coefficient from the perspective of sources of income. Table 3 gives the rates of contribution of above 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 kinds of 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 real 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 provided to protect the vulnerable and ensure that farmers can share the outcomes of social development equitably, but the result in this paper shows that this political objective has not been achieved.

Thirdly, if we further explore why the transfer income does not achive the goal of policy, it seems that there are some problems with transfer payments from the government. One observation is poorer rural households have not received more transfer payments from the government, which is just the opposite of policy's goal. Taking the data on the income of grouping farmers as an example, it is showed from Table 4 that the transfer income non-poor gained from the government is five times of that of non-poor on average. Even in 2008, when the gap was the smallest, the ratio of transfer income of non-poor to the poor also reached 2.8:1. Therefore it indicates that transfer payments from the government mainly flow to the non-poor.

5. Conclusions and Policy Implications

China's success against poverty since the reforms that began in 1978 is remarkable. But a unignorable fact is the wide gap exists the poor and the rich, the coastal areas and middle and west areas as well as the different industries. Particularly the internal income difference of rural residents has been slowly rising, which is unfavorable to reduce rural poverty. We have presented results using the econometric model and Gini coefficient to address the macro economic question of how much of the variation of rural poverty reduction is explained by income growth and distribution. Furthermore, we demonstrates the status of inequality in rural and urban areas and contributions of various income to rural inequality for the sake of explaining the causes of inequality.

One key finding is that 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. 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. It is evident that when policy makers emphasize the importance of economic growth, the reform on income distribution should be also considered in case Growth Without Development takes place.

Gini coefficient results shows that the extent 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. Furthermore, a decompositon analysis based on income data illustrates that wage income is the main factor affecting the income inequality in rural areas since 2000, followed by family operating income. One observation which helps to explain why the transfer income does not work very well to reduce poverty is that non-poor people gain more transfer income from the government than the poor in rural areas. For example, the transfer income non-poor gained from the government is five times of that of non-poor on average, which clearly shows that the goal of public policy on transfer income is far from the original expection.

Hence, while implementing a series of pro-poor and agriculture-supporting policies to improve the situation of income distribution and reduce rural poverty, it is of importance to evaluate the impacts of these kinds of agriculture development policies on various groups among rural residents. For instance, we should take into account whether public resources which aim at reducing poverty flow to the rural poor and whether they really benefit the poor. Cosidering the importance of wage income, the poor should have more access to get invovled in economic activities and equally benefit from the economic growth. One way the government may consider is to increase the public investment in education, by which the poor could, to some extent, get the capacity of moving out from poverty. More importantly, the young people from poor family probably get rid of the curse of vicious circle of poverty and finally get rich.

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Tables and Figures



Figure 1 Growth/decline rate of income, inequality and the incidence of poverty since 2000 Unit: %

Source: calculation based on statistical data

Independent variables	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)
R ² _within	0.685
R ² _between	0.931
R ² _overall	0.870

Table 1 Regression results about the relationship between income growth, inequality and poverty

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

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

Table 2 Calculation results of rural and uban Gini coefficient

Source: calculation by the author

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

Table 3 Rates of contribution of various source of income to inequality Unit: %

Source: calculation by the author

Table 4 Transfer payments from the government by grouping farmers Unit: Yuan

Year	The Poor	Non-poor	Ratio of the non-poor and the poor
2000	4.8	39.9	8.3
2001	6.6	46.7	7.1
2002	5.7	54	9.5
2003	12	52.9	4.4
2004	20.2	73.8	3.7
2005	26.1	96.2	3.7
2006	48.5	123.9	2.6
2007	53.7	163.3	3.0
2008	91.7	258.7	2.8

Note: Low-income rural households were regarded as poverty-stricken rural households after the new poverty line was adopted in 2008. Source: Department of Rural & Social and Economic Survey of National Bureau of Statistics

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