Chapter 5
The Decomposition of Income Growth and Income Inequality on Rural Poverty

This[1] chapter discusses the changes in China's rural poverty index since the reform and opening up, especially the impact of income growth and distribution on rural poverty. Although relevant researches have been done, few focus on the reasons why different FGT indexes under different poverty lines can be decomposed to reach different conclusions. Also, the FGT index only presents a one-sided picture of the poverty situation, while a country's overall poverty is complex and varies with one or several main one-dimensional poverty factors in different periods. In this regard, we try to go one step further to find out which FGT index or indexes would have a greater impact on poverty in different periods by Shapley decomposition method. This chapter also examines the factors that impede the trickle-down effect.

1 Dynamic Changes of Growth, Inequality and Poverty in Rural China

As mentioned in Chap. 1, China's poverty alleviation work has gone through the following stages since the reform and opening up: Institutional reform (1978–1985), development-oriented poverty alleviation (1986–1993), "National Eight-Seven Poverty Reduction Plan" period (1994–2000), and the start-up phase of "New Century Poverty Alleviation Plan" (2001–2010).[2] For various reasons, the poverty indexes were not declining all the time, despite the fact that China's economy has

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[1] This chapter is referred to: Shen, The Impact of Economic Growth and Inequality on Rural Poverty [J]. The Journal of Quantitative and Technical Economics, 2012 (8): 19–34.

[2] The process of poverty alleviation can be summarized as follows: General poverty reduction under the planned economic system (1949–1977), large-scale poverty reduction under institutional reforms (1978–1985), development-oriented poverty reduction during economic booms (1985–2000), and poverty reduction in the course of building a well-off society in an all-around way (2001-present), referred to Zhang, *Evolution of China's Poverty Alleviation and Development Policy (1949–2005)*, China Financial and Economic Publishing House.

maintained a high growth rate of over 8%. Currently, China is in a new era of poverty alleviation (2011–2020). Studies on the evolution of rural poverty and the deep-rooted causes of changes in the past decade can help find out the crux of rural poverty, which is of practical significance to determine the future poverty alleviation work and to understand the key tasks of poverty alleviation in the next stage. The research on rural poverty in this chapter is divided into two parts: The first part is a retrospective study of the rural income growth, income inequality and poverty changes in China during the first 20 years of reform and opening up, and the following part studies the changes in rural poverty index in the first ten years in the new century.

1.1   Stage 1: 1980–2000

Since the reform and opening up, rural residents' income has increased significantly with the implementation of the household contract responsibility system with remuneration linked to output and the national economic development. From 1980 to 2000, the income of rural residents increased by 12.5% annually, the Gini coefficient of income inequality changed from 0.251 to 0.357, representing an average annual increase of 1.7%, and the poverty headcount ratio (below the official absolute poverty line) dropped from 25.1 to 4.4%, an average annual decrease of 8%.

Table 1 summarizes the income distribution characteristics, inequality and poverty level of Chinese rural households from 1980 to 2000.[3] Statistics show that in 1980, the average income of Chinese rural residents was only RMB192, and the lowest 1% of the population earned about RMB50 and the highest 1% of the population earned RMB465 per year. In 1990, the average income of Chinese rural residents rose to RMB685, 3.6 times that of a decade ago. The average income of the lowest 1% of the population was RMB168, and that of the lowest 5% of the population was RMB251, a rise of 2.5 times and 2.4 times compared with a decade ago, respectively; the average income of the highest 5 and 1% of the population was RMB1449 and RMB2179, respectively, increasing by 2.9 times and 3.6 times compared with a decade ago. In 2000, the average income of rural households further increased to RBM2037, 3.4 times that of a decade ago and 12 times that of two decades ago. In particular, the average income of the lowest 5% of the population was RB 614, 2.5 times that of residents in the same bracket 10 years ago and 8.1 times that of resident in the same bracket 20 years ago; the average income of the top 5% was RBM5,319, 3.7 times that of residents in the same bracket 10 years ago and 14.0 times that of residents in the same bracket 20 years ago. These changes show that the income of rural households of all levels has increased rapidly, but the income growth rate of poor people is significantly lower than that of rich people and the income gap between the rich and the poor is widening.

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[3] To facilitate comparison with actual statistics, we use nominal values instead of data of 1980 for statistics.

Table 1 Income of rural residents in China and distribution characteristics: 1980–2000

Year	1980	1985	1990	1995	2000
Mean	192	382	685	1578	2307
Fractile: 1%	50	81	168	259	297
5%	76	140	251	468	615
10%	91	175	306	605	811
25%	130	248	417	881	1233
50%	177	350	584	1295	1883
75%	241	480	829	1930	2823
90%	310	636	1170	2806	4164
95%	367	741	1449	3563	5319
99%	465	950	2179	5760	9048
Inequality index					
Relative mean deviation	0.178	0.191	0.213	0.242	0.253
Coefficient of variation	0.477	0.529	0.626	0.735	0.793
Logarithmic standard deviation	0.468	0.519	0.540	0.639	0.695
Gini coefficient	0.251	0.271	0.300	0.340	0.357
Mehran index	0.353	0.380	0.406	0.456	0.478
Piesch index	0.201	0.217	0.247	0.282	0.296
Kakwani index	0.058	0.067	0.081	0.103	0.113
Theil index (GE (1))	0.103	0.123	0.155	0.203	0.227
Mean log deviation GE (0))	0.106	0.128	0.149	0.200	0.227
Entropy index (GE (−1))	0.123	0.159	0.173	0.273	0.382
Poverty index					
Below the absolute poverty line: H-index	0.253	0.161	0.094	0.070	0.044
PG index	0.061	0.041	0.020	0.020	0.012
SPG index	0.975	0.687	0.310	0.204	0.112
Below the low-income line: H-index	0.975	0.687	0.310	0.204	0.112
PG index	0.531	0.247	0.080	0.058	0.029
SPG index	0.324	0.118	0.031	0.025	0.013

Data Source China Yearbooks of Household Survey, collated by the author.
Note ① The poverty index data are all multiplied by 100 on the basis of original data for viewing purposes; ② All the calculated results have passed the hypothesis testing at the 5% level of significance.

The latter part of Table 1 lists the changes in the inequality index of rural households during this period. Take the Gini coefficient as an example: In 1980, the Gini coefficient for China's rural areas was only 0.25, indicating a very equal distribution. Then the Gini coefficient climbed to 0.27 in 1985, 0.30 in 1990, 0.34 in 1995, and exceeded 0.36 (0.357) in 2000. Despite a widening gap, the income inequality within China's rural areas maintained within a reasonable range during this period. Most

notably, in the early decade of China's reform and opening up, from the perspective of economic efficiency, a moderate polarization protected the laboring population's incentives to produce and contributed to the sustained growth of economy. The growth and moderate polarization during that period had a mutual positive effect on each other.

Changes in rural poverty in the same period were also analyzed. In the early years of reform and opening up (1980), the rural poverty headcount ratio (H-index) was 25%, meaning that one quarter of the rural population lived below the absolute poverty line.[4] Poverty during that period was marked by absoluteness and universality. In the later period, the poverty-stricken population decreased significantly. 42% of the population living below the absolute poverty line was lifted out of poverty in 1980–1985. Such a dramatic change reflects the remarkable effectiveness of the emancipation of productive forces on income increase of rural residents in China in the early stage of reform and opening up. The poverty headcount ratio varies with the poverty line. By the absolute poverty line, from 1980 to 2000, the poverty headcount ratio dropped from 16.1 to 4.4%, and the number of the poor population declined from 220 to 23 million, with an average of 9.85 million people left out of poverty annually; by a higher poverty line, such as the low-income line, H-index dropped from 68.7% in 1985 to 11.2% in 2000, and the number of people living below the line was reduced from more than 500 million to 60 million in the same period.[5] The poverty gap index (PG index) showed a similar trend to H-index, but for SPG index, its variation was special. By the absolute poverty line, the absolute level of SPG index was higher than that of H-index and PG index, and its downward trend was more pronounced; by the low-income line, the change of SPG index was smaller than that of the other two poverty indexes in both the absolute level and the changing trend. According to the definition and characteristics of different FGT indexes, more weight for the SPG index is given to the people living in extreme poverty, and a higher index result means that if measured by the low-income line, the number of people with incomes close to this threshold is relatively small, meaning that there are a great number of people with a very low income. This is of course understandable and reasonable, because in the early years of reform and opening up, the living standard of rural residents was generally low, while the low-income line deflated by price index was high.

Further, the SST index decomposition method was used to detail changes in poverty over the period, as shown in Fig. 1. In the figure, the horizontal axis represents the year, the vertical axis represents $\Delta \ln(SST)$ and its decomposition results, and the column length represents $\Delta \ln(SST)$ or the numerical value of its decomposition results. Values above the zero graduation line are positive and those below

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[4] According to relevant data, at the beginning of 1980, the per capita calorie intake of rural residents was less than 2100 kcal, lower than the minimum nutrition level required for maintaining normal human function during that period. What's more, in the previous two decades (1967–1978), the food consumption of rural residents was at zero growth.

[5] We reckon that both the low-income line and the poverty line of "USD1 per person per day" are relatively high for the rural poverty situation in the early years of reform and opening up. Therefore, we use it as a reference rather than as the main basis for judging.
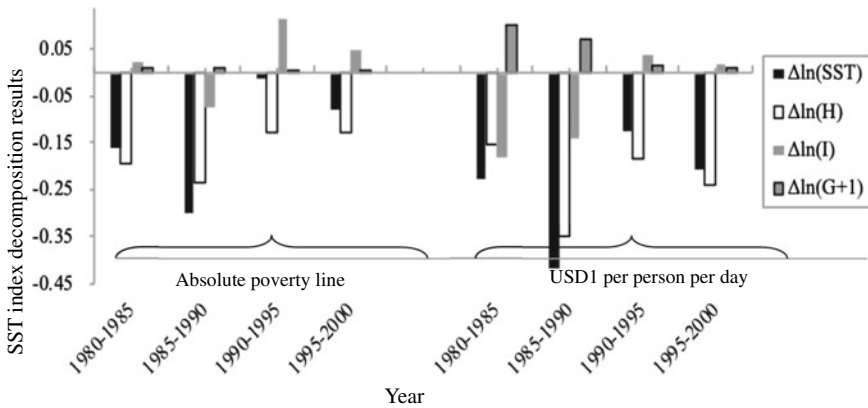
Fig. 1 SST Index decomposition results: 1980–2000. *Data Source China Yearbooks of Household Survey*, collated by the author. *Note* ① All the structural data have passed the hypothesis testing at the 5% level of significance; ② Compared with other influencing factors, the variation of $\Delta \ln(G + 1)$ is small and not obvious in the figure, so it is specially marked

it are negative. For example, a $\Delta\ln(SST)$ column below zero on the vertical axis implies a reduction in poverty compared with the previous year, or on the contrary if the column is above zero; a $\Delta\ln(l)$ column above zero indicates that the change in poverty pulls $\Delta\ln(SST)$ upward, indicating a negative effect on poverty reduction, or on the contrary if the column is above zero. In addition, the longer the column is, the greater the change (or influence) resulted from the corresponding factor is.

First, the interannual change of $\Delta\ln(G + 1)$ was analyzed. $\Delta\ln(G + 1)$ is basically positive, indicating that the income polarization within the poor population was intensifying gradually, but in most years the variation range was very small or even negligible. But it doesn't mean that the influence of rural income inequality on poverty is negligible. The reason for this variation is that SST index measures the income inequality with the Gini coefficient of the poverty gap rate, and this mathematical approach weakens the economic implications of numerical results. Second, the intertemporal changes in the logarithmic form of the other three indexes were studied. On the whole, negative values of $\Delta\ln(SST)$ implies continuously decreasing SST index and indicates a continuous decline of China's comprehensive poverty level. Columns of different lengths show that the SST index changes irregularly. Generally speaking, the poverty headcount ratio (H-index) is the most important factor for reducing the SST index, and the reduction in the comprehensive poverty in China's rural areas mainly owes to the decrease in the number of the poor. The poverty gap rate (I-index) is another major factor for reducing the SST index, but has an adverse effect on the SST index in individual years. For example, in periods 1980–1985, 1990–1995, and 1995–2000 when the absolute poverty line was adopted and in 1990 –1995 and 1995–2000 when the low-income line was implemented, $\Delta\ln(I)$ showed

positive changes. The widening poverty gap was likely due to the emergence or increase in number of people living in extreme poverty. Albeit a small change, we should pay attention to it.

1.2   Stage 2: 2000–2010

Similar to the previous analysis, Table 2 shows the income distribution characteristics, income inequality, and poverty levels of China's rural residents in the new century. On the whole, the rural residents' income was increasing, but the growth rate was slowing down and tended to be stable.[6] It is estimated that from 2001 to 2010, the average annual income of rural residents increased by 9.4%, the Gini coefficient of income inequality rose from 0.363 to 0.376, with an average annual growth rate of 0.4%, and the poverty headcount ratio (below the official absolute poverty line) dropped from 5.2 to 2.9%, with an average annual decline of 5.7%.

Changes in the data show that the growth rate of the income of the top 5% of rural households was generally above average, and the income of the top 1% was fast before 2003, then slowed down, and even showed a negative growth in 2005–2006; the average growth rate of the income of the lowest 5% and the lowest 10% of rural households was slightly below average. Therefore, during this period, the income inequality of China's rural poor population grew in fluctuation. Table 2 shows that the rural Gini coefficient rose from 0.363 in 2001 to 0.379 in 2003, dropped slightly to 0.367 in 2007, then hovered between 0.365 and 0.375, and bounced slightly in 2009 and 2010. As other inequality indexes show a similar trend, we'll not repeat them here.[7]

In the new century, the changing trend of the poverty index remains unchanged: H-index dropped slowly, and PG index and SPG index fluctuated synchronously. The degree of variation in the poverty index is affected by the choice of poverty line: If a low poverty line is adopted, the poverty index movement is minor; if a higher poverty line is adopted, the poverty index movement is more significant, but whether it is goes upward or downward is not affected. The three indexes showed a remarkable movement in this period: As the total number of the poverty-stricken population continued to decline, the PG index that measures the amount of poverty alleviation

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[6] It is calculated that the average income growth rate of rural households in the ten years was 5.5%, 5.4%, 11.7%, 11.1%, 9.7%, 14.9%, 15.4%, 8.1% and 13.9% respectively. The average income growth rate of the rural population at the lowest 5% and the lowest 10% was slightly below average, at 3.2%, 1.9%, 15.5%, 6.6%, 8.5%, 13.3%, 13.9%, 3.0%, 13.9%, and 2.1%, 3.5%, 15.8%, 8.4%, 9.3%, 14.6%, 13.5%, 3.8%, 13.9%, respectively. The average income of residents in the highest income bracket grew by 6.5%, 7.0%, 9.9%, 17.4%, 10.7%, 11.5%, 10.6%, 17.3%, 13.9%, and 9.1%, 8.0%, 7.1%, 6.3%, −6.1%, 10.2%, 9.0%, 28.2%, 13.9%, respectively. According to NBS data, the income growth rate of residents in the corresponding bracket in 2010 was 13.9%. We have reservations about this calculation result.

[7] The result is slightly different from the rural Gini coefficient published by the National Bureau of Statistics. For details, please refer to Chap. 1.

Table 2 Income of rural residents in China and distribution characteristics: 2001–2010

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mean	2422	2555	2694	3009	3342	3666	4214	4864	5258	5991
Fractile: 1%	281	314	295	398	314	401	447	463	423	482
5%	633	653	665	768	819	889	1008	1148	1183	1348
10%	836	854	884	1024	1110	1213	1391	1578	1638	1867
25%	1279	1306	1363	1580	1724	1888	2172	2485	2628	2995
50%	1955	2027	2128	2413	2672	2936	3363	3919	4192	4776
75%	2951	3120	3267	3664	4093	4527	5414	6607	6458	7359
90%	4399	4711	4966	5480	6384	7542	8704	9715	10,595	12,073
95%	5673	6044	6465	7106	8341	9237	10,298	11,385	13,358	15,222
99%	9744	10,632	11,478	12,290	13,063	12,269	13,516	14,726	18,878	21,511
Inequality index										
Relative mean deviation	0.258	0.266	0.269	0.260	0.265	0.264	0.265	0.265	0.270	0.270
Coefficient of variation	0.816	0.859	0.875	0.825	0.779	0.710	0.696	0.672	0.742	0.742
Logarithmic standard deviation	0.734	0.736	0.763	0.738	0.836	0.793	0.800	0.833	0.874	0.874
Gini coefficient	0.363	0.374	0.379	0.367	0.371	0.366	0.365	0.360	0.376	0.376
Mehran index	0.485	0.496	0.502	0.488	0.496	0.495	0.496	0.495	0.507	0.507
Piesch index	0.303	0.313	0.317	0.306	0.309	0.302	0.299	0.293	0.310	0.310
Kakwani index	0.117	0.123	0.126	0.119	0.121	0.117	0.117	0.114	0.124	0.124
Theil index (GE (1))	0.237	0.252	0.260	0.241	0.238	0.220	0.217	0.209	0.235	0.235
Mean log deviation GE (0))	0.241	0.251	0.261	0.243	0.264	0.249	0.249	0.252	0.275	0.275
Entropy index (GE (-1))	0.562	0.524	0.666	0.742	2.644	1.585	1.696	2.538	3.979	3.979

(continued)

Table 2 (continued)

| Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Poverty index										
Below the absolute poverty line: H-index	5.20	4.95	4.45	4.50	3.45	3.25	2.80	2.90	– [8]	–
PG index	1.63	1.66	1.44	1.56	1.13	1.36	1.08	1.11	–	–
SPG index	11.70	11.10	10.45	10.00	8.05	7.00	6.00	5.05	–	–
Below the low-income line: H-index	11.70	11.10	10.45	10.00	8.05	7.00	6.00	5.05	4.35	4.00
PG index	3.48	3.37	3.07	3.09	2.37	2.38	1.98	1.74	1.64	1.58
SPG index	1.66	1.70	1.50	1.59	1.17	1.38	1.10	1.01	1.04	1.06
Below USD1/person/day: H-index	6.30	5.85	5.45	5.15	3.55	3.20	2.65	2.05	1.70	1.60
PG index	1.93	1.91	1.68	1.74	1.15	1.34	1.04	0.89	0.90	0.94
SPG index	0.99	1.08	0.93	1.01	0.67	0.94	0.70	0.65	0.71	0.77

Data Source China Yearbooks of Household Survey, collated by the author

Note ① The poverty index data are all multiplied by 100 on the basis of original data for viewing purposes; ② All the calculated results have passed the hypothesis testing at the 5% level of significance.

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[8] It should be pointed out that, in 2008, China unified the low-income line and the absolute poverty line and the absolute poverty line. So under the absolute poverty line, we remove the corresponding FGT index change point. For their changing trend, please refer to the calculation results under the low-income line.
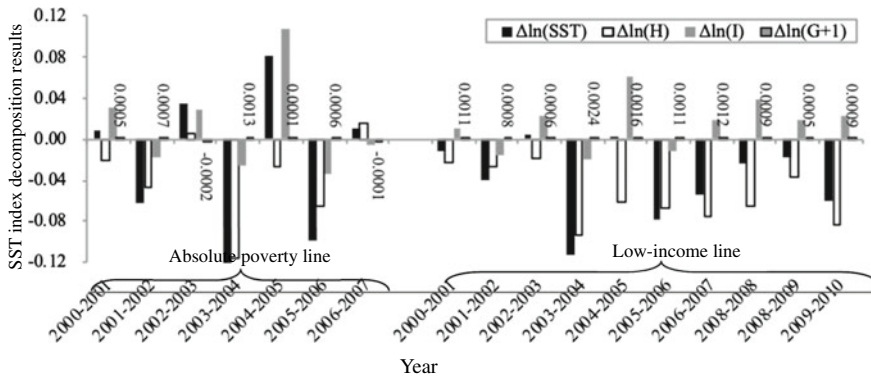
Fig. 2 SST Index decomposition: 2000–2010, *Data Source*: *China Yearbooks of Rural Household Survey*, collated by the author. *Note* ① All the structural data have passed the hypothesis testing at the 5% level of significance; ② Compared with other influencing factors, the variation of △ ln($G + 1$) is small and is not obvious in the figure, so it is specially marked. ③ The above decomposition results are based on the data in Table 1

funds and the SPG index that indicates the income inequality within the poverty population dropped slightly and even increased in individual years, indicating that most of the existing poverty-stricken people were easily to be left out of poverty, and that the poverty-stricken groups most in need of support were not effectively assisted, resulting in a decline in their relative (or even absolute) living standards. In different periods, PG, SPG and SST indexes changed irregularly but in a consistently upward or downward tendency in the same year, which implies that the three indexes may be affected by a specific factor, namely, the adverse impact of changes in income inequality on poverty. Also, similar to the previous stage, the SPG index measured under the absolute poverty line was at its highest level, opposite to it measured under the low-income line. This shows that the income of the poor living above the absolute poverty line but below the low-income line grew faster, and that of the poorest people grew at a less positive rate.

We also present the graphical decomposition results of SST index (see Fig. 2) to further analyze the poverty dynamics over this period. First, short △ ln($G + 1$) columns indicate that inequality within the poor has a minor effect on SST index. Second, whatever poverty line is selected, △ ln(H) columns are basically negative and long (except the results for 2002–2003 and 2006–2007 based on the official absolute poverty line), indicating that the reduction in the number of poverty-stricken population is the primary driving force for poverty reduction; △ ln(I) has a smaller impact on poverty change, and its impact is alternately positive or negative. We also found that whether △ ln(I) is positive or negative is robust and independent from the impact of the poverty line. Given all this, we've drawn a poverty box for the year 2003, 2006 and 2009 for the rural areas, as shown in Fig. 3.[9] The poverty box

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[9] The figure does not show the calculation results of the official poverty line in 2009, because after the two standards were unified in 2008, the results are not comparable. Since the Poverty Box based
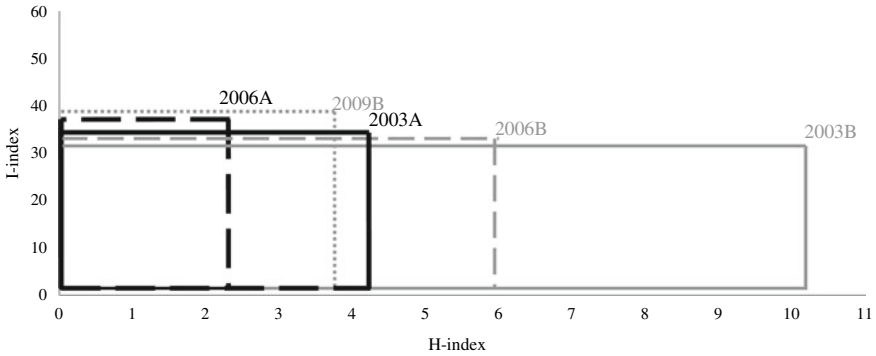
Fig. 3 Poverty box: 2003, 2006 and 2009. *Data Source China Yearbooks of Rural Household Survey*, collated by the author. *Note* "A" represents the calculation results of the official poverty line, and "B" represents the calculation results of the low-income line. For instance, "2003A" represents "Poverty box for the year 2003 under the official poverty line"

was proposed by Osberg (2000), and the principle is: SST index can be expressed approximately as the product of H-index and I-index, considering the small rate of change of G. As shown in Fig. 3, despite the expanding I-index, the box size is significantly shrunk due to the slumped H-index. And whichever poverty line is selected, as a result of the decrease in the number of poverty-stricken people, SST index continuously declines. In the figure, size of the poverty box is reduced. This finding is consistent with what Xu and Osberg (1999) have found by decomposing micro-data of Canada, the United States, some European countries and China earlier years. To some extent, the structure of poverty is subject to the change of income inequality, which is an inherent law.

To sum up, H-index and I-index are the main affecting factors to poverty level, and the impact of the former is stronger. The continuous decline of H-index plays a positive role in reducing poverty, while the growing I-index's role is opposite. Although the rural population living below the specific poverty line was declining, the poverty level and the income inequality within the rural population were constantly expanding. As the poverty line was raised, the annual variation of poverty indexes was smaller, a trend indicating that there were more people living in extreme poverty and less in moderate poverty, which was the main sticking point that has hindered the poverty alleviation in China in the last decade. It is fair to say that there is still a long way to go to reduce rural poverty and lift the poorest out of poverty.

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on "USD1 per person per day" has a consistent trend with that under the first two poverty lines in the three-year period, it is presented in this paper.

1.3   Stage 3: 2010 to Present

Since the beginning of the new century, the poverty-stricken households' income has been growing in speed, the Gini coefficient for the rural areas has been maintained at a high level, and remarkable achievements in targeted poverty alleviation have been made. According to Fig. 4, the Gini coefficient for the rural areas declines, mainly due to the increase in the income of the middle-income group. But the gap between the lowest-income group and other income groups has widened since the beginning of 2010. The rural Gini coefficients were 0.378, 0.390, 0.387 and 0.386 respectively in 2010, 2011, 2012 and 2013,[10] according to data from the National Bureau of Statistics, and 0.372 and 0.369 in 2014 and 2015 respectively,[11] according to survey data of China rural households. The Gini coefficient showed a downward trend. There are different findings based on the in-depth research on the gap between the low-income group and other income groups. Table 3 lists the inequality coefficients of income ratio, the income ratios of different income groups (lower-middle-income group, middle-income group, upper-middle-income group, and high-income group) to the low-income group calculated by this coefficient, the ratio of mean income to low income, and the ratio of median income to low income. The results show that the gap between the low-income group and the high-income group is more significant. For example, the income ratio of the low-income group to the lower-middle-income
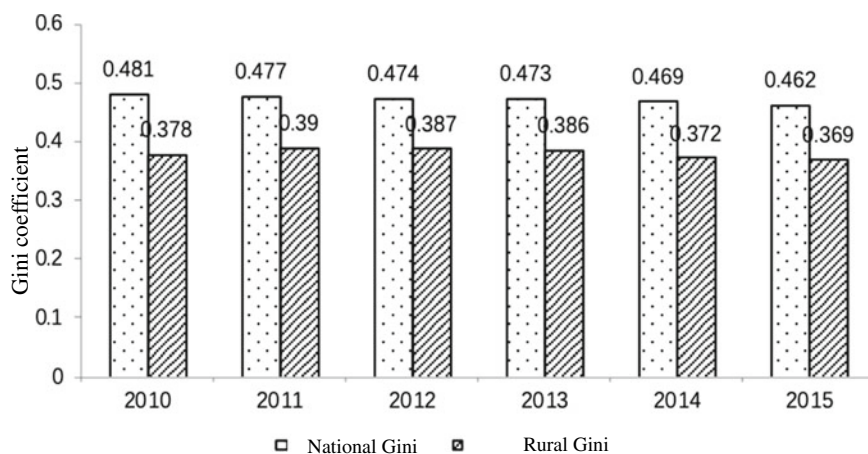
Fig. 4 Rural Gini coefficient and National Gini coefficient: 2010–2015, *Data Source* National Gini coefficients are from the National Bureau of Statistics; rural Gini coefficients for 2010 and 2013 are from *China Yearbook of Household Survey*; rural Gini coefficients for 2014 and 2015 are calculated by the author based on the survey data of China's rural households

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[10] Data source: The rural Gini coefficient for 2010–2013 is published in the *China Yearbook of Household Survey*.

[11] The rural Gini coefficients for 2014 and 2015 are calculated, so they are not fully comparable with those in 2013 and before.

Table 3 Fluctuation trend of income inequality among five groups of residents: 2010–2016

	2010	2011	2012	2013	2014	2015	2016
Low-income group to low-income group	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lower-middle-income group to low-income group	1.9	2.1	2.1	2.1	2.4	2.3	2.6
Middle-income group to low-income group	2.8	3.1	3.0	2.9	3.4	3.3	3.7
Upper-middle-income group to low-income group	4.0	4.4	4.4	4.1	4.9	4.7	5.2
High-income group to low-income group	7.5	8.4	8.2	7.4	8.7	8.4	9.5
Mean income to low income	3.2	3.5	3.4	3.3	3.8	3.7	4.1
Median income to low income	2.8	3.1	3.0	2.9	3.4	3.3	3.7

Data Source Data of per capita net income of the five groups in 2010–2013 are from the database of the National Bureau of Statistics; other data are from the *Poverty Monitoring Reports of Rural China*. Median: Data of 2010 are calculated based on the *2011 Income Growth of Urban and Rural Residents*, and the other data are from the Statistical Bulletin on National Economic and Social Development of the year
Note Values in the table are ratios of other groups to the lowest income group of the year

group was 1:1.9 in 2010, but changed to 1:2.6 in 2016; in the same period, the income ratio of the low-income group to the high-income group changed from 1:7.5 to 1:9.5. Although the gap between the low-income group and the other groups narrowed from 2014 to 2015, it rose again in 2016.

Table 4 shows the changes in rural poverty across the country based on the subsample of rural household survey data. First, the downward trend of absolute poverty manifests that achievements have been made in targeted poverty alleviation. By whichever absolute poverty line, the rural poverty headcount ratio, poverty gap (PG) index and the squared poverty gap (SPG) index were all declining. For example, by the official poverty line of RMB2300 per person per year, the poverty headcount ratio dropped from 7.5% in 2014 to 5.2% in 2015, at an average annual decline rate of 31%. The PG index and the SPG index also dropped rapidly, at an average annual decline rate of 30.7% and 27.0% respectively. Second, if the absolute poverty line is

Table 4 Changes in poverty under the absolute poverty line: 2014–2015

Poverty index (%)	2014			2015			Change rate of 2014–2015 (%)		
	H	PG	SPG	H	PG	SPG	H	PG	SPG
RMB2300	7.5	2.2	1.1	5.2	1.6	2.2	−31.0	−30.7	−27.0
USD3.1	12.1	4.2	2.1	9.6	3.1	4.2	−20.4	−26.4	−28.0
RMB4600	25.5	8.8	4.5	21.7	7.0	8.8	−14.8	−20.7	−24.0

Data Source Rural subsample data of the routine integrated survey of urban and rural households conducted by the National Bureau of Statistics in 2014–2015, collated by the author. Unless otherwise specified, data sources of subsequent tables and figures are the same

raised, the poverty reduction rate will slow down, indicating that the income of people living on the edge of poverty (above the official poverty line) grows slower than that of registered poor households. This trend is reasonable: For a higher income group, its income base is also higher, so the income growth rate is relatively slow. Other possibilities may also exist. That is, in accordance with the current targeted poverty alleviation strategy, poverty-stricken households are the primary target for increasing income. With the strong support of poverty alleviation policies, registered poverty-stricken households showed a faster income growth. Conversely, people living on the edge of poverty who were not registered poor had a relatively slow income growth rate due to their lack of access to poverty alleviation policies. To prove the latter conjecture, we calculated the panel micro-data, and the results show that the income growth rate of rural households with income in ranges of RMB2300–USD3.1, RMB2300–RMB4600, and USD3.1–RMB4600 is significantly slower than that of poverty-stricken rural households. The growth rates are respectively 58.9, 34.1 and 27.2% of that of the poverty-stricken rural households (the results are similar when adjusted based on the consumer price index of the rural poor population or the rural consumer price index). This conclusion validates the second conjecture. We need to be aware of that attention should also be paid to vulnerable groups living on the edge of poverty in addition to those living in extreme poverty. In this regard, it is urgent to introduce policies for the people living on the edge of poverty to consolidate the achievements of poverty reduction and prevent people from falling back into poverty.

To prove the latter conjecture, we used the panel micro-data to estimate the income growth rate of groups with income in several ranges in 2014, and compared them with growth rates of all poor groups below the official line in 2014 (Table 5). The results show that the income growth rate of rural households with income in ranges of RMB2300–USD3.1, RMB2300–RMB4600, and USD3.1–RMB4600 was significantly slower than that of poverty-stricken rural households, accounting for 58.9, 34.1 and 27.2% of the poverty-stricken rural households' (the results were similar when adjusted based on the consumer price index of the rural poor population or the

Table 5 Comparison of income growth rate between the low-income group and poverty-stricken households in different income ranges: 2014–2015

Growth rate (%)	RMB2300–USD3.1 (%)	RMB2300–RMB4600 (%)	USD3.1–RMB4600
Adjusted according to the consumer price index of the rural poor population	58.9	34.1	27.2
Adjusted according to the rural consumer price index	58.8	33.9	26.9

Note To maintain consistency, the income growth rate of rural household groups except for "all rural households" in this table is based on the consumer price index (CPI) of the rural poor population eliminating the impact of price. The income growth rate of "all rural households" is based on the rural consumer price index eliminating the impact of price

rural consumer price index). Combined with the analysis of the dynamic change of poverty, we reckon that attention should also be given to the population living on the edge of poverty, who are vulnerable and assistance to them is of significance to reduce the probability of falling back into poverty. Therefore, policies that take into account both the population living in absolute poverty and those living on the edge of poverty should be formulated to consolidate the achievements of poverty reduction and prevent the returning to poverty.

We've studied the overall income growth, change in income inequality and poverty in rural areas. From a macro perspective, the income level of China's rural poor households and residents in state-level key poverty-stricken areas showed a positive upward trend, judging by the income growth. Compared with the average rural income growth, the income growth rate of poverty-stricken households and that of rural households in poor areas were higher. In spite of a rising tendency, there is something to watch out for: (1) There are still residents living in extreme poverty; (2) In the context of economic restructuring, such as economic new normal and supply-side reform, residents' income growth and the poor residents' income growth rate slowed down compared with the previous period. The two points show that eradicating extreme poverty is still a tough task, and differentiated and targeted measures should be taken to minimize the impact of economic new normal and restructuring on poverty-stricken rural households. In terms of income inequality, the rural Gini coefficient showed a downward trend in recent years, mainly due to the increase in the income of the middle-income group. The gap between the lowest-income group and other income groups was wider than that in early 2010. We've studied the income growth rate of households with income at the lowest 1–10%, and found that despite a relatively fast income growth, the rural households living in extreme poverty and the low-income household had a limited absolute increase in income due to their limited income level, even if the growth rate is close to nearly 20%. In terms of the poverty changing trend, absolute poverty showed a downward trend, indicating that targeted poverty alleviation was effective and fruitful. By a higher poverty line, the poverty reduction rate was lower. Such a changing trend is reasonable to some extent, because for those with a higher income, their income growth rate is relatively slower. Another possible reason is that rural households living on the edge of poverty are not registered poor and lack policy assistance for increasing income.

It can be seen from the aforementioned development stages that the fight against poverty is becoming more difficult and more challenging as time goes on. As the poverty alleviation course advances, the vast majority of the poor have been left out of poverty, and characteristics of the remaining poor may be changing and the spatial clustering is becoming more prominent. As Xi Jinping pointed out in his speech at the Symposium on Poverty Alleviation in Severely Impoverished Areas: "Severely impoverished areas are the main target of poverty alleviation, featuring poor natural conditions, weak economic strength, and deeply-rooted poverty that is difficult to be eradicated." So we reckon that it is the first concern when formulating policies to maintain a rapid increase in the income of poverty-stricken areas and population, and narrow the income gap among regions and residents. Discussions on the spatial

distribution of poverty and the characteristics of the poor population are included in the later section.

Finally, we forecasted the changing trend of absolute poverty in the next 15 years. Figures 5 and 6 shows the prediction of poverty change and number of the poor population under raised absolute poverty lines over the next 15 years. Figure 5 shows the results with an income growth of 7% and Fig. 6 shows the results with an income grow of 5%. Due to the length limit of the article, only the results of the 1.5 times, 2 times and 3 times absolute poverty lines are presented and discussed here.

First, if measured by the absolute poverty line, both the number of the poor population and the poverty headcount ratio will keep declining under whichever absolute poverty line, as long as low-income residents maintain a stable income
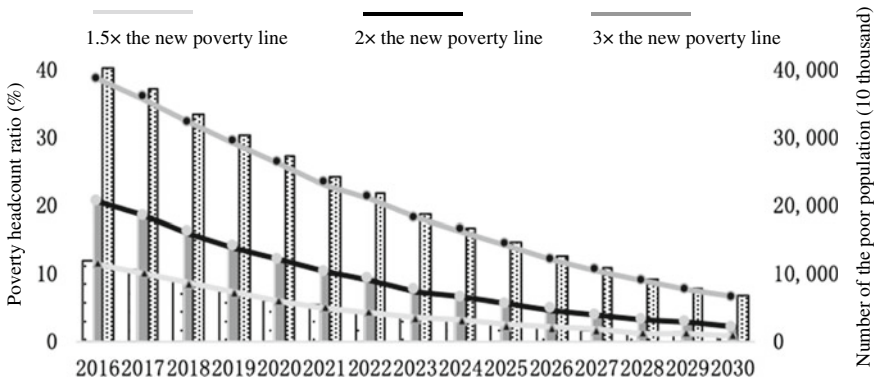

Fig. 5 Changes in poverty headcount ratio and number of poor population under different absolute poverty lines (assumed growth rate of 7%)
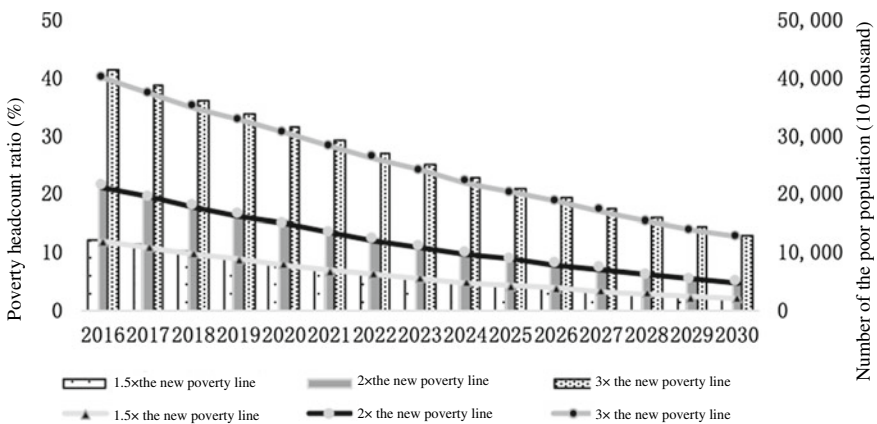

Fig. 6 Changes in poverty headcount ratio and number of poor population under different absolute poverty lines, note: assumed income growth rate of 5%

growth. In terms of the absolute value of poverty headcount ratio, given a 7% increase in income and a 1.5 × poverty line, the poverty headcount ratio will be about 6.2% and the number of the poor population will be less than 60 million in 2020; in 2025, the poverty headcount ratio will drop significantly to 2.6%, and the poor population will be below 25 million; in 2030, the poverty headcount ratio will be less than 1% and the poor population will be less than 9 million. That is, under an absolute poverty line that is 1.5 times the current one, the poverty headcount ratio will drop to a very low level 10 years later. If a 2 × poverty line is adopted, with the same income growth, the poverty headcount ratio in 2020, 2025 and 2030 will be 12.4%, 5.6% and 2.2%, respectively. If a 3 × poverty line is adopted, the poverty headcount ratio will be as high as 27.1% in 2020, and the corresponding number of the poor population will be about 250 million. If the income of the low-income rural households maintains at the same growth rate, the poverty headcount ratio will fall below 15% and 7% in 2025 and 2030, respectively.

Second, the Chinese government has raised the poverty line several times in some years.[12] Each upward adjustment has resulted in an increase in the number of the poor population and the poverty headcount ratio. After 2020, if the income/consumption-based poverty line is raised, there are certainly more people living below the line. After raising the poverty line from 1.5 times the official poverty line to 2 times, the poverty headcount ratio and the number of the poor population are roughly doubled (depending on the assumed income growth). But a more surprising conclusion is that when the poverty line is raised from 1.5 times the official poverty line to 3 times, both the number of the poor population and the poverty headcount ratio rise sharply to 4–5 times the results under 1.5 times the poverty line. With the increase of years, differences in the estimated size of poor groups under different poverty lines become bigger. Supposed that the income growth rate is 7%, the rate of decline of poverty headcount ratio is 16% under the 1.5 × poverty line and is 12% under the 3 × poverty line. And if the current poverty line is raised to 3 times, the number of the poor population as well as the poverty alleviation funds will multiply. What we can learn from it is that many low-income groups are within the income range of 2–3 times the poverty line. Whether these groups will be included in the future poverty alleviation plan depends not only on our understanding of poverty, but also on the country's financial capacity.

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[12] The poverty line was adjusted in 2000, 2008 and 2011.

2 Poverty Decomposition

Below are the FGT poverty index decomposition results calculated with the Shapley value method.[13] Corresponding to the analysis in Sect. 1, we studied the decomposition results of the poverty index in different periods before and after 2000.

2.1 Stage 1:1980–2000

First, we decomposed the rural poverty index in the first 20 years of reform and opening up, as shown in Table 6. It can be seen that although the widening income inequality restricts the reduction of poverty, growth is very effective in reducing poverty. Taking the absolute poverty line as an example: (1) The poverty reduction effect of income growth in 1980–1985 was up to 0.434, but the actual drop of the poverty index was slightly inadequate compared with the economic growth effect, which was affected by the negative impact of the widening income gap. According to ,

Table 6 Decomposition of China's overall Rural Poverty Index: 1980-2000

	Absolute poverty line			Low-income line			USD1/person/day		
H-index	ΔH	ΔE	ΔD	ΔH	ΔE	ΔD	ΔH	ΔE	ΔD
1980–1985	−0.420	−0.434	0.015	−0.288	−0.284	−0.005	−0.059	−0.053	−0.006
1985–1990	−0.250	−0.280	0.031	−0.377	−0.414	0.037	−0.246	−0.253	0.008
1990–1995	−0.024	−0.065	0.041	−0.107	−0.153	0.047	−0.172	−0.184	0.013
1995–2000	−0.038	−0.055	0.018	−0.087	−0.110	0.023	−0.189	−0.199	0.010
PG index	ΔPG	ΔE	ΔD	ΔPG	ΔE	ΔD	ΔPG	ΔE	ΔD
1980–1985	−0.135	−0.146	0.011	−0.285	−0.292	0.007	−0.228	−0.231	0.002
1985–1990	−0.080	−0.085	0.005	−0.167	−0.181	0.015	−0.232	−0.249	0.018
1990–1995	−0.001	−0.016	0.016	−0.023	−0.048	0.026	−0.074	−0.103	0.029
1995–2000	−0.008	−0.015	0.007	−0.023	−0.034	0.011	−0.072	−0.086	0.013
SPG index	ΔSPG	ΔE	ΔD	ΔSPG	ΔE	ΔD	ΔSPG	ΔE	ΔD
1980–1985	−0.058	−0.067	0.009	−0.206	−0.216	0.010	−0.240	−0.246	0.006
1985–1990	−0.036	−0.036	0.000	−0.088	−0.094	0.006	−0.168	−0.182	0.014
1990–1995	0.002	−0.006	0.008	−0.005	−0.021	0.016	−0.035	−0.060	0.024
1995–2000	−0.003	−0.006	0.004	−0.009	−0.015	0.006	−0.035	−0.045	0.011

Data Source China Yearbooks of Rural Household Survey, collated by the author.
Note: All the structural data have passed the hypothesis testing at the 5% level of significance.

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[13] For the introduction of the Shapley value decomposition method and its application to intertemporal decomposition of poverty index, see Shorrocks (2013), Wan and Zhang (2006), Shen (2012).

the H-index eventually decreases by 0.420. Similar conclusion is drawn on the decomposition of PG index and SPG index and will not be repeated here. (2) Compared with the previous five years, the poverty reduction effect of growth in 1985–1990 decreased, with ΔE of 0.28; the absolute level of the distributional effect increased, and ΔD of H-index under the absolute poverty line rises from 0.015 in 1980–1985 to 0.031 in 1985–1990, a final decrease of 0.25. On the whole, growth played a more prominent role in affecting poverty during this period, and the poverty index went downward. (3) Since 1990, rural poverty reduction has further slowed down. This period was marked by a marked reduction in the poverty-reduction effectiveness of growth and a widening adverse impact of inequality on poverty. For example, ΔE and ΔD of H-index under the absolute poverty line in 1990–1995 are -0.065 and 0.041, respectively, resulting in a final decrease of ΔH by only 0.024. Measured by the PG index, the fluctuation is more obvious: The effects of growth and inequality are evenly matched and ultimately leads to a 0.001% drop of the PG index. By the SPG index, the negative effect of income inequality is higher than the positive effect of economic growth, and finally leads to an expanding SPG index. The changing trend in 1995–2000 is similar to it and will not be repeated here.

A basic conclusion has been drawn from the above analysis that the income growth is favorable for poverty reduction, while the widening income inequality will hinder it. In the first 10 years of reform and opening up, the positive effect of growth on poverty reduction was significantly stronger than the negative effect of widening inequality, and the income growth had absolute pro-poor effects. However, as time goes on, the effect of growth is reduced absolutely and relatively, and the negative effect of widening income inequality on poverty reduction becomes more prominent.

2.2   Stage 2: 2000–2010

See Table 7 for the decomposition of the rural poverty index from 2000 to 2010. It can be seen that no matter which poverty index is selected, ΔE is always negative, indicating that economic growth is good for poverty reduction; ΔD is positive in most years, indicating that the widening income inequality worsens the poverty. In Fig. 4, exceptional periods include 2003–2004 and 2009–2010 by the standard of H-index, 2005–2006 by the standard of PG index, and 2001–2002, 2003–2004, 2005–2006 and 2009–2010 by the standard of SPG index. Comparing Table 7 and Fig. 7 (Gini coefficients based on the income of the rural population and the poor population in China from 1980 to 2010), it is found that these exceptional periods match the periods during which the Gini coefficient for the rural poor population decreased (2001–2002, 2003–2004, 2005–2006) or the Gini coefficient for the rural areas declined (2003–2004 and 2005–2006). At the same time, these periods are consistent with those of negative interannual change of I-index in SST decomposition (see Fig. 2). In light of the fact that China's poverty line is low, we speculate that the widening income inequality of the poor may be a result of an decrease in the relative or absolute income of the poorest people within the poor and an increase in the number of people living

Table 7 Decomposition of China's overall Rural Poverty Index: 2000-2010

	Absolute poverty line			Low-income line			USD1/person/day		
H-index	ΔH	ΔE	ΔD	ΔH	ΔE	ΔD	ΔH	ΔE	ΔD
2000–2001	−0.003	−0.005	0.003	−0.006	−0.011	0.005	−0.016	−0.023	0.008
2001–2002	−0.005	−0.007	0.002	−0.007	−0.015	0.009	−0.016	−0.032	0.016
2002–2003	0.001	−0.004	0.005	−0.005	−0.009	0.005	−0.015	−0.018	0.004
2003–2004	−0.011	−0.006	−0.005	−0.020	−0.014	−0.006	−0.049	−0.031	−0.018
2004–2005	−0.002	−0.007	0.005	−0.011	−0.015	0.004	−0.029	−0.037	0.008
2005–2006	−0.005	−0.006	0.001	−0.010	−0.012	0.002	−0.029	−0.031	0.002
2006–2007	−0.005	−0.006	0.002	−0.010	−0.011	0.001	−0.029	−0.030	0.001
2007–2008	–	–	–	−0.007	−0.008	0.001	−0.021	−0.024	0.003
2008–2009	–	–	–	−0.004	−0.008	0.004	−0.011	−0.021	0.010
2009–2010	–	–	–	−0.007	−0.007	0.000	−0.022	−0.022	0.000
2000–2005	−0.0195	−0.0283	0.009	−0.047	−0.060	0.013	−0.123	−0.140	0.017
2005–2010	−0.002	−0.002	0.001	−0.037	−0.046	0.009	−0.112	−0.126	0.014
PG index	ΔPG	ΔE	ΔD	ΔPG	ΔE	ΔD	ΔPG	ΔE	ΔD
2000–2001	0.000	-0.001	0.002	-0.001	−0.003	0.002	−0.005	−0.009	0.004
2001–2002	−0.002	−0.002	0.000	−0.003	−0.004	0.001	−0.006	−0.012	0.006
2002–2003	0.001	−0.001	0.002	0.000	−0.003	0.003	−0.004	−0.007	0.003
2003–2004	−0.004	−0.002	−0.003	−0.007	−0.004	−0.003	−0.018	−0.011	−0.007
2004–2005	0.002	−0.002	0.004	0.000	−0.004	0.004	−0.008	−0.013	0.005
2005–2006	−0.003	−0.001	−0.001	−0.004	−0.003	−0.001	−0.010	−0.010	0.000
2006–2007	−0.001	−0.002	0.001	−0.002	−0.003	0.001	−0.009	−0.010	0.001
2007–2008	–	–	–	−0.001	−0.002	0.001	−0.006	−0.008	0.002
2008–2009	–	–	–	−0.001	−0.002	0.001	−0.003	−0.007	0.004
2009–2010	–	–	–	−0.002	−0.002	0.000	−0.007	−0.007	0.000
2000–2005	−0.003	−0.008	0.005	−0.01101	−0.018	0.007	−0.041	−0.051	0.010
2005–2010	−0.004	−0.005	0.001	−0.01	−0.013	0.003	−0.035	−0.041	0.007
SPG index	ΔSPG	ΔE	ΔD	ΔSPG	ΔE	ΔD	ΔSPG	ΔE	ΔD
2000–2001	0.001	−0.001	0.002	0.000	−0.001	0.002	−0.002	−0.004	0.003
2001–2002	−0.001	−0.001	−0.001	−0.002	−0.002	0.000	−0.004	−0.006	0.003
2002–2003	0.001	0.000	0.002	0.001	−0.001	0.002	−0.001	−0.004	0.003
2003–2004	−0.003	−0.001	−0.002	−0.004	−0.002	−0.002	−0.010	−0.006	−0.004
2004–2005	0.003	−0.001	0.004	0.002	−0.002	0.004	−0.002	−0.006	0.004
2005–2006	-0.002	−0.001	−0.002	−0.003	−0.001	−0.001	−0.005	−0.005	−0.001
2006–2007	0.000	−0.001	0.000	−0.001	−0.001	0.000	−0.004	−0.005	0.001
2007–2008	–	–	–	0.000	−0.001	0.001	−0.002	−0.004	0.002
2008–2009	–	–	–	0.000	−0.001	0.001	−0.001	−0.003	0.002

(continued)

Table 7   (continued)

	Absolute poverty line			Low-income line			USD1/person/day		
2009–2010	–	–	–	−0.001	−0.001	0.000	−0.003	−0.003	0.000
2000–2005	0.001	-0.003	0.004	-0.003	−0.008	0.005	−0.018	−0.025	0.007
2005–2010	−0.002	−0.002	0.001	−0.004	−0.006	0.001	−0.016	−0.020	0.004

Data Source China Yearbooks of Rural Household Survey, collated by the author
Note All the structural data have passed the hypothesis testing at the 5% level of significance
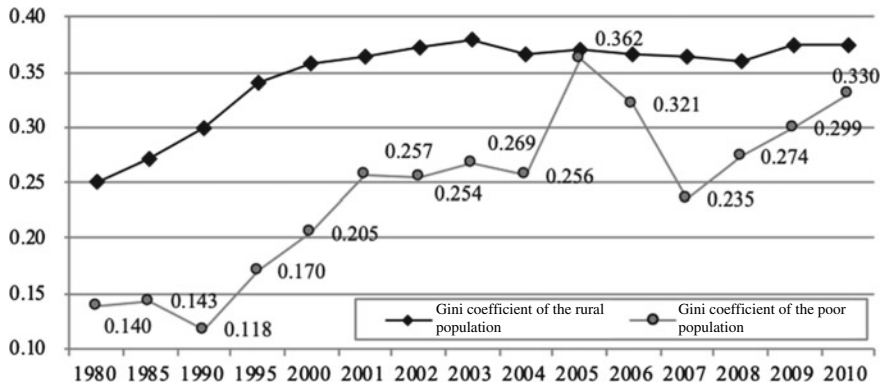
Fig. 7   Gini coefficient of income distribution of rural population and poverty-stricken population in China: 1980–2010. *Data Source China Yearbooks of Household Survey*, collated by the author

in relative or absolute poverty, further deepening the poverty as the poor population declines. This conclusion is proven in Chap. 3.

Specifically, we studied the H-index decomposition results under different poverty lines. We found that the impact of economic growth and income inequality on poverty index is intensified as the poverty line is raised. However, the effects of the two factors are not consistent. When H index is calculated and decomposed by a low poverty line, it is found that the pro-poor effect of economic development is a little bit higher than the negative effect of widening gap. When a higher poverty line is selected, the contribution of economic growth in alleviating poverty significantly increases, demonstrated by a sharp drop of the poverty index. These characteristics are almost in agreement with the findings of Wan and Zhang (2006), except for one respect: The two scholars hold that different poverty indexes have no effect on the relative magnitude of economic growth and redistribution. In most cases, the decomposition results are not sensitive to the choice of poverty line. This paper, however, holds that the difference in results from different poverty lines is significant. As shown in Table 4, with the upward adjustment of the poverty line, the numerical value and changing trend of the income inequality factor do not change significantly, but the economic growth factor shows growing pro-poor effect, implying that the pro-poor effect of economic development is limited to the people living in moderate poverty,

while the poorest group hardly benefits from it. Economic growth has limited effect on improving the income of the poorest (Chen et al. 2013).

Then we studied the decomposition results of the three poverty indexes under the official poverty line. We found that: (1) Economic growth has the largest impact on H-index, followed by PG index, and then SPG index (except that for 2007–2008[14]), indicating that the poverty index measured by the reduction of poverty population changes dramatically, leading to an obvious change in the decomposition results; if measured by the reduction of poverty alleviation funds or the reduction of the income gap within the poor population, the income growth effect will be small. (2) The income inequality restrains the decrease of FGT index, and the impact is stable and does not vary remarkably with the FGT index. (3) As α increases, the pro-poor effect of economic growth decreases, and even be offset by income inequality in some years (2004–2005), resulting in a widening poverty index.[15] This paper speculates that although economic development plays a positive role in benefiting the poor, the people living in moderate poverty represents the main beneficiary, while the poorest group benefits little. If it is true, China's anti-poverty achievements in the third decade of reform and opening up were not as satisfied as expected, and the challenge against poverty in China is still daunting!

To sum up, for rural residents across the country, moderate increase in the income of the poor population is favorable for the continuous reduction of poverty, while income polarization is harmful. The results show that for the same economic growth, the positive effects on poverty reduction have weakened in the recent period, while the negative effects of widening inequality have increased. In this regard, we propose that the most urgent task of alleviating poverty in recent years is to curb the widening gap between the rich and the poor, and this approach is more effective for poverty reduction than increasing residents' income.

2.3 Stage 3: 2012–2018

Table 8 shows the changes in income and expenditure of rural residents in China. On the whole, rural residents' income and consumption levels constantly increase. In 2007–2012, the nominal per capita net income of rural residents increased from RMB4327 to RMB8389, with a nominal average annual growth rate of 14% and real average annual growth rate of approximately 10%; in 2013–2018, the nominal

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[14] The sharp decline in the poverty index in 2007–2008 should owe to the polity of "unifying two standards".

[15] The conclusion that the pro-poor effect of economic growth decreases with the increase of α of the FGT index can be supported by the results under other poverty lines. However, as the poverty line is raised and more people living in moderate poverty are included for the calculation and decomposition of the poverty index, we found that no matter which poverty index is used, the pro-poor effect of economic growth outstrips the negative impact of income inequality, and the poverty index continuously drops. Due to the length limit of the article, graphics under other poverty lines are not presented here.

Table 8 Changes in income and expenditure in rural residents

| Year	Per capita income	Wage	Operation income	Property income	Transfer income	Consumption	Engel Index (%)
2007	4327	1596	2194	128	222	3224	43.1
2008	4999	1854	2436	148	323	3661	43.7
2009	5435	2061	2527	167	398	3993	40.0
2010	6272	2431	2833	202	453	4382	41.1
2011	7394	2963	3222	229	563	5221	40.4
2012	8389	3447	3533	249	687	5908	39.3
2013	9430	3653	3935	195	1648	7485	37.7
2014	10,489	4152	4237	222	1877	8383	37.9
2015	11,422	4600	4504	252	2066	9223	37.1
2016	12,363	5022	4741	272	2328	10,130	32.2
2017	13,432	5498	5028	303	2603	10,955	31.2
2018	14,617	5996	5358	342	2920	12,124	30.1

Data Source National Bureau of Statistics of China
Note (1) Incomes are measured in yuan. (2) The income definition refers to net income in 2013 and disposable income in 2013 and thereafter. Data of the two periods are not comparable

per capita disposable income of rural residents rose from RMB9430 to RMB14,617, with a nominal average annual growth rate of approximately 9% and a real average annual growth rate of approximately 7%. In the corresponding period, the nominal expenditure of rural residents grew from RMB3224 in 2007 to RMB12,124 in 2018, with an average annual growth rate of 12.5%. The Engel Index also dropped from 43.1% in 2007 to 30.1% in 2018.

In terms of income sources, rural residents' transfer income grew the fastest in 2007–2012, with a nominal average annual growth rate of 25%, which was largely due to the Chinese government's cancellation of agricultural taxes and provision of agricultural subsidies during this period (Shen et al. 2021a, 2021b). Wages rose by 16.6% in second place, followed by property income and operation income, which grew by 14.2% and 10%, respectively. In terms of the sub-income composition during this period, the proportion of transfer income in the net income of rural residents swelled from 5.1% in 2007 to 8.2% in 2012 due to its low absolute value, despite its high growth rate. During 2007 ~ 2013, operating income declined from 50.7% to 42.1%, while wage income rose from 36.9 to 41.1%. During 2013–2018, the nominal annual growth rate of rural residents' transfer income, property income and wage income was between 10 and 12%, while that of the operating income was only 6%.[16] The proportional ranking of rural residents' wage income and operating

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[16] Luo et al. (2021) identified a relative decline in the share of the agricultural sector using CHIP2013-2018 national data, with a real growth rate of −2.6% in net income from agricultural operations. It interprets this change as a general feature of structural changes in the course of economic development.
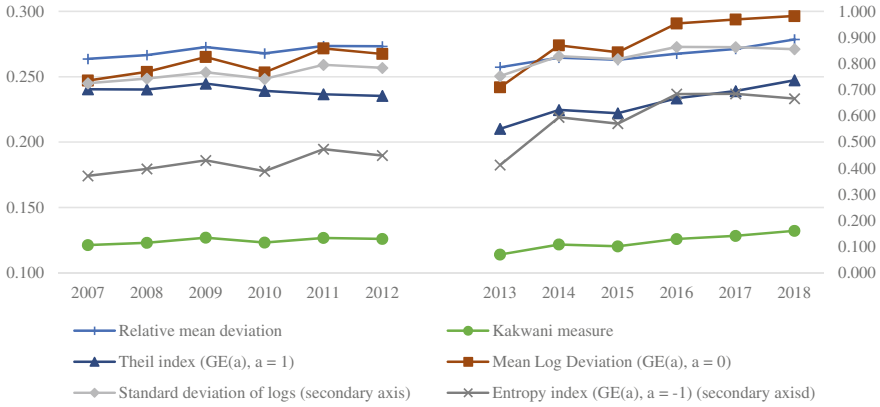
Fig. 8 Inequality trends in rural China, *Data Source* The author uses the disaggregated groups developed by Shorrocks and Wan (2008) for calculation and plotting of the five rural income groups published by the National Bureau of Statistics. Given the measurement error of the method itself, this result is only used as an illustration of the change trend of rural residents' income gap, and the absolute value of the measurement result is not of quantitative significance. *Note* The statistics of the National Bureau of Statistics of China on the income of rural residents (by five groups) refer to net income in 2013 and disposable income in 2013 and thereafter. Data of the two periods are not comparable.

income reversed. According to Table 8, rural residents' operating income and wage income accounted for 41.7% and 38.7%, respectively, in 2013 and 36.7% and 41.0%, respectively, in 2018. This ranking change by proportion of income from different sources indicates that wage income is increasingly affecting rural household income (Luo et al. 2021).

Figure 8 shows the Chinese rural residents' income inequality changes since 2007. We calculated several different inequality indices. The changing trend of these inequality indices suggests that Chinese rural residents' income gap is on the rise, which is similar to the findings of Terry et al. (2020).[17] The amplitude of variation is smaller in 2007–2013 than in 2013–2018, and the latter period shows a large fluctuation. Luo et al. (2021) decomposed the overall Gini coefficient by income source and showed the role of net non-farm operating income, property income, pension income, and other transfer income in widening the income gap. Comparatively speaking, the income from non-farming jobs and the net income from agricultural business can contribute to a smaller income gap.

After reviewing Chap. 1, it is found that China's rural poverty shows a downwards trend under various absolute poverty standards. Coupled with the change in rural residents' income distribution, the change in poverty is composed of the growth effect and gap effect. Specifically, the growth effect can be understood as the change of the mean value under the condition that the skedasticity of income variables (i.e., the form

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[17] Of course, due to the different sensitivity of different types of inequality indices to different income-range groups, we found that the Theil index in 2007–2013 has a different trend from other indices in 2011 and 2012.
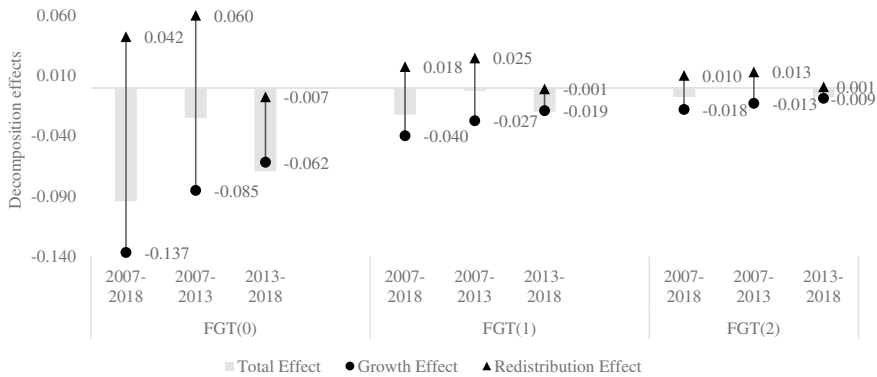
Fig. 9 The growth effect and redistribution effect during intertemporal changes in poverty. *Data Source* CHIPs data

of the Lorenz curve) remains unchanged, and the redistribution effect is formed by the change in skedasticity under the condition that the mean value remains unchanged (Bourguignon, 2004). In the real world, the relationships among growth, inequality and poverty are often complex and interdependent (Kakwani, 1993; Kakwani and Son, 2016). To further understand the effect of poverty reduction in the process of growth, we referred to Kakwani's (1993) growth-inequality decomposition approach to decompose the intertemporal change of poverty into the growth effect and gap effect.

Figure 9 shows the growth effect and redistribution effect that are decomposed from the intertemporal change of poverty. The total effect expresses the intertemporal change in poverty indices (FGT (0), FGT (1) and FGT (2)). The growth effect is the poverty reduction effect of income growth, and the redistribution effect is the poverty reduction effect of gap change. In the long run, the poverty incidence decreased by approximately 9 percentage points from 2007 to 2018. Specifically, income growth should have reduced the incidence of poverty by 13.7 percentage points, but the widening income gap among rural residents inhabited poverty reduction by 4.2 percentage points during this period. Therefore, the decline in the overall poverty incidence decreased. By stages—taking the change of the poverty incidence as an example—the widening income gap of rural residents from 2007 to 2013 strongly inhibited the poverty reduction effect of growth but the situation was reversed from 2013 to 2018. During 2013–2018, both growth and gap changes promoted poverty alleviation at the same time and contributed 0.7 percentage points and 6.2 percentage points to poverty reduction (FGT (0)), respectively. The above conclusions indicate that China's growth during 2013–2018 might be more pro-poor.

Through a further investigation of the results of FGT (0) and FGT (1), we observed a trend similar to FGT (0) in FGT (1), indicating that the gap and growth effects not only reduced the scale of poverty but also positively filled the poverty funding gap during 2013–2018. The characteristic of the FGT (2) index is to give a higher weight to the poor groups with the lowest income. In other words, it is important to pay

attention to the internal inequality of the poor group. We failed to find the poverty reduction effect of FGT (2) from the gap change from 2013 to 2018, indicating that the internal gap among the poor groups will inevitably occur to some extent in the closing stage of poverty alleviation in China and can be effectively alleviated by raising the minimum living standard.

3 Discussion: What is Diminishing the Trickle-Down Effect?

In the course of studying the economic development and poverty reduction, the academic community has come up with a concept termed "trickle-down effect", which states that poverty can be eradicated by creating an environment favorable for sustained economic growth. The basis for it is that relying on economic development, more jobs will be created and provided for the poor, and the government can allocate a portion of the tax revenue to the poor through reasonable transfer payment to improve their income and non-income status (see Chap. 2). However, some scholars have found that although economic development contributes to poverty reduction, factors such as economic environment, cultural customs, institutional arrangements, especially the widening gap between the rich and the poor may blunt the trickle-down effect. Blindly pursuing economic growth does not necessarily reduce poverty, and the same is true of rural poverty in China. Given this, we conclude this chapter by exploring factors that may impair the trickle-down effects of China's economic development on reducing rural poverty.

3.1 What Blocks Employment Channels?

Hu et al. (2006) pointed out that the quality of China's economic growth has degraded in recent years. As a result, the poor people had no way to share the fruits of economic growth. Hu has analyzed the adverse effect of macro environment and institutional arrangement on the employment of poor people from four aspects: ① Restricted by slow development of township enterprises and inadequate employment creation of secondary and tertiary industries in rural areas, employment opportunities are becoming less in the rural region. ② As the ratio of the agricultural output value to GDP, the ratio of agricultural labor productivity to national average labor rate, and the ratio of per capita income of rural residents to per capita GDP decline, rural residents' income growth is also capped; ③ Rural residents, especially the rural poor population have week resistance to risks. In case of major natural disasters or other economic shocks, they are highly vulnerable and their living conditions get worsen easily; ④ The dualistic urban–rural system and barriers caused to the rural–urban migrant

workers' circularity due to lack of necessary social security make it challenging to provide the poor with more jobs relying on economic growth.

3.2   What Impedes the Poor's Access to Capabilities?

China's progress in income growth and poverty reduction has been uneven. On the one hand, rising inequality will impede the poor people's access to and share of economic benefits, affecting their income increase; on the other hand, under the market economy conditions, the low-income level means limited access to resources and less development possibilities.

As to the second point, there are some explanatory examples: The reform and opening up facilitated the disintegration of rural communes and the implementation of the household contract responsibility system with remuneration linked to output, which was the primary reason for the rapid reduction of rural poverty in the first half of the 1980s. The side-effect was the market-oriented supply-side reform in fields of health, education and other public services caused by changes in relevant institutional arrangements. For rural areas which lack of financial resources, it is difficult for local governments to meet their public-service responsibilities to finance public services. A direct consequence is increasing spending of rural households on education and health. According to statistics of the World Bank (2009), in 1988–2003, the proportion of rural households' expenditure on education in total household expenditure rose from 1.0 to 8.3%, and the proportion of health expenditure rose from 1.6 to 5.1%. The total household cash expenditure on health care rose sixfold in the decade to 2004 and increased about 40 times compared with 1980 (World Bank, 2006). Another survey of 3037 villages showed that in 2004, the annual tuition fee for each fifth-grade primary school student was RMB260 on average, and that for each middle school student was RMB442, accounting for 40 and 70% of the official poverty line, respectively.

The direct conclusion is that income has a greater impact on people's access to health and education (human capital) than in the past. The data also imply that the poor population lack development resources. If such a problem is not tackled in a timely manner, it is very likely that the poor people will fall into the poverty trap and be poor for generations.

3.3   What Affects the Redistribution Effects for the Poor?

The government's implementation of redistribution can make up for the income deficiency of the poor population from certain aspects. Although China has stepped up efforts in poverty alleviation recently, there are still some problems. First, the official poverty line is low. China has long set the official poverty line according to the absolute poverty line (subsistence income). In the early days of reform and opening up

when material resources were scarce, the subsistence income standard guaranteed the necessary conditions for survival and development of rural residents. In the new century, materials are not in scarcity but may be insufficient for certain human groups due to income inequality, and the resource inequality may have different impacts on the population development of different income groups, especially for the poor. The lack of access to education, health care, and job opportunities, and social discrimination can all be factors that hinder their development.[18] If the government fails to change poverty lines as the economy is growing, it may be not able to determine the optimal scope of poverty alleviation or obtain satisfying results in poverty alleviation. After all, the two goals of keeping the poor from starving and providing the poor with development opportunities will lead to very different outcomes, especially when a country's economy is booming while the gap between rich and poor is widening. Second, negative factors that affect the income increase of poor households emerged in the implementation of poverty alleviation policies. There are three key factors: ① After 2000, the Chinese government carried out a poverty alleviation mechanism targeted at villages and implemented more targeted measures. But as the poverty-stricken population is widely dispersed, less than 50% of the poor have been covered by the poverty alleviation policy (Wang et al. 2007; World Bank 2006). ② The participation of poverty-stricken population in village-level development projects is not high due to their low educational level and low political participation, which gives a reason for local officials to redirect the use of poverty alleviation funds, and the poorest families are kept away from the funds (Wang and Li 2005). ③ Relevant evidence shows that local institutions of Agricultural Bank of China refused to lend money to people in poverty-stricken areas a lot. In particular, Agricultural Bank of China after the shareholding reform is more commercial and is providing fewer loans for rural households.[19]

3.4 How the Government Support for the Poorest?

In terms of rationally allocating poverty alleviation resources, the government should moderately allocate more to the poorer groups through transfer payment, at least to allocate them a portion not less than average. The study shows that economic development benefits those living in moderate poverty more than the poorest. To some extent, this is a result of the government's political achievement-oriented allocation of poverty alleviation resources and the inadequate use of poverty indexes.

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[18] The lack of these resources to some extent becomes the inducement of poverty. In terms of medical care, the Rural Development Institute of Chinese Academy of Social Sciences pointed out in 2001 that 40%-50% of the poorest rural households in central and western regions of China were poor or fell back into poverty due to health expenses.

[19] Nearly half of China's poverty alleviation funds are subsidized loans managed by the Agricultural Bank of China. According to the central-government policy, these loans are mainly used to support leading rural enterprises in poverty-stricken areas.

In reality, government departments as the implementing agencies of poverty alleviation policies have their own interest demands. At present, beneficiaries of the poverty alleviation policies do not participate in policy supervision and effect evaluation. In this case, the policy effect is inevitably to favor the performance of the government in the poverty-stricken areas and its poverty alleviation departments. And the achievements in poverty alleviation have long been accessed based on the H-index, which is one of the first poverty indexes. H-index is easy to apply and understand, and is widely used by most countries and UN agencies in the world. But H-index itself contains very little information, and the data quality is poor. Reference to H-index only may cause the deviation of policy action. The most effective way of poverty alleviation with reference to H-index is to help the poverty-stricken population with relatively high incomes (close to the poverty line) to get rid of poverty first, which is also easier to succeed. Lifting the poorest people to "jump over" the poverty line is very challenging, though. What's more, it is difficult to see the effectiveness of poverty alleviation through the H-index, even if the results are based on loads of investments. Therefore, people most in need are least likely to be favored by those who carry out poverty alleviation policies. When the poverty alleviation policy can affect the performance of local officials, the policy implementation pattern may naturally become "a government-led and political performance-oriented action in accordance with rough standards, which leads to deviation in effect", so that the "trickle-down effect" only benefits those living in moderate poverty, leaving the poorest people out of door.

References

Bourguignon, F. 2004. The Poverty-Growth-Inequality Triangle. Paper Presented at Indian Council for Research on International Economic Relations, New Delhi, 1–30.

Chen, Z., Y. Shen, and Y. Zhou. 2013. On the Absolute and Relative Changes in the Poverty in China's Villages and on the Setting of the Relative Poverty Line. *Management World,* 1: 76–77 [in Chinese].

Hu, A., L. Hu, and C. Zhi. 2006. China's Economic Growth and Poverty Reduction (1978–2002). *Journal of Tsinghua University (philosophy and Social Sciences)* 21 (5): 105–115 [in Chinese].

Kakwani, N. 1993. Poverty and Economic Growth with Application to Côte d'Ivoire. *Review of Income and Wealth* 39 (2): 121–139.

Kakwani, N., and H.H. Son. 2016. *Social Welfare Functions and Development: Measurement and Policy Applications.* London: Palgrave Macmillan.

Luo, C., S. Li, and X. Yue. 2021. An Analysis of Changes in the Extent of Income Disparity in China (2013–2018). *Social Sciences in China*, 1: 33–54+204–205.

Shen, Y. 2012. The Impact of Economic Growth and Inequality on Rural Poverty in China. *The Journal of Quantitative & Technical Economics* 29 (08): 19–34 [in Chinese].

Shen Y., P. Zhan, and Y. Zhou. 2021a. The Multidimensional Poverty-Growth-Inequality Triangle: Rural China 1995–2018. *CIID Working Paper*.

Shen, Y., S. Li, and X. Wang. 2021b. Impacts of Two Tax Reforms on Inequality and Welfare in China. *China & World Economy* 29 (3): 104–134.

Shorrocks, A. F. 2013. Decomposition Procedures for Distributional Analysis: A Unified Framework Based on the Shapley Value. *The Journal of Economic Inequality* 11 (1): 99–126.

Shorrocks, A., and G. Wan. 2008. Ungrouping Income Distributions: Synthesising Samples for Inequality and Poverty. *UNU-WIDER Working Paper*.

Terry Scular, Shi Li, Ximing Yue, and Hiroshi Sato. 2020. *Changing Trends in China's Inequality: Evidence, Analysis, and Prospects*. New York: Oxford University Press.

Wan, G., and Y. Zhang. 2006. Income Growth and Inequality Effects on Poverty. *Economic Research Journal* 6: 112–123 [in Chinese].

Wang, S., A. Park, S. Chaudhuri, and G. Datt. 2007. Poverty Alleviation and Poverty Targeting of China's Village during New Era. *Management World* 1: 56–64 [in Chinese].

Wang, S., and W. Li. 2005. The Advices for Helping the Poor. *Scientific Decision Making* 5: 12–23 (in Chinese).

World Bank. 2006. *World Development Report 2006: Equity and Development*. Oxford University Press.

World Bank. 2009. China from Poor Areas to Poor People: China's Evolving Poverty Reduction Agenda: An Assessment of Poverty and Inequality in China. *World Bank Report No. 47349-CN*.

Xu, K., and L. Osberg. 1999. Poverty Intensity: How Well Do Canadian Provinces Compare? *Canadian Public Policy*, 25(2): 179–195.