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Consumption and Income Poverty in Rural China: 1995–2018

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Abstract

This paper studies consumption and income poverty in rural China during the period from 1995 to 2018 using Chinese Household Income Project (CHIP) data. It finds that the wellbeing of Chinese rural residents has improved significantly during this period as part of China's rapid industrialization and economic growth. The incidence of poverty has fallen substantially, either measured in terms of income or consumption. However, consumption poverty is not consistent with income poverty. It was the substantial growth of consumption or income that brought about the sharp fall in poverty, whereas the redistribution of consumption or income in particular during the period from 2002 to 2018 was unfavorable for poverty reduction. A large number of rural household workers moved away from household farming to participate in local or urban non-farming activities, resulting in a fall in poverty in the households that engaged purely in farming, and economic growth led to a sharp fall in poverty within different rural household groups.

Key words: consumption poverty, economic growth, income poverty, rural China
JEL codes: D60, I32, R00

I. Introduction

The concept of poverty has been evolving. Rowntree (1901) argued that poverty is generally defined as consumption or income poverty. In the late 1970s, Sen (1979a) argued that poverty is largely caused by the deprivation of personal "capabilities" such as health and education. At the turn of millennium, Alkire and Foster (2007, 2011) proposed a multi-dimensional poverty measurement based on Sen's "capability"

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approach. In its "rooting-out poverty campaign," implemented since 2014, the Chinese government has adopted a simplified multidimensional poverty standard, i.e. that the people should not worry about food and clothing, and should have "three guarantees" – 9 years' compulsory education for children and youth of school age, basic medical care, and housing safety. By their definition of income poverty, a total of about 800 million poor people have been lifted out of poverty in China over the last 40 years since the country's reform and opening up (Xian et al., 2016; Ryder, 2017). In this paper, we intend to verify this argument by examining consumption poverty against income poverty in rural China (because Khan (1998) argued that poverty is largely a rural phenomenon in China).

Regarding consumption and income poverty, Sen (1979b) pointed out that the former should be classified as direct and the latter as indirect indicators. Consumption poverty identifies those whose actual consumption fails to meet their minimum needs, while the income method identifies those who do not have the ability to meet these needs. Consumption, relative to income or wealth, is more accurate in revealing people's real economic well-being (Deaton, 1997; Johnson, 2004), reflecting the material resources that people own more comprehensively and a family's resources other than money, such as their level of education, health care, housing, private cars, and social security (Meyer and Sullivan, 2011, 2012, 2013). Cutler and Katz (1992) argued that income, which often fluctuates, is easily affected by temporary shocks and is prone to measurement errors. By contrast, consumption is not only more stable than income but can also be measured more easily. Finally, consumption is also a common indicator for the study of poverty and inequality in developing countries. The World Bank defines those living on US$1.90 a day, based on purchasing power parity (PPP) for the year 2011, as extremely poor, which is also based on consumption (Ferreira et al., 2016). Many scholars therefore believe that consumption may be a better way to measure poverty (e.g. Jorgenson and Slesnick, 1987; Cutler and Katz, 1991; Slesnick, 1993, 1994, 2001; Jorgenson and Dale, 1998).

To investigate the argument that 800 million people have been lifted out of poverty since the late 1970s in China, we employ the 1995, 2002, 2013, and 2018 four-round Chinese Household Income Project (CHIP) rural household survey data. Apart from providing thorough household income information, CHIP data also offered household consumption expenditure in eight categories as defined by the National Bureau of Statistics (NBS). Before examining poverty in rural China we explored the changes in rural households' income and consumption, and their distribution. The income per capita and consumption per capita of Chinese rural households rose significantly for the period from 1995 to 2018, although their corresponding annual growth rates were much

lower than those of GDP per capita and national consumption per capita in that order. Income inequality also increased significantly during this period. With this information, and according to the Chinese government's official poverty line, we calculated the poverty headcount for consumption and income in rural China. It is interesting that the consumption poverty rate was higher than that of income for the years 1995 and 2002, but the former is almost negligible and lower than the latter for the years 2013 and 2018. Given this result, we used the non-parametric decomposition method described by Datt and Ravallion (1992) on the CHIP rural data and found that economic growth and industrialization (expressed as rural–urban migration) contributed to the dramatic fall in poverty.

The remainder of this paper is as follows. Section II is a literature review. Section III introduces the data, poverty measurement methods, and other research methods used in this paper. Section IV introduces and analyses the changes in the household consumption poverty of rural China during the period from 1995 to 2018, and compares the difference between income poverty and consumption poverty on this basis. Section V provides a non-parametric decomposition of rural absolute poverty rate, and analyzes the effects of growth and redistribution factors on poverty reduction. Section VI concludes this paper.

II. Literature review

There are several studies on consumption poverty. Pendakur (2001) found that, during the period from 1969 to 1998, consumption poverty in Canada "first declined and then rose," in a way that was different from income poverty and its changes. Norris and Pendakur (2013) found that during the period from 1997 to 2009, the overall poverty and child poverty by consumption in Canada substantially reduced, but poverty of the elderly was hardly improved. Menchini and Redmond (2009) studied the problem of child poverty in 19 countries of the Commonwealth of Independent States and South Eastern Europe, and found that the countries with the lowest income and highest child population density had the highest rate of absolute consumption poverty. The relative consumption poverty rate of children was higher in the countries with higher national income. Rathnayake and Gunaratne (2006) used comprehensive data from Sri Lanka to create a set of composite indices based on weighted principal component factor analysis to measure consumption poverty. They found that the traditional methods, which are based on direct aggregation of various consumption components, overestimate poverty in some situations. Gunewardena (2007) found that the consumption poverty rate of Sri Lanka declined during the period from 1985 to 2002, but the decline was neither obvious nor stable, and economic growth and income redistribution had an important impact on

the poverty. Sumarto et al. (2007) used Indonesian data (2004) for analysis and found that consumption-related models had the best performance in predicting the expenditure and poverty. Bavier (2008) found that the income poverty rates and trends are similar to the rates and trends of consumption poverty, especially, at the bottom of the income or consumption distribution, there is no "huge deviation" between income poverty and consumption poverty. Meyer and Sullivan (2012) discovered that a consumption poverty index played a better role in identifying the most vulnerable groups and the trends characterizing their poverty than the official poverty and auxiliary poverty indicators. McKay (2015) used three comparable high-quality household surveys to analyze trends in consumption poverty in Rwanda during the period from 2001 to 2010, and found that, in the first half of this period, the consumption poverty rate declined slowly and inequality increased; in the latter half of this period, however, consumption increased rapidly, the poverty rate dropped significantly, and inequality decreased moderately. Mawonike and Chigunyeni (2016) used the common double factor method to study the impact of time and location on consumption poverty in Zimbabwe, and found that time had no significant impact on the consumption poverty in Zimbabwe, but location had a significant impact on the consumption poverty.

There are also a few studies on consumption poverty in China. Jalan and Ravallion (1999) tested how well consumption is insured against income risk in a panel of sampled households in rural China. They found that the rejection of full insurance is strongest for the poorest wealth decile, with 40 percent of the effect of an income shock being passed on to current consumption. By contrast, consumption by the richest one-third of households is protected from almost 90 percent of an income shock. Park and Wang (2001) evaluated possible sources of bias in China's official poverty estimates and concluded that the official statistics has underestimated rural poverty and overstated the speed of poverty reduction. Direct measures of nutritional outcomes supported the contention that poverty was more widespread than suggested by official statistics. Yue et al. (2007) found that household productivity factors mattered more to chronic poverty than transient poverty, and had greater impact on the poverty measured by consumption than that measured by income. Knight and Li (2006), using the 1999 household survey in urban China, found that a large proportion of the poor have the income above, but the consumption below, the poverty line. Using the 2011 China Household Finance Survey (CHFS), Han (2015) found that an increase in consumption of food materials, heating, communications, and medical care and other necessities of life would result in a larger fall of the severity and depth of poverty, while an increase in consumption in education and entertainment would result in a smaller fall in the poverty

indices. Zheng (2016) found that in a town in Eastern Hubei province, with a fall in poverty caused by the increase of income, a rise of poverty caused by overspending became increasingly apparent. Using farmer household longitudinal survey data from two poor villages in Guizhou province, Guo et al. (2017) found that the comprehensive development of participatory communities had significant dynamic poverty reduction effects measured by consumption. Chen et al. (2019) found that there was no poverty among migrant workers measured against the official poverty line; however, considering the high costs of housing, medical care, education, and the lack of long-term stable employment security in urban areas, the migrants' consumption poverty was much worse measured by the urban standards.

The main contribution of this paper is that it compares long-term trends in poverty dynamics of household income and consumption for the period from 1995 to 2018.

III. Data and research methods

This paper attempts to study consumption and income poverty among rural households in China using the rural household survey data of the CHIP in 1995, 2002, 2013, and 2018.[1] The CHIP data surveys have been sampled based on the national household survey pool of the NBS, which is representative of the whole country.[2] One advantage of CHIP data is that the survey contains a more comprehensive record of household income and consumption than the NBS survey. A detailed introduction to CHIP data can be found in Riskin et al. (2001), Li et al. (2008), Li et al. (2013), and Sicular et al. (2020).

Household consumption items in the CHIP data are classified into eight categories, namely food and alcohol and tobacco, clothing, household equipment and services,

[1]We did not use CHIP 2007 rural household survey data because its rural household survey only covered nine provinces and its household consumption variable was somewhat different from the other years' CHIP rural household survey data.

[2]The rural household survey of CHIP data covered 19 provinces: Beijing, Hebei, Shanxi, Liaoning, Jilin, Zhejiang, Jiangsu, Anhui, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Sichuan, Guizhou, Yunnan, Shaanxi, and Gansu in 1995; in 2002 it covered 22 provinces as follows: Beijing, Hebei, Shanxi, Liaoning, Jilin, Zhejiang, Jiangsu, Anhui, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, and Xinjiang; in 2013 it covered 15 provinces: Beijing, Shanxi, Liaoning, Jiangsu, Anhui, Shandong, Henan, Hubei, Hunan, Guangdong, Chongqing, Sichuan, Yunnan, Gansu, and Xinjiang; in 2018 it covered 15 provinces: Beijing, Shanxi, Neimenggu, Liaoning, Jiangsu, Anhui, Shandong, Henan, Hubei, Hunan, Guangdong, Chongqing, Sichuan, Yunnan, and Gansu.

health care, transport and communication, education and culture and entertainment and services, housing, and miscellaneous goods and services. Given that household expenditure on education and health is investment in human capital, we intend to compare overall consumption, which covers all of the categories mentioned above, and basic consumption excluding expenditure on education and health. In terms of income, it consists of wages, net farm income, net income from household non-farm activities, property income, rental value of owner-occupied housing, net subsidies from the state and collective, and other income including private transfer (Khan and Riskin, 2005). In view of the fact that rural houses are mostly used by residents themselves and there are almost no market transactions of houses in rural areas, this paper uses the method proposed by Khan and Riskin (2005) to estimate the rental value of owner-occupied housing, and incorporates it into the residential category. As this paper studies changes in household consumption poverty over the period from 1995 to 2018, it is necessary to adjust household consumption expenditure in other years according to the constant price in 2018. China also has a vast territory and abundant resources and there is a big gap between regions in terms of price level. Studies on China's poverty and consumption gap have long been restricted by the lack of calculation and adjustment of the price difference between regions. This paper has adjusted the relevant variables of the CHIP data on the basis of the price indexes in different regions and different years provided by Brandt and Holz (2006, 2014).[3]

To take into consideration the scale economy effect in household consumption – for example, a family with two members will not consume more heating than another family with only one member – this paper uses the Organisation for Economic Cooperation and Development (OECD) equivalence scale to work out household consumption expenditure (Jappelli and Pistaferri, 2010). Specifically, the family's first adult consumption weight is 1, the other adults' consumption weight is 0.7, and the consumption weight of each minor at or under 16 years of age is 0.5. After the adjustment of the equivalence scale, the per capita overall consumption expenditure of the households increased by 37.3, 34.5, 28.0, and 29.0 percent in 1995, 2002, 2013, and 2018, respectively, whereas the corresponding figures for the per capita basic consumption of the households are 37.2, 34.4, 27.9, and 29.0 percent (Table 1). Without this adjustment, the incidence of consumption poverty would be overestimated.

[3]Brandt and Holz updated their indexes and provided the updated indexes online. They are available from: http://heindehaas.blogspot.it/2014/07/human-migration-myths-hysteria-and-facts.html?spref=fb（online; cited October 2018).

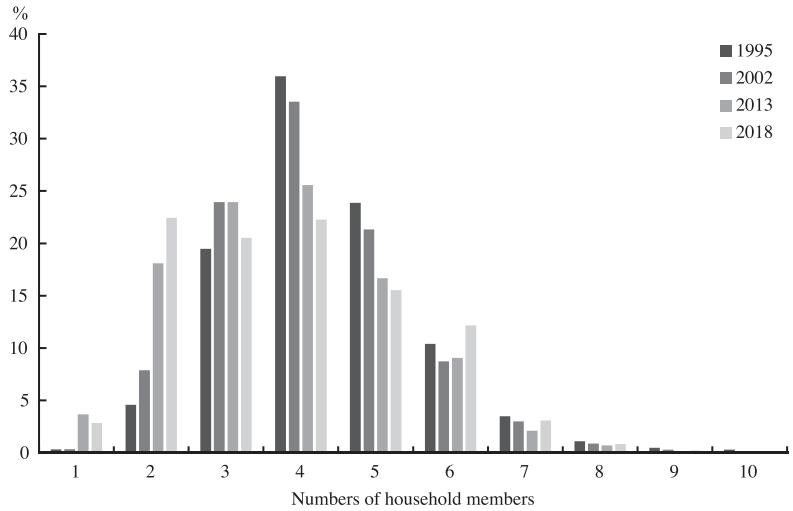
Table 1. Comparison of the per capita consumption of rural households before and after the adjustment of the equivalence scale (RMB) in four surveys

	1995		2002		2013		2018	
	Before adjustment	After adjustment	Before adjustment	After adjustment	Before adjustment	After adjustment	Before adjustment	After adjustment
Overall consumption per capita								
Mean Standard deviation	3,078.53 (2,450.45)	4,228.14 (3,132.97)	3,782.42 (2,668.05)	5,088.00 (3,410.01)	10,598.67 (10,024.54)	13,568.96 (12,192.08)	11,731.59 (14,272.07)	15,131.95 (15,791.02)
Min	359.60	474.16	682.39	973.24	0.00	0.00	1,044.97	1,523.92
Max	84,453.43	99,356.98	101,469.10	126,836.40	445,964.20	524,663.70	1,049,231.0	1,049,231.0
Basic consumption per capita								
Mean Standard deviation	2,830.14 (2,207.19)	3,884.32 (2,834.90)	3,363.25 (2,389.52)	4,520.64 (3,044.81)	8,948.64 (7,950.79)	11,447.18 (9,743.14)	9,249.03 (7,675.93)	11,928.26 (9,574.05)
Min	349.03	470.38	567.26	886.34	0.00	0.00	788.23	1,050.97
Max	84,453.43	99,356.98	100,741.70	125,927.10	111,809.10	131,540.20	167,186.0	167,186.00
No. of households	7,998	7,998	9,200	9,200	9,973	9,973	9,076	9,076

Source: Calculated based on consumption from CHIP 1995, 2002, 2013, and 2018 and equivalence scale.

The difference in the per capita consumption before and after the adjustment decreases with time in both the overall and basic consumption per capita. This phenomenon can be explained by the fact that the average family size in rural China decreased from 4.34 persons in 1995 to 4.13 persons in 2002 and 3.74 persons in 2013, but bounced up a little to 3.80 persons in 2018 (calculated from CHIP data). Figure 1 shows that the number of families with 1–3 members increased with the time, whereas the proportion of the family with 4–5 members decreased with the time.

Figure 1. Household population density in China



Since the reform and opening up, the standard of poverty alleviation in China has been adjusted many times – mainly from RMB100 (RMB366 at 2010 price) in 1978 to RMB530 (RMB807 at 2010 price) in 1990, then again to RMB625 (RMB1,528 at 2010 price) in 2000 and finally to RMB2,300 (2010 price) in 2010 (Xian et al., 2016). This paper uses the official rural poverty standard issued by the Chinese government – a rural per capita net income of RMB2,300 per year (constant price in 2010).[4] The current Chinese official poverty line is higher than the World Bank's US$1.9 per person per day line (2011 PPP).[5] At the same time, to facilitate international comparison, this paper also uses the World Bank's lower middle-income poverty line of US$3.2 per person per day (2011 PPP) to estimate the poverty rate.[6] In addition to using different poverty lines to estimate the rural poverty rate, this paper also carries out a "dominance analysis": the curve of the incidence of poverty is drawn according to the poverty lines, in order from low to high, with the aim of showing that if the poverty rate had been decreasing with time, the poverty incidence curve of the later year would all be lower than that of the previous year no matter where the poverty line is defined (Appleton et al., 2010).

IV. Comparison of consumption and income poverty in rural China

1. Changes and trends in consumption and income poverty in rural China from 1995 to 2018

In general, the CHIP data and the NBS data showed that both the per capita income and per capita consumption had increased rapidly, in particular for the period from 2002 to 2013 (Table 2). The annual growth rate of income per capita is much lower in the CHIP data than in the NBS data, and so is the annual growth rate of consumption per capita. Despite this, the rural residents' wellbeing has been improved significantly. For example, the per capita income and the overall per capita consumption in 2018 are 3.18 times and 3.53 times those of the year of 1995, respectively (calculated from Table 1). The difference between them could be explained by the fact that the household consumption per capita has been adjusted by the equivalence scale.

[4]On 29 November 2011, the Chinese government's conference on poverty alleviation and development was held in Beijing. The Premier, Jiabao Wen, announced that a net income of RMB2,300 per capita would be set as a new poverty line.

[5]According to the PPP, the World Bank's US$1.9 poverty line is about RMB2,274.51 (2013 price), and the International Comparison Program's rural adjustment exchange rate was 3.04 in 2011 (Ferreira et al., 2016), whereas the Chinese official poverty line at 2013 prices is RMB2,756 (the author's calculation).

[6]See http://www.worldbank.org/en/topic/poverty/lac-equity-lab1/poverty/head-count (online; cited February 2019).

Table 2. CHIP and NBS income and consumption growth rate (%)

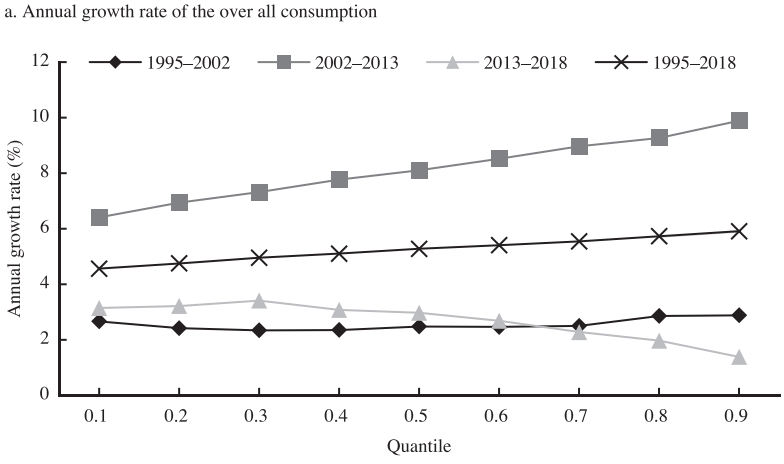
Period	CHIP			NBS	
	Overall consumption per capita	Basic consumption per capita	Income per capita	Overall consumption per capita	Income per capita
1995–2002	2.68	2.19	2.43	4.92	6.65
2002–2013	9.33	8.81	6.85	13.64	12.33
2013–2018	2.20	0.83	5.34	10.13	9.16
1995–2013	6.69	6.19	5.11	10.17	10.08
1995–2018	5.70	6.09	5.16	10.16	11.63

Source: Calculated based on income and consumption from CHIP 1995, 2002, 2013, and 2018, and the net income per capita and consumption per capita from the NBS (available from: https://data.stats.gov.cn/easyquery.htm?cn=C01).

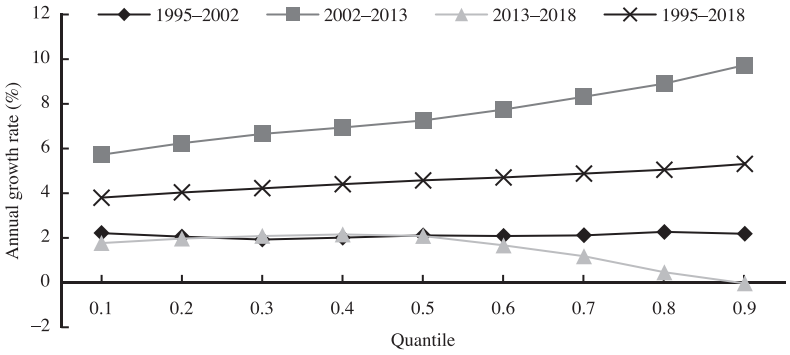
Note: Income per capita data from the National Bureau of Statistics of China (NBS) refer to the net income per capita.

Figure 2 reports the annual growth rate of the overall and basic consumption per capita, and the income per capita. For the period from 1995 to 2018, the annual growth rate of the overall consumption per capita increased from 4.6 percent at the first decile to 5.9 percent at the ninth decile. The annual growth rate of the basic consumption per capita was nearly the same, and the income per capita increased from 3.4 percent at the first decile to 5.6 percent at the ninth decile.

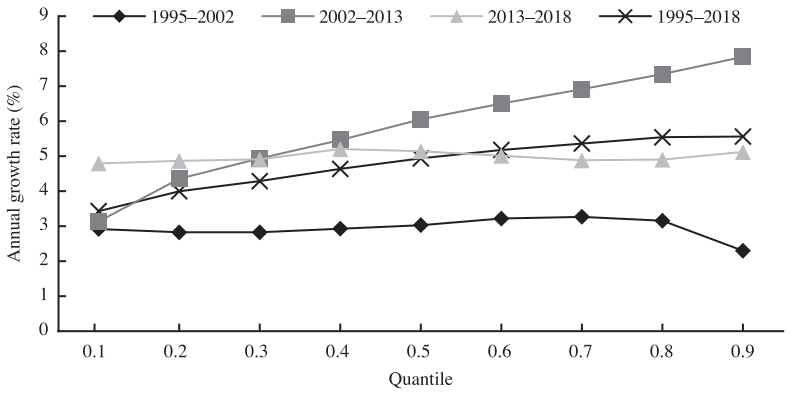
Figure 2. Annual growth rate of the overall and basic consumption per capita, and the income per capita in rural China



b. Annual growth rate of basic consumption per capita



c. Annual growth rate of income



Source: Calculated based on consumption from CHIP 1995, 2002, 2013, and 2018.
Note: The units on the horizontal axis are decile points.

Apart from the fast growth in the consumption level, the structure of household consumption expenditure in rural China has also been changing dramatically from 1995 to 2018. The share of food expenditure in total household consumption was more than halved from 66.98 to 33.80 percent (Table 3). However, by 2018 the share of food expenditure was still higher than 40 percent in about 45 percent of rural households.[7] In the same period, the share of housing increased from 11.78 to 23.33 percent in total consumption, that of transportation and communication from 1.61 to 11.06 percent, that of education, culture and leisure from 4.53 to 7.37 percent, and that of medical care from 2.72 to 9.60 percent.

[7]In OECD countries, the share of food expenditure in total household consumption is less than 25 percent (Economist Intelligence Unit, 2012).

Table 3. Household consumption structure

	1995		2002		2013		2018	
	Overall consumption per capita	Basic consumption per capita	Overall consumption per capita	Basic consumption per capita	Overall consumption per capita	Basic consumption per capita	Overall consumption per capita	Basic consumption per capita
Mean (RMB)	4,228.14	3,884.32	5,087.996	4,520.637	13,568.96	11,447.18	15,131.95	11,928.26
Median (RMB)	3,582.86	3,310.04	4,264.13	3,837.07	10,393.28	8,529.63	12,060.88	9,467.60
Food (%)	66.98	72.09	52.70	58.10	33.71	39.52	33.80	41.98
Clothing (%)	5.64	6.14	4.82	5.37	5.68	6.73	5.27	6.63
Housing (%)	4.00	12.71	2.91	24.32	5.36	35.45	5.79	28.47
House equipment and services (%)	11.78	4.34	22.06	3.22	30.68	6.27	23.33	7.16
Transport and communication (%)	1.61	1.75	4.79	5.34	8.56	10.10	11.06	13.69
Education (%)	4.53		5.25		7.54		9.51	
Health care (%)	2.72		4.23		6.82		9.60	
Other goods and services (%)	2.74	2.98	3.24	3.65	1.64	1.94	1.65	2.07
No. of households	7,998	7,998	9,200	9,200	9,973	9,973	9,076	9,076

Source: Calculated based on species of consumption expenditure from CHIP 1995, 2002, 2013, and 2018.

Note: The data in the table are adjusted for the regional consumer price index provided by Brandt and Holz (2006, 2014).

Similarly, the structure of per capita household income has also transformed from 1995 to 2018 (Table 4). The share of household farming income decreased from 74.60 percent to 43.58.[8] In contrast, the share of wage income increased from 11.91 to 48.76 percent. In 2018, the share of wage income steadily increased from 43.9 percent in the first decile to 50.8 percent in the last decile. The share of owner-occupied housing increased from 6.03 to 11.63 percent and that of government subsidies from 0.39 to 8.29 percent. The share of non-farming own-account enterprises ("*getihu*" in Chinese) remained around 7 percent.

[8]For 1995 it is the sum of the net income from the sold agricultural products of household farming, and the estimated market value of self-produced and self-consumed ("*zichanzixiao*" in Chinese) agricultural products. In the 2013 and 2018 CHIP rural household survey data, the net household income had already included the market value of the self-produced and self-consumed agricultural products; in other words, there is not an independent category of the self-produced and self-consumed agricultural products in the two years' data sets.

Table 4. Household income composition in China

Income per capita	1995	2002	2013	2018
Mean (RMB)	5,299.68	6,271.30	12,994.14	16,857.99
Median (RMB)	4,221.01	5,218.34	10,154.42	13,131.16
Wage income of employed members (%)	11.91	21.63	47.41	48.76
Income from outside companies (benefits, bonuses, etc.) (%)	3.74	0.16	0.65	0.34
Net income from agricultural and non-agricultural activities (%)	45.27	44.95	31.87	26.51
Net income from household farming (%)	38.54	35.51		
Net income from non-agricultural activities (%)	6.43	9.44		
Self-produced and self-consumed agricultural product (%)	29.33	20.51		
Property income (%)	0.30	0.12	0.35	0.81
Imputed rental value of owner-occupied housing (%)	6.03	11.64	11.11	11.63
Subsidies from government (%)	0.39	–0.02	5.83	8.29
Other income (private transfer, etc.) (%)	3.04	1.00	2.79	3.65
No. of households	7,998	9,200	9,973	9,076

Source: Calculated based on income sources from CHIP 1995, 2002, 2013, and 2018.

Note: As mentioned in footnote 8, the values of self-produced and self-consumed agricultural products in 2013 and 2018 CHIP data sets were collected together in the net income of rural households, and it is impossible to distinguish "the net income from household farming" or "the net income from non-agricultural activities" from the net income from agricultural and non-agricultural activities.

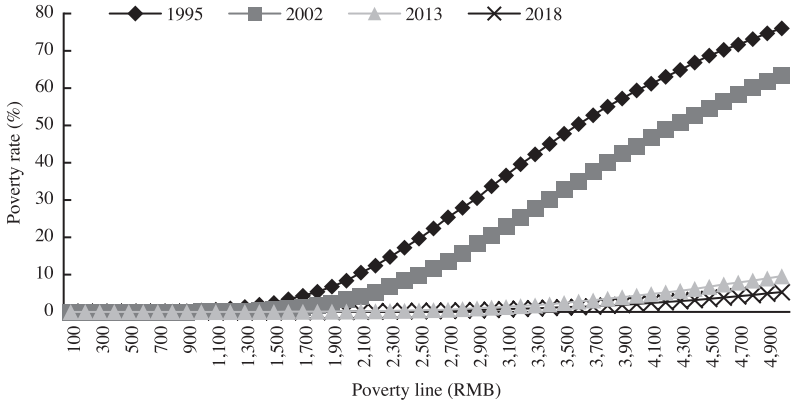
2. Comparison of consumption poverty and income poverty

Here we use per capita consumption after the equivalence scale adjustment. Figures 3 and 4 plot the percentage of rural residents who are poor for different poverty lines in order from low to high. The poverty incidence curve for 2018 is below those of earlier years measured by overall consumption per capita (Figure 3). This implies that the conclusion that absolute poverty has fallen is robust to the location of the poverty line.

In 1995 and 2002, the poverty incidence curve of per capita income was below those for the basic and overall consumption per capita (Figure 4). This indicates that the consumption poverty was more severe than income poverty. However, in 2018, although the poverty incidence curve of overall per capita consumption was still below that of basic per capita consumption, the latter crosses the poverty incidence curve of per capita income at the value of RMB3,900. This means that below this value, income poverty is more severe than that of consumption. In other words, the very poor households relied on saving or borrowing to smooth consumption.[9]

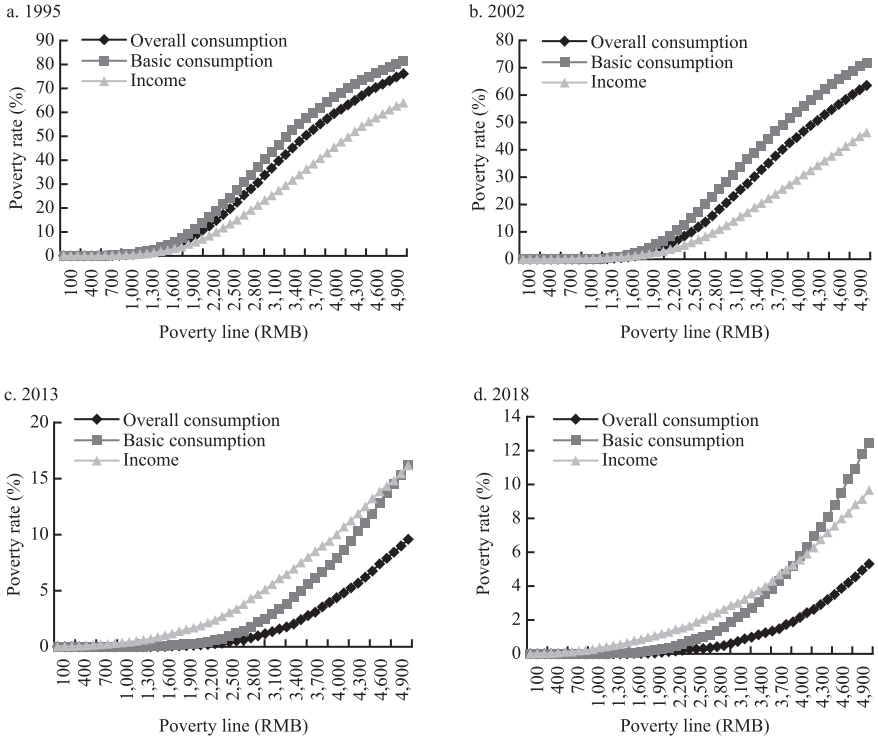
[9]However, when using consumption before the adjustment of the equivalence scale, the income poverty incidence curve crosses that of overall consumption per capita at RMB2,500.

Figure 3. Poverty incidence curves of the overall consumption per capita



Source: Calculated based on consumption from CHIP 1995, 2002, 2013, and 2018.

Figure 4. Poverty incidence curves by years



Source: Calculated based on income and consumption from CHIP 1995, 2002, 2013, and 2018.

However, measuring poverty simply in terms of the headcount of the poor is inadequate, so we use a broader poverty index, i.e. the P-alpha index system proposed by Foster et al. (1984), and the index of poverty is only one of the numerous indexes (when $\alpha = 0$). If the conclusion that the poverty incidence curve is lower in the later years than in the previous years revealed in Figure 3 is correct at any value of α, then any P_α poverty index in 2018 must be lower than the same index in the previous years. In other words, no matter how the poverty line is set, the poverty gap (P_1) in 2018 (i.e. the difference between the per capita consumption expenditure of a poor family and the poverty line) and the squared poverty gap (P_2) must be lower than the corresponding index in 1995, 2002, 2013, and 2018 (Appleton et al., 2010).

Table 5 provides the P_α indexes under different poverty lines. Taking the poverty line of RMB2,300 per person per year as an example, almost all the poverty indexes in the latter years are lower than that of the previous year. In particular, the incidence of poverty P_0 for the overall consumption per capita fell from 33.53 percent in 1995 to 20.49 percent in 2002 and 1.15 percent in 2013, and further to 0.58 percent in 2018.[10] The corresponding figures for basic consumption per capita are 40.30, 28.15, 2.40 and 1.87 percent,[11] and those for the per capita income are 23.06, 12.33, 5.23 and 2.86 percent. The poverty gap P_1 indexes and the squared poverty gap P_2 indexes for overall or basic consumption or income all fell sharply and follow the above patterns in these four years (Table 5).

Apart from using the official RMB2,300 poverty line, we also applied the World Bank's lower middle-income poverty line, which is US$3.2 per person per day based on 2011 PPP. According to this poverty line, the P_0 for the overall consumption fell from 63.02 percent in 1995 to 48.71 percent in 2002 and 5.28 percent in 2013, and further to 2.60 percent in 2018. The corresponding figures for basic per capita consumption are 70.01, 57.95, 9.35, and 6.88 percent for these four years, and those for per capita income are 49.32, 32.33, 11.51, and 6.21 percent (Table 5).

Taken together, we obtain the following two findings. First, the incidence of poverty in rural China fell sharply to below the 5 percent level; so did the poverty gap and the squared poverty gap. Second, in the first two years of observations, 1995 and 2002, the incidence of consumption poverty was more severe than that of income poverty. However, by 2018, income poverty was more severe than consumption poverty. The

[10]According to the authors' calculation, the figures for overall consumption per capita before the adjustment of the equivalence scale are 61.89, 42.13, and 4.55 percent.

[11]According to the authors' calculation, the figures for basic consumption per capita before the adjustment of equivalence scale are 70.81, 55.74, and 8.17 percent.

poverty incidence curves, the poverty gap, and the squared poverty gap show the same trend. The poverty index system under the international poverty line has also shown a similar trend.

Table 5. P_α indexes under different poverty lines (%)

Poverty	1995			2002			2002			2018		
	OC	BC	Inc	OC	BC	Inc	OC	BC	Inc	OC	BC	Inc
RMB2,300 (at 2010 price)												
P_0	33.53	40.30	23.06	20.49	28.15	12.33	1.15	2.40	5.23	0.58	1.87	2.86
P_1	7.75	9.74	5.25	3.80	5.69	2.55	0.18	0.40	1.42	0.10	0.33	0.89
P_2	2.69	3.51	1.82	1.09	1.72	0.89	0.05	0.11	0.65	0.03	0.09	0.44
US$3.2 per person per day (at 2011 PPP price)												
P_0	63.02	70.01	49.32	48.71	57.95	32.33	5.28	9.35	11.51	2.60	6.88	6.21
P_1	19.68	23.12	14.06	12.69	16.55	8.16	0.96	1.89	3.30	0.49	1.38	1.89
P_2	8.18	9.98	5.66	4.57	6.36	3.03	0.28	0.58	1.48	0.15	0.44	0.90
Gini	0.28	0.22	0.289	0.29	0.21	0.26	0.37	0.34	0.515	0.35	0.31	0.44

Source: Calculated based on income and consumption from CHIP 1995, 2002, 2013, and 2018.

Notes: The Chinese official poverty line at the 2010 constant price level is RMB2,300. In terms of purchasing power parity (the rural International Comparison Program (ICP) adjustment exchange rate in 2011 was 3.04 according to Ferreira (2016)), the international poverty line, US$3.2 per person per day (at the 2011 PPP price), is equivalent to RMB 4,193.378 at the 2018 Chinese rural price level. BC, basic consumption per capita; Gini, refers to the Gini coefficient; Inc, income per capita; OC, overall consumption per capita; P_0, the incidence of poverty; P_1, poverty depth index; P_2, poverty depth index square.

In addition to the comparison of the changing trend of consumption and income poverty overt time we explored the disparities between consumption poverty and income poverty. Based on the matrix of consumption and income in Table 6, the relationships between consumption poor and income poor can be classified into four types. First, consumption non-poor and income non-poor. It is certain that these households are not poor. Second, consumption poor but income non-poor (Type 1 poverty). It is possible that these households save for their children's education, marriage, or other contingencies. Third, income poor but consumption non-poor (Type 2 poverty). It is likely that these households suffered from temporary economic shocks (such as a bad harvest or an economic downturn) and relied on their savings or borrowing to smooth their consumption. Fourth, both consumption poor and income poor (Type 3 poverty), or double-poor. There is no doubt that these households lived in poverty.

Table 6. Matrix relationship between income poverty and consumption poverty

Dimension	Income poor	Income non-poor
Consumption poor	Consistent	Not consistent
Consumption non-poor	Not consistent	Consistent

The poor identified by consumption are not consistent with the poor identified by income, and conclusions based on the poverty measured by income are quite different from those based on the poverty measured by consumption. Using overall consumption to define poverty, the incidence of Type 1 poverty fell from 17.12 to 12.12, 0.67 percent, and further to 0.48 percent in the four observation years, and the incidence of Type 3 poverty fell sharply from 16.42 to 8.37, 0.49 percent, and further to 0.10 percent (Table 7).

Table 7. Disparity between the incidence of consumption and income poverty (%)

Dimension	1995		2002		2013		2018	
	Income poverty	Income non-poor	Income poverty	Income non-poor	Income poverty	Income non-poor	Income poverty	Income non-poor
Overall consumption per capita								
Poor	16.42	17.12	8.37	12.12	0.49	0.67	0.10	0.48
Non-poor	6.64	59.83	3.96	75.55	4.59	94.24	2.77	96.65
Basic consumption per capita								
Poor	18.28	22.02	9.88	18.27	0.94	1.50	0.37	1.50
Non-poor	4.78	54.93	2.45	69.40	4.14	93.41	2.49	95.64

Source: Calculated based on income and consumption from CHIP 1995, 2002, 2013, and 2018.

The poverty rate for overall consumption poor but income non-poor fell continually in these four years (Table 8, Type 1 poverty). It implies that certain households have income but choose to consume less for precautious savings and this type of poverty decreased with time. Of the three types of poverty, the share for overall consumption poor but income non-poor first increased but then decreased, which is strongly related to the development of the rural social security system (Table 8, share of Type 1 poverty). During the period from 1995 to 2002, there was almost no social security at all in rural China. The rural residents therefore had to bear the burden of education, medical care, and care for the elderly by themselves, so their preventive saving motivation was strong. Since the 2002 SARS crisis, China has gradually built up its rural social security system, establishing the New Rural Cooperative Medical Insurance, abolishing farming taxes, subsidizing household farming, rural low-income

family allowance, rural retirement pension, and the latest 2020 rooting-out poverty campaign, and undertaking similar measures. The motivation of rural households for preventive savings has therefore been decreasing or their propensity for consumption has been increasing. The income-poor households' propensity for consuming has been increasing over time.

Table 8. Poverty incidence and share of three types (%)

Dimension	1995		2002		2013		2018	
	Overall consumption per capita	Basic consumption per capita	Overall consumption per capita	Basic consumption per capita	Overall consumption per capita	Basic consumption per capita	Overall consumption per capita	Basic consumption per capita
Consumption poor or Income poor	40.17	30.60	24.45	30.60	5.76	6.59	3.35	4.36
Type 1 poverty	17.12	18.27	12.12	18.27	0.67	1.50	0.48	1.50
Type 2 poverty	6.64	2.45	3.96	2.45	4.59	4.14	2.77	2.49
Type 3 poverty	16.42	9.88	8.37	9.88	0.49	0.94	0.10	0.37
Share of Type 1	42.61	48.85	49.58	59.72	11.67	22.83	14.47	34.34
Share of Type 2	16.53	10.60	16.18	7.99	79.79	62.86	82.57	57.07
Share of Type 3	40.87	40.55	34.24	32.29	8.54	14.31	2.96	8.59

Source: Calculated based on income and consumption from CHIP 1995, 2002, 2013, and 2018.

Notes: Type 1 poverty: consumption poor but income non-poor. Type 2 poverty: income poor but consumption non-poor. Type 3 poverty: both consumption poor and income poor.

V. Non-parametric decomposition and parametric analysis of changes in absolute poverty

The non-parametric decomposition and parametric analysis of changes in the poverty index will help us carry out in-depth study of the change trend of rural poverty during the period from 1995 to 2018. In this part, we use the following non-parametric decomposition method and panel data fixed-effect estimation method to study the effect of rural per capita consumption growth on China's rural anti-poverty work.

1. Growth and distribution decomposition

Economic growth contributes to the reduction of rural poverty, while the widening distribution gap is unfavorable for anti-poverty work. According to the method described by Datt and Ravallion (1992), we can decompose the reasons for the change of absolute poverty index into economic growth factors and redistribution factors. The change in rural households' poverty rate index in the period from the year t_1 to the year t_2 can be decomposed as follows:

$$\underbrace{P_{at_2} - P_{at_1}}_{variation} = \underbrace{\left[P_a\left(\mu^{t_2}, \pi^{t_1}\right) - P_a\left(\mu^{t_1}, \pi^{t_1}\right)\right]}_{C_1} + \underbrace{\left[P_a\left(\mu^{t_1}, \pi^{t_2}\right) - P_a\left(\mu^{t_1}, \pi^{t_1}\right)\right]}_{C_2} + R / ref = 1, \quad (1)$$

where $P_{at_2} - P_{at_1}$ is the change of rural households poverty index (a = 0, 1, 2) during the period from the year t_1 to year t_2, C_1 is the change in growth factors, C_2 is the change in redistribution factors, R refers to the residual error, ref = 1 refers to the benchmark year, μ refers to the economic growth factor, and π refers to the distribution factor.

Table 9. Decomposition results of the poverty rate (P_0), poverty gap (P_1), and squared poverty gap (P_2) indexes (%)

Period	Poverty rate (P_0)			Poverty gap (P_1)			Squared poverty gap (P_2)		
	Overall consumption per capita	Basic consumption per capita	Income per capita	Overall consumption per capita	Basic consumption per capita	Income per capita	Overall consumption per capita	Basic consumption per capita	Income per capita
1995–2018									
Growth factors	–33.40	–39.76	–30.31	–7.73	–9.64	–5.20	2.68	–3.48	–1.81
Redistribution factors	8.40	7.98	2.63	4.84	5.55	6.22	2.58	3.15	3.81
Residual	–7.96	–6.64	–7.49	–4.76	–5.33	5.38	–2.55	–3.09	3.40

Source: Calculated based on income and consumption from CHIP 1995 and 2018.

For simplicity, Table 9 provides the decomposition results of the poverty rate (P_0), poverty gap (P_1), and squared poverty gap (P_2) indexes. The results show that the growth of per capita consumption expenditure or per capita income in rural households had an obvious effect on poverty reduction. According to the domestic poverty line of RMB2,300 based on the constant price in 2010, we find that if the rural poor witnessed the same rate of overall consumption growth as the mean value of the sample in the period from 1995 to 2018, China's rural poverty rate would be reduced by 33.40 percent. In other words, the rural poor in 1995 would almost bid farewell to poverty in 2018 if the consumption distribution remained unchanged and the overall consumption per capita kept growing at this speed. In fact, however, the poverty rate dropped by 33.40 percentage points during this period, and this rate of decline is a little lower than that of the incidence of poverty when the distribution situation remains unchanged.

In line with the overall consumption inequality mentioned above, Table 5 also shows that, during the period from 1995 to 2018, the overall consumption inequality increased and had a significant impact on the incidence of poverty. During the period from 1995 to 2018, for example, if the overall per capita consumption did not increase, the worsening consumption inequality would increase the poverty rate by 8.4 percentage points (i.e. the growth rate of poverty rate was up to 8.40% / 33.53% = 25.05%), and the

redistribution factors in the changes of the poverty index during the period from 2002 to 2018 were the most significant.

The decomposition of the basic consumption per capita, the per capita income, and the P_1 and P_2 indexes for consumption poverty or income poverty all reflected roughly the same pattern and trend.[12]

2. Sectoral decomposition

With the development of urbanization in recent years, rural households have continuously expanded their economic activities from farming to non-agricultural production and management, and the poverty rate in rural areas has been declining. We divide rural households' economic activities into four non-overlapping types: households only engaged in farming, households only engaged in non-agricultural activities, households engaged in both farming and non-agricultural activities, and the households whose economic activities are not reported.

Table 10 lists the proportions and poverty rates of the above four types of farmers in 1995, 2002, 2013, and 2018. Given that there is non-overlap between these household groups, the changes in the poverty index can be decomposed into the changes in poverty within the group and the population shift effect between groups (Ravallion and Huppi, 1991). Assuming that there are two population groups (i = 1, 2), the changes in the poverty indexes of each group and the whole countryside during the period from the year t to the year $t + n$ can be decomposed into "intra-group effect," "population shift effect between groups," and "interaction effect":

$$\underbrace{P_{t+n} - P_t}_{variation} = \underbrace{\sum_{i=1}^{2}(P_{t+n}^i - P_t^i)n_t^i}_{E_1} + \underbrace{\sum_{i=1}^{2}(n_{t+n}^i - n_t^i)P_t^i}_{E_2} + \underbrace{\sum_{i=1}^{2}(P_{t+n}^i - P_t^i)(n_{t+n}^i - n_t^i)}_{E_3}, \quad (2)$$

where P_t^i and P_{t+n}^i represent the poverty index in the year t and the year $t + n$, and n_t^i and n_{t+n}^i represents the share of population in the year t and the year $t + n$; $P_{t+n} - P_t$ is the change in the poverty rate of rural households during the period from year t to year $t + n$; E_1 is the intra-group effect, E_2 is the population shift effect between groups, and E_3 is the interaction effect. If households in other groups are reclassified into the groups with a reduced poverty rate due to changes in the category of their economic activities, the interaction effect should be positive.

Since 1995, it has become common for farmers to work in cities or engage in non-agricultural activities locally. Table 10 shows during the period from 1995 to 2018, the proportion of pure farming households declined sharply from 27.94 to 4.78 percent,

[12]To save space, the decomposition result is not reported here.

that of diversified households between farming and non-farming increased slightly from 50.93 to 54.95 percent, and that of pure non-farming increased significantly from 21.13 to 40.27 percent. It indicates that the income generated by non-agricultural economic activities has gradually become the main source of rural households' income. Only the population shift effect for those pure farming households was therefore reducing the incidence of poverty, which outweighed the population shift effect of the other two groups, which were raising poverty, and hence the total population shift effect was still favorable to poverty reduction.

Table 10. Decomposition of rural poverty change by rural households' economic activities (%)

Type	1995				2018			
	Population share	Headcount poverty rate			Population share	Headcount poverty rate		
		OC	BC	Inc		OC	BC	Inc
Pure farming	27.94	39.24	46.76	32.21	4.78	0.23	1.38	10.60
Farming and non-farming	50.93	31.30	38.15	21.26	54.95	0.72	2.37	2.71
Pure non-farming	21.13	31.36	36.92	15.27	40.27	0.43	1.26	2.16
Total	100.00	33.53	40.30	23.06	100.00	0.58	1.87	2.86

Type	The contribution to changes in the poverty rate								
	Population shift effect between groups			Intra-group effect			Interaction effect		
	OC	BC	Inc	OC	BC	Inc	OC	BC	Inc
Pure farming	–9.09	–10.83	–7.46	–10.90	–12.68	–6.04	9.03	10.51	5.00
Farming and non-farming	1.26	1.53	0.85	–15.57	–18.22	–9.45	–1.23	–1.44	–0.75
Pure non-farming	6.00	7.07	2.92	–6.54	–7.53	–2.77	–5.92	–6.83	–2.51
Total	–1.83	–2.23	–3.68	–33.01	–38.44	–18.26	1.89	2.25	1.75

Source: Calculated based on income and consumption from CHIP 1995 and 2018.

Notes: BC, basic consumption per capita; Inc, income per capita; OC, overall consumption per capita; Type, economic activity type.

This period also witnessed a large fall in poverty rates as measured by consumption or income for all the three groups. Consequently, all the three household groups' intra-sectoral effects indicated a large reduction in poverty. Finally, interaction effects for the diversified and the pure non-farming groups caused a reduction in poverty, which outperformed the deterioration in poverty that was brought about by the interaction effect for the pure farming group.

As far as the three sub-periods from 1995 to 2002, from 2002 to 2013, and from 2013 to 2018 are concerned, the change in the proportion and the poverty rate for all

the three rural household groups follows the same trend and patterns within the whole period from 1995 to 2018, so does the population effect or intra-group effect or the interaction effect on poverty for all the three groups.[13]

VI. Conclusion

In this paper we conducted a comparative study of consumption and income poverty in rural China during the period from 1995 to 2018 using CHIP data. We found that the Chinese rural residents' wellbeing improved significantly during the period from 1995 to 2018, and the incidence of poverty fell substantially, whether measured in terms of income or consumption, regardless of the poverty lines.

Specifically, the share of food expenditure in total household consumption was more than halved from two-thirds to less than one-third. The share of household farming income decreased from more than two-thirds to less than a quarter; in contrast, that of wage income increased from a little more than one-tenth to almost a half. In terms of distribution, the per capita income was systematically higher than the per capita consumption at all the nine deciles, and the gap between them increased with the level of income or consumption but decreased over time. This implies that the saving rate of Chinese rural households is decreasing or their marginal propensity of consumption is increasing. Without the adjustment of the equivalence scale, consumption poverty is more severe than income poverty. Consumption poverty is not consistent with income poverty. The double poor (consumption poor and income poor) and the overall consumption poor but income non-poor accounted for the main part of the poor, and the incidence of these two types of poverty was falling sharply.

The decomposition of the change in poverty index into a growth factor and a redistribution factor indicates that it was the substantial growth of consumption or income that brought about the sharp fall in the incidence of poverty, whereas the redistribution of consumption or income in particular during the period from 2002 to 2018 was unfavorable to poverty reduction. The sectoral decomposition demonstrates that a large number of rural household workers moved away from household farming to the local or urban non-farming activities brought about the fall of poverty in the pure farming households, and the sharp fall of poverty within each of the three rural household groups or the inter-group effect delivered the reduction of poverty by a large amount.

The main reasons for the sharp fall in poverty in China since the reform and opening up are the return of land to rural households on long-term lease, allowing rural

[13]To save space, the decomposition result is not reported here.

collectives and individuals to engage in non-farming income-generating activities, and the further integration of hundreds of millions of rural migrant workers into China's industrialization since the 1990s. According to the Chinese development experience, only light-industry-based industrialization, which was participated in by the middle and lower classes, can lead to the rapid reduction of poverty on a large scale (Wen, 2015).

According to Ravallion and Chen (2007), the rural and urban poverty rates were 75.7 percent (using the RMB850 poverty line at 2002 prices) and 6.01 percent (using the RMB1,200 poverty line at 2002 prices) respectively in 1980, and China's urban population takes up 19.39 percent of the whole China's population. That gives the weighted overall poverty rate of China in 1980 as 62.19 percent. Suppose there were no economic development since 1980 and the poverty rate was kept at the level of 1980, then there should have been roughly 868 million population living in poverty in 2018 as China's total population was 1,395.38 million in that year.[14] The rural poverty rate reported in this paper is 2.86 percent against the much higher official poverty line of RMB2,300 (in 2010 prices) in 2018, at which time the rural population was 564.01 million. Based on the estimation of this paper there were 16.13 million rural people living in poverty, and the number of the urban poor should not be more than that of rural. Therefore, there is no strong evidence against the argument that 800 million people have been lifted out of poverty since the late 1970s.

After 40 years' industrialization and urbanization in China, there are still 570 million rural residents (Chen, 2019) whose Engle coefficient of food consumption lags behind that of the urban residents by 10 years (Tang and Xia, 2019). Given China's vast size and huge population, there are still hundreds of millions of people living in impoverished areas, such as the southwest mountainous regions, where bad geographic conditions deprive the ethnic minorities of better communication and education and medical care, and the desert-ridden northwest where there are shortages of drinking water, hospitals, schools, and decent job opportunities. Although China eradicated poverty by the end of 2020, poverty will definitely emerge again. Natural disasters, such as floods, earthquakes, pandemics, bad harvests, and so forth, can instantly send tens of millions of vulnerable rural residents back into poverty. In short, China still has a long way to go in terms of providing its vast population with a secure and decent life.

[14]China's population figure for 2018 is from the official website of the National Statistics Bureau of China, available from: http://data.stats.gov.cn/easyquery.htm?cn=C01&zb=A030601&sj=2013 (online; cited February 2020).

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