RECONCILING THE CONFLICTING NARRATIVES ON POVERTY IN CHINA

Shaohua Chen
Martin Ravallion

ABSTRACT

The widely held view that China has greatly reduced income poverty over the last 40 years does not accord with all the evidence. The paper tries to reconcile the conflicting findings. The fact that strongly-relative measures show rising poverty is easily understood, since such measures depend solely on relative distribution, and inequality in China has been rising until recently. More surprising, and revealing, is the story told by the official lines, which were revised twice since the original 1985 line. The paper shows that the official lines are neither absolute nor strongly relative. Rather, they are weakly relative, with a positive elasticity to the mean that is less than unity. Along with rising inequality, this feature slowed the pace of measured poverty reduction when compared to absolute measures. Nonetheless, substantial progress against poverty is indicated, as we confirm using our independent, and higher, weakly-relative lines calibrated to cross-country data.

Shaohua Chen
Gregory Chow Center for Economic Research
Xiamen University, China
shchenzhao@gmail.com

Martin Ravallion
Department of Economics
Georgetown University
ICC 580
Washington, DC 20057
and NBER
mr1185@georgetown.edu

1. Introduction

The prevailing narrative today is that China has been hugely successful against poverty since soon after its reforms began in 1978.[2] Figure 1 gives China's income-poverty rates implied by the World Bank's $1.90 a day poverty line at 2011 purchasing power parity (PPP).[3] The national poverty rate fell from almost 90% in 1981 to under 4%.[4] (Figure 1 also gives consumption-based measures when possible.) That implies over 800 million fewer people living below the World Bank's poverty line. In terms of sheer numbers of people this is undeniably the best performance against poverty that we have seen in the developing world.[5]

It appears to have gone largely un-noticed that this often-heard narrative of China's success against poverty is not exactly what China's own official poverty lines tell us. As we will show in this paper, China's official poverty lines, as set by the government's National Bureau of Statistics, suggest much less progress. Judged by the official poverty lines, the number of people deemed to be living in poverty fell by about 400 million over the last 40 years. The discrepancy is even more striking if one starts the clock in 1985, when the country's first official poverty line was set, and after the sharp reduction in poverty in the wake of the agrarian reforms introduced by Deng Xiaoping. Since 1985, around 650 million fewer people in China live below the World Bank's line, yet (as we will show) that is true of only about 140 million people using the official poverty lines.

Even more striking is the difference between the prevailing narrative of poverty reduction in China and that told by the various measures of relative poverty found in the

---

[2] 1981 is the earliest year for which credible survey-based estimates of poverty measures are possible. Official reports on the incidence of poverty in the pre-reform period are considered to be substantially downward biased (see, for example, Yao 2000).

[3] One difference with the standard PPPs produced using the prices collected by the International Comparison Program (ICP) is that we allow an urban-rural difference in price levels following Ravallion and Chen (2010). The national consumption PPP for 2011 is 3.70 Yuan per $ while our urban PPP is 3.90 and the rural PPP is 3.04. We apply this allowance for higher cost-of-living in urban areas in all measures of poverty and inequality in this paper.

[4] The $1.90 line in 2011 prices is an update of the $1.25 a day line proposed by Ravallion et al. (2009), the update being to adjust for inflation in the set of low-income countries used to anchor the $1.25 line; further details on how this was done can be found in Ferreira et al. (2016). The calculations in Figure 1 use the income distributional data produced by the National Bureau of Statistics, as described more fully later in this paper. The consumption-based measures in Figure 1 are also available for 2015 and 2016 from the World Bank's *PovcalNet* database but the required income distributions are not yet available for those years. Also note that the sharp reduction in China's poverty measures between 2012-2013 and later years in *PovcalNet* is probably due to the changes of survey method as well as this difference in the type of data. For further details on the World Bank's methods and tests of robustness to its assumptions see Chen and Ravallion (2010).

[5] Other countries, such as Malaysia, appear to have done better over the longer term in terms of the annual rate of decline in the proportion of the population deemed to be living in poverty (Ravallion 2020b).

literature. These measures set the poverty line at a constant proportion of the mean or median—giving what Ravallion and Chen (2011) dub "strongly-relative" measures. Such measures suggest no progress in reducing poverty, and even a rise in the poverty rate over time until quite recently.

The paper tries to explain the striking inconsistencies in these different pictures of China's progress against poverty. In the process, something important is learnt about poverty measurement in rapidly developing countries where the idea of what "poverty" means evolves over time, but not in the way suggested by strongly relative measures.

It would surely be surprising if the same real line could be as socially relevant in the China of 2020 as that of 1980; average income has roughly quadrupled in China over this period. One clue to how standards for defining "poverty" might have evolved in China is found in subjective well-being data. Self-assessed average "satisfaction-with-life" in China has not increased much, if at all, since 1990, despite the substantial economic growth (Easterlin et al. 2017). One might conclude that "money does not buy you happiness," but that is inconsistent with the evidence for China (and elsewhere) that self-assessed welfare rises with higher income (Clark et al. 2019; Wang et al. 2020). The more plausible explanation is that the idea of what it means to be "satisfied" or not with one's life has changed with economic development. There is also evidence of social (positional) effects on behavior even in relatively poor rural areas of China (Brown et al. 2011).

The urban-rural profile of poverty is also clouded by relativist considerations. Poverty comparisons that adjust only for differences in price levels have long shown that poverty measures are higher in rural areas of developing countries, though with a tendency for poverty to urbanize over time.[6] This is true in China, as is evident in the urban-rural breakdown of the poverty rates in Figure 1, which also suggests that poverty has virtually vanished in urban China (under 0.5% since 2009).[7] However, while there is clearly rising awareness in China of living standards in other places besides where one lives, it can still be expected that urban residents tend mostly to judge their welfare relative to urban comparators, and similarly for rural residents. On considering the implications of such relativism for urban-rural poverty comparisons, is it still true that poverty measures are higher in rural China?

---

[6] Evidence on this point can be found in Ravallion et al. (2007).
[7] This allows for a higher cost-of-living in urban areas, as adjusted through the PPP differential note in footnote 3.

Setting poverty lines is often influenced by politics, and there can be considerable political inertia in updating the poverty line in real terms, as has been famously seen in the U.S., where the real value of the national poverty line has not changed since 1965, despite arguments from critics that the line has lost relevance over time.[8] These political influences on setting and updating national poverty lines are unlikely to be absent in China. Nonetheless, the government has updated its national lines (in real terms) twice since the first official line in 1985.

The following section provides some background on poverty measurement, drawing on the literature for both developed and developing countries, including the papers that have estimated strongly relative measures for China. Section 3 examines China's official poverty lines. Section 4 provides our estimates of the implied income poverty measures and tries to better understand the discrepancies between our results and prevailing assessments of progress against poverty based on absolute lines, such as the World Bank's. Section 5 provides another perspective on the issue, independent of the official lines, but drawing instead on evidence from global poverty-line comparisons. Section 6 concludes.

2.   Relative poverty measures in the literature

We follow common usage in the literature in defining "absolute" poverty as having an income no greater than a line with (as best can be determined) fixed purchasing power, while a "relative" measure is defined with reference to a line that varies positively with average incomes across the relevant settings. Note, however, that this usage does not assume that "income" is a sufficient statistic for welfare (though it does assume that higher income, *ceteris paribus*, yields higher welfare). And it can be agreed that welfare is the more appropriate space for defining poverty. Thus, a guiding principle in thinking about monetary poverty lines is that they should be absolute in the space of the concept of individual welfare that one uses in saying that one person is "better off" than another. Then all poverty measures can be said to be absolute in the space of welfare, which may well require relative measures in the income space.[9]

Indeed, it has long been argued that fixed real lines do not keep up with how standards for defining poverty evolve over time in growing economies. In an early contribution (with

---

[8] See the discussions in Citro and Michael (1985) and Blank (2008).
[9] This point was made by Sen (1983) where he defines "welfare" in terms of human capabilities. Thus, "…an absolute approach in the space of capabilities translates into a relative approach in the space of commodities" (Sen, 1983, p. 168).

4

reference to the U.S.), Fuchs (1967, p.89) argued that ".. all so-called 'minimum' or 'subsistence' budgets are based on contemporary standards which will soon be out of date." But how should poverty lines be updated? Fuchs (1967) was the first to propose an explicitly relative line set at 50% of the current median income. The Fuchs proposal was not adopted for official poverty measures in the U.S. but has been used extensively in Western Europe, and is the most common method in the OECD and Eurostat, and is also used by a number of national governments in the OECD (though 60% of the median is more common than 50%).[10] Atkinson (1998) used the Fuchs method in describing poverty in Europe. Measures anchored to the mean have also been used at country level, such as in the U.K. (Atkinson 1998). Nor has the use of such measures been confined to relatively rich countries. The Sustainable Development Goals of the United Nations include reducing the share of the population living below 50% of the median. OECD researchers have estimated such measures for many developing countries (Garroway and de Laiglesia 2012).[11] The Fuchs method can be given an economic interpretation as the welfare-consistent monetary line assuming that welfare depends on relative income, interpretable as what Runciman (1966) called "relative deprivation." This implies that the monetary line has an elasticity of unity with respect to the median or mean.[12]

There have been examples of the use of strongly relative measures for China.[13] Yang and Chui (2010) estimate the share of the rural population living under 40% of median income using a regression model based on the Gini index calibrated to data for OECD countries. This method shows a rise in the relative poverty rate for rural China since 1978, in line with the rise in inequality.[14] However, there is no obvious reason why the relationship between the relative poverty measure and the Gini index found among OECD countries would also hold over time in rural China. Appleton et al. (2010) and Li and Sicular (2014) use 50% of the median income in poverty measures calculated from survey data for China. By this measure, Appleton et al. (2010) find a rising relative poverty rate in urban China over 1988-2012, from 3% to 10%. Li

---

[10] Examples can be found in Smeeding et al. (1990), Blackburn (1994), Atkinson (1998), Eurostat (2005), Nolan (2007) and OECD (2008, Chapter 5)..

[11] Another example is found in Atkinson and Bourguignon (2001).

[12] To see why, suppose that welfare is given by $u = u(y/m)$ where y is "own-income" and m is mean income of the relevant comparison group in assessing relative deprivation, with the function u continuously and strictly increasing and unchanging. Let the minimum level of welfare to not be considered "poor" be $\bar{u}$. Then the required monetary poverty line (z) is defined implicitly by $\bar{u} = u(z/m)$. Inverting this, $z = k.m$ where $k \equiv u^{-1}(\bar{u})$.

[13] Gustafsson and Zhong (2000) also use 50% of the median in their base year (1988) but then fix the real value of that line over time, making their measures absolute not relative.

[14] On the rise in inequality see Khan and Riskin (1998), Ravallion and Chen (2007) and Li and Sicular (2014).

and Sicular find almost no change in their relative poverty rate between 2002 and 2007 (a small increase from 13.2% to 13.3%.). By contrast, the absolute measures (also provided in all three of these studies) show a marked decline in the poverty rate.

There are a number of concerns about these strongly relative measures of poverty, following the Fuchs proposal. Such measures violate two theoretically appealing axioms for any measure of poverty. The first says that individual welfare depends (positively) on both "own-income" and relative income, while the second says that if all incomes increase (decrease) by the same proportion then an aggregate poverty measure must fall (rise).[15] The first axiom is consistent with a body of research across multiple disciplines (as reviewed n Clark et al. 2008). The second axiom is appealing on theoretical grounds, as discussed in Ravallion and Chen (2011), who dub it the weak relativity axiom. A related concern about strongly relative measures in the context of poor countries is that they imply implausibly low poverty lines. 50% (say) of the rural mean for China implies a poverty line of $0.50 a day for 1981—almost certainly well below the income needed to survive for more than a short period of time.[16] Nowhere, to our knowledge do we find poverty lines that low.

An alternative approach to relative poverty measurement that satisfies both axioms is to use what Ravallion and Chen refer to as weakly relative lines, which rise with the mean (or median) but with an elasticity less than unity.[17] For linear relative poverty lines (linear in the mean or median) this simply requires a positive intercept, interpretable as minimum possible line, which can be taken to no less than survival requirements. Thus, one can assure that the poverty line cannot fall to an unacceptably low level in poor places or times.

Nor is the strong relativity embodied in the Fuchs method likely to be shared by other methods that also embody concerns about relative poverty. One strand of the literature on these alternative approaches emphasizes the (relative) costs of social inclusion, as in, for example, Townsend (1979). These approaches need not imply a poverty line that is directly proportional to the mean or median, yet it is still a relative line. Meng et al. (2005) provide poverty measures for urban China in which the poverty line is re-calculated at each date using the methods

---

[15] Note that the failure of the second axiom holds for a large class of poverty measures that are homogeneous of degree zero between the poverty line and the mean.

[16] Lindgren (2015) estimates that the survival level of income at 2005 PPP would be $0.65 a day, which would be about $1.00 a day at 2011 PPP.

[17] In the literature, proposals for poverty measures with this feature have been made by Kakwani (1986), Foster (1998), Ravallion and Chen (2011, 2019) and Ravallion (2020b).

proposed in Ravallion (1994). These can also be interpreted as weakly relative lines, with a more generous allowance for non-food goods as food demand behavior shifts over time as an economy develops and new options for non-food consumption emerge, and more expensive calories are consumed.

The welfarist case for weakly relative measures rests crucially on the first axiom above. As noted, if the welfare function is independent of own income given relative income then we have the strongly relative lines. However, while it is reasonable to assume that people care about relative income, it is implausible that they do not care about their own income at given relative income. Thus, welfare-consistent poverty measures have the property that the elasticity of the poverty line to the mean is positive but less than unity.

Uncertainty remains about just how much weight should be attached to relativism. It can be argued that absolute and weakly relative lines are the lower and upper bounds to the true welfare-consistent poverty line (Ravallion 2020b). The need for bounds arises from uncertainty about the extra real income needed to attain a given level of welfare as an economy develops. If no extra income is required then an absolute line is defensible, while if a higher real income is needed to attain the same level of welfare (either to avoid relative deprivation or to cover higher costs of social inclusion) then a weakly relative line is implied. By this reasoning, strongly relative lines only emerge as the limiting case in which welfare depends only on relative income. And absolute lines only emerge in the opposite limiting case in which relative income does not matter to welfare given own income.

3.   China's official poverty lines

The Government of China—specifically its National Bureau of Statistics (NBS)—has only set official lines for rural areas. This reflects the longstanding view that poverty in China is mainly found in rural areas. Clearly they become questionable when there are concerns about relative poverty. Even focusing solely on absolute poverty, the scale and nature of the migration seen from rural areas to urban areas over the last 40 years suggests that we can expect to see an urbanization of poverty, as demonstrated by Ravallion et al. (2007). In this section we will focus on the official lines, recognizing that they are intended for use in rural areas, although when we apply them to urban distributions of income we will allow for a higher cost of living in urban

areas. Section 5 will return to the question of how urban-rural comparisons of relative poverty have evolved.

For absolute poverty measures, the poverty line is adjusted over time using the implicit deflator in NBS's annual series of nominal lines corresponding to the current official line. Since the food share of total expenditure is higher for poorer households, the standard consumer price index (CPI) is re-weighted by NBS to have a higher food share for the poor based on household survey data. Figure 2 compares the implicit deflator with the rural CPI. The divergence since about 2006 reflects the rising relative price of food.[18]

There have been three official poverty lines, set in 1985, 2000 and 2011, which is the current official line.[19] Using the implicit deflator to convert to 2011 prices and then converting to $PPP, we obtain the three lines in $ per person per day as given in Table I, Column 2. For example, the $0.98 per day figure is obtained by converting the 1985 line of 206 Yuan per year (in 1985 prices) to 2011 prices which gives a line of 1084, and then converting to $'s using our 2011 PPP for rural China of 3.04 (and then diving by 365 days per year).[20] The 1985 official line was used for the official poverty measures for the 1980s and 1990s, only updated for inflation.

The 1985 line was designed to assure that a person could afford a food bundle that attained 2100 calories per person per day.[21] However, the monetary value of the 1985 line could only assure that caloric intake by consuming a very frugal diet, with a large share of coarse grains, starchy vegetables with little variety (mainly potatoes), low allowances for protein and other food items and a high food share, and (hence) low allowance for non-food needs. As living standards rose generally, the 1985 line was clearly seen to be out of step with what poverty meant

---

[18] Over the period 2000-2018 the food component of the rural CPI rose by 133% as compared to 56% for the overall CPI.

[19] These are the dates at which the lines were set by the statistics office and the line was denominated in the prices of that year (although the 1985 line was originally denominated in the prices of 1978). The survey data used were from the year before each of these dates. The 2000 line is referred to as the "2008" line in some places; that is because the 2000 line was originally called a "low-income line" to aid the transition to the new line in public discourse. In 2008 it started to be referred to as the "poverty line."

[20] Recall from footnote 3 that our rural PPP for China is lower than the standard national consumption PPP from the 2011 ICP to allow for lower prices in rural areas, following Chen and Ravallion (2010).

[21] Some documents say that this line allows 2400 calories a day. However, that is only the case if one uses the "planning" prices for public procurement (historically set below market prices) to calculate the calorific values of the poverty line. (This is evident if one compares the unit values for 1985 reported in Xian et al. 2016 with those in Park and Wang 2001.) For further discussion of the issues with the original official poverty measures based on the 1985 line see Chen and Ravallion (1996).

in China. This was argued explicitly by the Government's statistics office when it came to revising the line. A document produced by staff of NBS refers to the need to "..re-estimate the food and nonfood expenses to adopt higher poverty standards to meet basic living needs in different periods according to the economic and social development" (Xian et al. 2016, p.10).

The revised official lines were also anchored to 2100 calories. The food bundle for 2011 comprised (per person) 0.5kg of foodgrains, 0.5kg of vegetables 0.05kg meat or 1 egg, and small amounts of cooking oil and seasoning (Xian et al. 2016). In the aggregate, the quantities of these main food groups appear to have changed little between different official poverty lines.[22] What changed was the quality of the diet rather than the quantities under these broad headings. This is most evident when we compare the real values of the average prices used for vegetables. The quantity of vegetables was similar in the 1985 and 2011 bundles at about 0.5kg per person. However, when deflated by the implicit price index in the 2011 poverty lines, the price used for the 1985 poverty line was only 40% of that used for the 2011 line.[23] This undoubtedly reflects a more varied and expensive basket of vegetables implicit in the 2011 line.

Lower food shares were also used in the revised lines, implying a more generous allowance for nonfood goods.[24] Xian et al. (2016) say that the food share in the 1985 line was 85%. By contrast, in 2014 prices, the current (2011 base) poverty line is 2800 Yuan, in which nonfood goods count for 47%. The 2011 line does not only aims to guarantee adequate food and clothing for the rural poor, it also includes allowances for basic education, health care and housing (Xian et al. 2016). When converted to 2011 prices and $PPP, the 2011 line is $2.29.

While China's official poverty lines are not explicitly anchored to average income, our review of the methods used in setting the lines points to two main ways that their real value could increase with higher average incomes. The first is that we can expect to see a more varied and more expensive diet in reaching caloric requirements (even when the latter remain fixed).

---

[22] We say "appear" here because there is some uncertainty about what the precise bundle of foods was in the original 1985 lines, with (modest) disparities between some descriptions. For example, the food bundles reported in Chen and Ravallion (1996) differ slightly from Park and Wang (2001), yet both cite NBS sources. It is unclear why such differences exist, though for our purposes it suffices to only know the overall monetary poverty line about which there is no uncertainty.

[23] This calculation is based on the prices in Xian et al. (2016, Table 1). The price index for 2014 is 5.809 times that for 1985, implying a 1985 price for vegetables of 1.16 Yuan/kg in 2014 prices, as compared to the price of 2.96 Yuan/kg in the bundle used for the 2011 line. The real values of the prices used for grain and meat were similar.

[24] The allowance for nonfood needs was anchored to the food Engel curve in a neighborhood of the food poverty line using the method proposed in Ravallion (1994). For further discussion of this method and alternatives see Ravallion (2016, Chapter 4).

Secondly, with rising average income we tend to see new nonfood goods and services being broadly consumed in the society; an example is the cell phone, which was not available in China until 1987 but might well be considered essential today. Thus, we can expect to see a decline in the share of spending devoted to food, including in a neighborhood of the food expenditure at which nutritional requirements are met. Combining these two effects, we can expect to see rising food and nonfood components of the poverty line as an economy develops.

This is confirmed by a comparison of the real values of the official poverty lines for rural China, as given in Table I. The poverty line fell as a share of mean income from 0.64 in 1985 to 0.36 in 2011. The real value of the poverty line rose by 134% over 1985-2011. Over the same period, the value of mean income in rural areas rose by 312%, implying an elasticity of the poverty line to the mean of 0.43. The elasticity is higher for the second period (2000-2011) than the first (1985-2011). Over 2000-2011, the elasticity is 0.59.

China is not unusual among developing countries in the relativism of its national poverty lines. The elasticity of China's official lines to mean income that we find above is not very different from the average elasticity of the national poverty lines to the mean of 0.52 (with a robust s.e.=0.04; n=598); this is the estimate made in Ravallion (2020b) using the panel data on implicit national poverty lines in a regression of the log poverty line on the log mean including county fixed effects (so the elasticity is only identified from the time series variation).[25]

Notice that, while the ratio of the official poverty line (z) to the mean (m) falls over time, the ratio $z/(m + 2)$ (with both z and m measured in $ per day) is quite stable (Table I, Column 4) with a mean of 0.276 (and a standard error of only 0.001). So $0.276(m + 2)$ provides a good characterization of the official lines (Table I). In contrast to strongly relative lines, this has a positive lower bound, namely $0.55 a day at $m = 0$.

4. Implications for measuring poverty

We apply the official poverty lines described above to data from the national household surveys produced by China's NBS spanning 1981-2016. An immediate problem faced is that the

---

[25] Ravallion (2020b) used a data set on implicit national lines produced by Jolliffe and Prydz (2017). Implicit national lines are estimated by numerically finding the quantile of reported national poverty rates.

micro data are not publicly available.[26] The time series of income distributional data we have used are from annual China household survey yearbooks (NBS various years b,c). Before 2013, the data are from China's separate rural/urban household survey yearbooks. These yearbooks provide the percentage of households in each income group ranking by per capita income and the average per capita income in each income group (weighted by household size and sampling expansion factors). Fortunately, the yearbooks also give the average household size in each income group, so that the percentage of households can be converted into percentages of individuals to form the income distributions.[27] We will also provide consumption-based measures, which are available for selected years in *PovcalNet*.[28]

Prior to 2013, China's National Bureau of Statistics had implemented separate urban and rural household surveys. These were integrated in 2013 into a single national survey. This involved multiple changes to achieve a national sample frame and a common questionnaire. The sample frame switched from being registration ("hukou") based to census based and rural migrant workers who had been in the city more than six months were re-classified as being members of the urban population. Another important change in the survey (in this context) is that from 2013 onwards imputed rents were included for owner-occupied housing in the aggregates for consumption and income. This reduced measured inequality in rural China, where most people own their own home. Some of the decline in measured poverty after 2013 reflects this change in the primary surveys. Comparisons over the period up to the date at which the current official poverty line was calculated, 2011, are not affected.

We will base our poverty measures on disposable incomes, following common practice for China. One difference with recent official practice is that NBS has also used a consumption filter, whereby a household is deemed poor if both its income and consumption is below the poverty line. We cannot implement this method without access to the micro data.

---

[26] Micro data are available from other surveys, including that done for the Chinese Household Income Project (CHIP), as used by Khan and Riskin (1998), Gustafsson and Zhong (2000), Appleton et al. (2010), Li and Sicular (2014) and Zhang et al. (2014). However, the options such as CHIP lack the coverage over time that we desired.
[27] After 2014, the yearbooks only provide five groups of average per capita income, each containing 20% of households. From previous years, we know that average household size declines from the poorest quantile to the richest when ranking by per capita income. In general, the poorest 20% of households contains about 22% of people, while the top 20% of households has roughly 16% of the population. Without this adjustment one will underestimate income poverty.
[28] The data for China in the 1980s in *PovcalNet* are hybrid estimates combining income distribution data with data on the consumption means by year. For consistency, we do not use these data in our calculations.

To estimate poverty and inequality measures from the available grouped distributional data we use parameterized Lorenz Curves.[29] After testing alternative parametric forms, we found that the two best specifications were the General Quadratic form (Villasenor and Arnold 1989) and the Beta form (Kakwani 1980). In each case we chose the better specification of the two in terms of fit.

The summary statistics in Table II include our estimates of the national Gini index. Figure 3 plots our estimates of the national, rural and urban Gini indices.[30] (Consistently with our adjustment for PPPs, we assume a 28% higher cost-of-living in urban areas in 2011. Thus, we obtain slightly lower Gini indices than others, including NBS.) It is notable that the inequality index at the national level did not rise in all periods; indeed, it fell in the early 1980s and mid-1990s (as discussed further in Ravallion and Chen 2007). We also see a reversal in the rising trend around 2008.

Our estimates of the absolute poverty rates for China over the entire period using each of the official poverty lines—held constant in real terms over time and allowing for a higher cost-of-living in urban areas consistently with our other measures—are found in Table II and Figure 4. All three lines show a marked reduction in absolute poverty rates. This is especially pronounced in the early 1980s for the lower lines, consistent with the emphasis given to pro-poor agrarian reforms in that period (Ravallion and Chen 2007). Using China's current official line of $2.29 a day in 2011 prices, the poverty rate has fallen from 94% in 1981 to 4% in 2014.

A troubling feature of the absolute measures plotted in Figure 4 is that the poverty rate at date t is not being judged by the official definition of what "poverty" meant at date t. We can, of course, question whether the official lines were appropriate at the time they were set. However, they were the official lines at the time. In measuring poverty in China over these 40 years

---

[29] Once we have a continuous (differentiable) Lorenz curve, $L(p)$ giving the share of total income held by the poorest $p\%$, we can retrieve the Gini index by integration and we can calculate the cumulative distribution function (CDF) and thus the poverty rate and "higher-order" poverty measures using the fact that $y = L'(p)\mu$ is the quantile function (inverse of the CDF). Datt and Ravallion (1992) provide the formulae for various poverty measures implied by these Lorenz curves.

[30] Note also that the national Gini index is not a weighted mean of the rural and urban indices but also reflects the inequality between urban and rural areas and a component reflecting the overlap in the distributions (Lambert and Aronson 1993). Rural and urban Lorenz curves are aggregated as follows. Let $L_r(p_r)$ and $L_u(p_u)$ denote the rural and urban Lorenz curves respectively. For a given p_r one can find the corresponding p_u by inverting $L_u(p_u) = L_r(p_r)\mu_r/\mu_u$. (In cases outside the region of common support, the relevant p is set to zero and the other is renormalized.) For any pair (p_r, p_u), the corresponding national proportion is $p = n_r p_r + n_u p_u$, while the cumulative share of national income is $[n_r \mu_r L_r(p_r) + n_u \mu_u L_u(p_u)]/\mu$ where μ is the national mean. Thus, we generate a set of points on the national Lorenz curve and then calculate the Gini index by integration.

according to the official lines, it would then be a defensible option to use the official line for each date rather than the line of some other time period when the official idea of what "poverty" meant was different, in keeping with differences in overall living standards.

Applying the official lines to the rural income distributions at the three dates of the official poverty lines we get the results in Table III. Across these three years, we see a decrease in the rural poverty rate (% below the official line for that date) but increases in the two poverty gap indices when we use incomes. The latter finding does not hold when we switch to consumption though consumption-based measures are not available prior to 1990. The consumption-based measures show a reduction in the poverty rate using the official lines for all three measures (Table II).

While the official poverty lines are for rural areas, it is of interest to see the corresponding measures for urban areas, as also given in Table III.[31] The poverty numbers are markedly lower than for rural areas. We see the urban poverty rates and poverty gap indices rising over 1985-2000 and falling subsequently; the squared poverty gap (SPG) rises over the whole period.[32]

When we aggregate the rural and urban poverty measures (using population shares) we obtain the measures in Columns (9)-(11) of Table II. We see a decline in the national poverty rate—from 19% in 1985 to 8% in 2011—and we now see a modest decline over time in the poverty gap index, but a rise in the squared poverty gap index. The consumption-based measures show a decline over 2000-2011.

To give us an idea of what the time series of relative measures anchored to the official lines looks like, Table II and Figure 5 give the income poverty rates implied by our schedule of predicted lines calibrated to fit the official lines over 1981-2014 as given in Column 6 of Table I, but now calculated for all years. (We also give national results using consumption distributions when available.) We still see the pronounced reduction in the poverty rate in the early 1980s but a much slower pace of decline from the mid-1980s onwards. We also see a reduction in poverty measures in the mid-1990s, which appears to be largely attributable to a reduction in the implicit taxation of farmers associated with the use of foodgrain procurement

---

[31] Note that this allows for a higher cost-of-living in urban areas, consistently with our other calculations.

[32] The squared poverty gap index weights individual poverty gaps among the poor by the gaps themselves, thus making the measure sensitive to inequality among the poor. This index was proposed by Foster et al. (1984).

prices set below market prices (Ravallion and Chen 2007). The urban poverty rate shows a trend increase. Note, that the rise in the urban poverty rate in 2013/14 could well be due to the aforementioned change in survey design, whereby migrants to urban areas (living in urban areas for six months or more) were counted as members of the urban population, starting in 2013.[33] The consumption-poverty rate fell from 32% in 1990 to under 15% by 2016.

Comparing Figures 4 and 5 we see that the upward revisions to the real value of the official poverty lines came close to counteracting the effect of declining absolute poverty measures. Comparing 1985 and 2011, using the official lines for each date, the poverty rate fell by 7.8 percentage points. If we hold the 1985 poverty line constant it falls by 19.8 points. The balance of 12.0 points is attributable to the upward revision of the poverty line in 2011. For the distribution-sensitive squared poverty gap, the upward revision to the official poverty line dominates. Holding the real value of the official line constant at its 1985 level, the SPG would have fallen by 1.4 points; this was more than cancelled out by the effect of the upward revision to the official line in 2011, which added 2.84 points to SPG.[34]

Notice that there are two roughly offsetting ways that growth in mean income impacts the poverty measures based on the official lines. The first is the negative impact of growth in the mean on the absolute lines while the second is the positive impact of growth in the mean on the official poverty lines. Since inequality rose over the period, all of the reduction in absolute poverty is attributable to growth in the mean. While the headcount index for 2011 would have fallen to 4.3% if the 1985 line had not been updated, it would have fallen to virtually zero if the 1985 Lorenz curve had not changed, as well as using the 1985 poverty line. And, since the ratio of the official poverty line to the mean fell over time (Table 1), the component attributed to the higher official poverty line can be entirely attributed to the higher mean income.

5.   Relative poverty measures for China assessed by global standards

One possible explanation for the fact that we see much less progress against poverty using the official lines is that the 1985 line was just too low. It has been contended that there was a politically motivated tendency to underestimate the extent of rural poverty in the pre-

---

[33] Rural migrants are typically poorer than the average urban resident so this change in survey methods is likely to have increased the urban poverty rate.

[34] Naturally, the reduction in absolute poverty is larger if we use the 2011 official line as the base, and the opposite effect of the revision to the official line is also larger. The Addendum gives further details on this decomposition.

reform period;[35] possibly this persisted into the early 1980s. The rise in the real value of the official lines may then be interpreted as a corrective to the initial underestimation.

The frugality of the 1985 line is also confirmed if we compare it to other national lines. Converted to 2011 prices and to $s at PPP, the official line for China in 1985 of $0.98 per person per day would have been the 6th lowest line in the world if it had been included in the compilation of 146 national poverty lines used in Ravallion and Chen (2019).

These observations suggest that it is of interest to reconstruct China's (weakly) relative lines, anchored more closely to the poverty lines observed among developing countries globally. Specifically, we now construct an alternative series of poverty measures for China that ignore the county's official lines. We keep the conceptual attractive feature of weak-relativity (under the seemingly plausible assumption that people care about both their "own-income" and relative income) but we anchor the lines to the World Bank's international line, almost double the 1985 official line. The new series of poverty lines is then adjusted upwards over time consistently with the cross-country evidence on national poverty lines.

For this purpose, we use the method proposed in Ravallion and Chen (2019).[36] The key difference with strongly relative measures is that we allow for a positive intercept in the relationship between the relative poverty line and the current mean income. (Without this intercept, linear relative lines violate the two key axioms discussed in Section 2; as noted, they also fall to implausibly low levels at low average income.) The World Bank's $1.90 line is imposed as the lower bound but the schedule of poverty lines, which rise with the Gini-adjusted mean income above a critical income level.[37] The lines for 1985, 2000 and 2011 are $1.98, $2.66 and $5.86 respectively; the latter line is 2.6 times the current official line though still only about one third of the official poverty line in (say) the U.S.

It is of interest to see how our weakly relative lines compare to subjective poverty lines. Wang et al. (2020) report results from a survey of 2,000 rural households in five provinces of China. The survey included the question: *"Please offer an income amount below which you will feel poor for a household (such) as yours."* They find that the mean subjective line for 2015 is

---

[35] See Yao's (2000) discussion of the official count of the poor in 1978, at the outset of the reform period.
[36] The Addendum provides a summary of the derivation of the poverty lines following Ravallion and Chen (2019).
[37] The Gini adjustment to the mean reflects rank-based weights in calculating the mean, to reflect downward comparisons in assessing relative income, as is consistent with national poverty lines; see Ravallion and Chen (2019) for details and the Addendum to this paper for a summary.

15

about three times the official line. Our weakly-relative line for 2014 is $7.46, 3.3 times the official line. Thus, our line is quite close to these (independent) subjective poverty lines.[38]

Table II (Column 9) gives our estimates of the weakly-relative poverty rates for China over 1981-2014 using this new schedule of poverty lines calibrated to international lines.[39] For comparison, Figure 6 also gives two strongly relative measures—one set at 50% of the current mean and one at 60% of the current median (as in the Fuchs proposal and many applications since)—as well the absolute measures of income poverty using the World Bank line (from Figure 1).

We see that our weakly-relative poverty rate for China shows a substantial decline in poverty incidence, though less (of course) than for the corresponding absolute measure. The absolute and weakly-relative measures diverge markedly from the mid-1990s, once mean incomes in rural areas rise to a point where the weakly-relative rural line takes over from the absolute $1.90 line. Nationally, our weakly-relative poverty rate falls from 88% in 1981 to 23% in 2014, implying an annual rate of poverty reduction of 1.8 percentage points. That is still a huge reduction in the count of poor people in China—by over 500 million—but far less than the 850 million implied by the $1.90 a day absolute line when fixed in real terms over time. By contrast, the strongly relative measures show a trend increase over time (Figure 6), consistently with the rise in income inequality (Table III); the correlation coefficients are 0.98 and 0.96 between the Gini index and the shares of the population below 50% of the mean and 60% of the median respectively. This rise in strongly-relative poverty measures came to an end in 2009— around the time when relative income inequality in China also reached its peak (Figure 3).

We can use the same method to compare urban and rural areas of China, with the line being set relative to the current mean income in each of the two sectors of the economy (as distinct from Figure 1 in which the urban and rural lines are only adjusted for cost-of-living differences). Naturally, this implies higher urban poverty measures relative to rural areas, given the difference in mean incomes. The virtual disappearance of urban poverty in China, as

---

[38] Gustafsson et al. (2004) also estimate subjective poverty lines for various cities of China in 1999. They do not provide comparisons with the official poverty lines but they do compare estimates of poverty measures based on their subjective lines with those implied by objective lines calibrated by seemingly similar methods to the official lines. They find that the urban poverty rates are 33-55% higher using the subjective method. This suggests a closer correspondence than found by Wang et al. (2020) though the use of more recent data by the latter paper may be playing a role.

[39] The national weakly-relative measure is the population-weighted mean of the urban and rural measures, discussed further below.

suggested by the World Bank's poverty line and methods, is not robust to using our weakly-relative measures, as is evident in Figure 7. Instead of zero poverty rate in urban China in 2014, the rate is about 20%. However, our weakly relative measures still suggest convergence in poverty measures between urban and rural areas, as we saw in Figure 1 using the World Bank's absolute line. In 1981, our weakly-relative poverty rate for rural areas was almost 60% higher than the urban rate, but by 2014 it was 35% higher.

6.   Conclusions

The prevailing narrative of greatly reduced poverty in China is in sharp contrast to the various independent estimates of strongly relative poverty measures found in the literature. This is not too surprising given that strongly relative measures essentially depend on income inequality, which has been trending upwards in China since the mid-1980s (until 2008). More telling is that the measures implied by China's own official national lines also tell a rather different story to the prevailing narrative, as we have shown in this paper. Depending on the time period, the reduction in the count of poor people in China differs by 400-500 million when comparing measures based on the World Bank's international line with those based on the official lines.

The paper has tried to understand why. The official lines are found to have evolved over time in real terms, along with higher overall living standards in China. What it meant to be "poor" in rural China in the mid-1980s was clearly very different to what it means today. That is to be expected in a rapidly developing economy. What is more surprising is that this plausible relativism is still ignored in so many assessments of progress against poverty in China (as elsewhere), including the World Bank's.

The rise in inequality in China, alongside the rise in the real value of the official poverty lines with a higher mean income, has attenuated progress against poverty judged by the official lines. Nonetheless, using year-specific predicted values of the national official lines over time we still find a sizeable reduction in the incidence of poverty in China.

We have also provided estimates of poverty measures for our own schedule of weakly relative lines. These are anchored to the World Bank's absolute line of $1.90 a day but rise with mean income. The main difference is that the initial poverty line implied by our alternative series is about twice China's official line in 1985, which makes it more consistent with national

poverty lines in countries with similar average income to China around this time. Our alternative schedule of weakly-relative lines shows a marked reduction in poverty—falling from 88% to 23% over 1981-2014—though not as much as the absolute $1.90 lines. Our implied weakly-relative line for 2014 accords well with independent estimates of the subjective poverty line for China, which is about three time the official poverty line.

We do not deny that China has made huge progress against poverty by either absolute or sensibly relative measures. It is entirely reasonable for every country to set official poverty lines that it deems appropriate to what "poverty" means by prevailing standards, which may well come to reflect rising standards, either due to perceptions of relative deprivation, or higher costs of assuring social inclusion. What poverty means in China, including officially, appears to have become more influenced by such concerns than was the case when the country was much poorer than today. That is the main thing that is missing from the picture of poverty reduction we obtain from strictly absolute poverty measures. Both approaches tell us something important, but rather different, about progress against poverty.

Table I: China's official poverty lines for rural areas in 2011 $PPP

	(1)	(2)	(3)	(4)	(5)	(6)
	Poverty line (z)		Mean income in rural areas (m)	$\dfrac{z}{m}$	$\dfrac{z}{m+2}$	Predicted line $\hat{z} = 0.276(m+2)$
	Yuan/year in current prices	$/day in 2011 prices				
1985	206	$0.98	$1.53	0.64	0.28	$0.97
2000	865	$1.30	$2.76	0.47	0.27	$1.31
2011	2536	$2.29	$6.30	0.36	0.28	$2.29

Note: China's official poverty lines are explicitly for rural areas.
Sources: China Rural Poverty Monitoring reports (2001-2018); China Rural Household Survey Yearbook (2000-2013); China Household Survey Yearbook (2014+).

Table II: Summary of our estimates of the annual national poverty measures

|	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Summary statistics		Absolute poverty rate (% below poverty line)					Weakly relative poverty rate (%)	
			World Bank line		China's official lines				
	Mean income ($/day/person)	Gini index (%)	$1.90	$1.90 (consumption)	$0.98	$1.30	$2.29	Anchored to official lines	Anchored to $1.90
2016	16.37			0.53					
2015	15.36			0.73					
2014	14.26	39.38	3.50	1.36	2.06	2.49	4.31	9.56	23.16
2013	13.15	40.16	3.39	1.86	1.13	1.86	4.51	10.00	24.18
2012	11.93	41.22	5.37	6.50	1.61	2.83	7.19	9.46	25.52
2011	10.85	41.67	6.34	7.93	2.22	3.55	8.38	10.53	26.40
2010	9.82	41.87	6.77	11.21	1.45	3.16	9.41	10.42	27.61
2009	8.93	42.91	8.60		2.51	4.45	11.65	11.66	29.20
2008	8.06	42.96	9.60	14.86	2.74	4.89	13.15	11.97	30.14
2007	7.36	42.61	10.91		3.11	5.53	14.97	11.97	30.86
2006	6.53	43.28	13.05		0.98	4.03	19.23	11.66	34.32
2005	5.88	42.83	15.17	18.54	4.64	7.80	20.89	13.66	33.87
2004	5.32	42.12	17.60		4.86	8.75	24.21	13.73	35.44
2003	4.89	42.27	20.92		6.39	10.91	28.06	15.11	36.97
2002	4.52	41.35	22.46	31.70	6.48	11.42	30.33	15.21	38.13
2001	4.07	39.97	24.55		7.18	12.42	33.33	15.68	39.49
2000	3.79	38.94	26.64		7.53	13.28	36.1	16.03	40.47
1999	3.60	36.84	26.61	40.25	6.59	12.56	36.64	14.38	41.09
1998	3.36	35.87	28.79		6.91	13.44	39.52	14.60	42.26
1997	3.18	35.42	30.84		8.02	14.73	42.12	15.06	43.35
1996	3.01	35.43	34.43	41.72	8.16	16.6	45.57	15.40	45.15
1995	2.75	37.02	41.58		12.69	22.19	52.72	18.45	49.44
1994	2.54	38.00	47.61		14.80	25.59	59.04	19.66	54.65
1993	2.34	37.27	52.27	56.69	17.46	30.02	62.93	21.09	59.47
1992	2.19	34.81	53.95		18.01	30.97	64.86	20.75	61.18
1990	1.94	32.00	59.88	66.27	19.17	34.90	70.83	20.96	65.17
1987	1.86	30.51	61.37		19.49	35.09	73.16	20.47	67.13
1985	1.72	27.04	66.36		18.75	36.21	79.36	18.84	71.55
1984	1.64	26.40	70.86		20.10	39.23	82.98	19.66	74.22
1981	1.18	28.18	87.21		46.51	67.71	93.64	33.89	88.22

Note: Household income per person except for Col. 4 which uses household consumption per person. Authors' calculations based on distributions of household per capita income produced by China's National Bureau of Statistics. Our estimates are aggregated up from rural and urban distributions allowing for a 28% higher cost of living in urban areas in 2011, consistently with the PPP differential we use for 2011. National poverty measures are population-weighted means of the corresponding urban and rural measures. (See text for further details.)

Table III: Poverty measures based on official poverty lines

|	(1) Income (Y) or consumption (C)	(2) Poverty line (z)	Rural			(6) Poverty rate (%)	Urban		(9) Poverty rate (%)	National	
			(3) Poverty rate (%)	(4) Poverty gap index (%)	(5) Squared poverty gap index (x100)		(7) Poverty gap index (%)	(8) Squared poverty gap index (x100)		(10) Poverty gap index (%)	(11) Squared poverty gap index (x100)
1985	Y	$0.98	24.11	5.70	1.91	0.66	0.15	0.07	18.75	4.43	1.49
2000	Y	$1.30	19.99	6.13	2.60	1.28	0.31	0.15	13.28	4.04	1.72
	C	$1.30	36.92	10.25	3.81	3.55	0.68	0.24	24.95	6.82	2.53
2011	Y	$2.29	16.35	6.29	3.35	0.59	0.29	0.29	8.38	3.26	1.80
	C	$2.29	24.23	6.22	2.28	1.08	0.26	0.13	12.54	3.21	1.19

Note: Authors' estimates of the poverty measures using distributions of household per capita income produced by China's National Bureau of Statistics. China's official poverty lines are explicitly for rural areas. Our estimates for urban areas allow for a 28% higher cost of living than rural areas, consistently with the PPP differential we use for 2011.

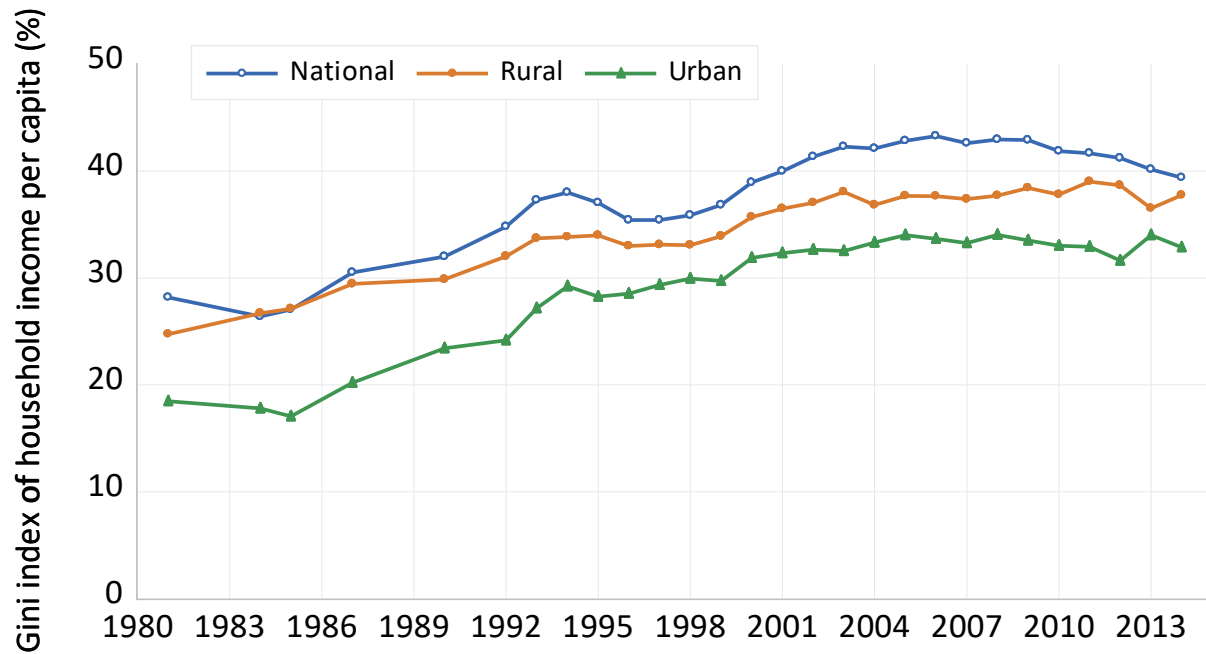**Figure 1: Absolute poverty rates for China based on the World Bank's international line**
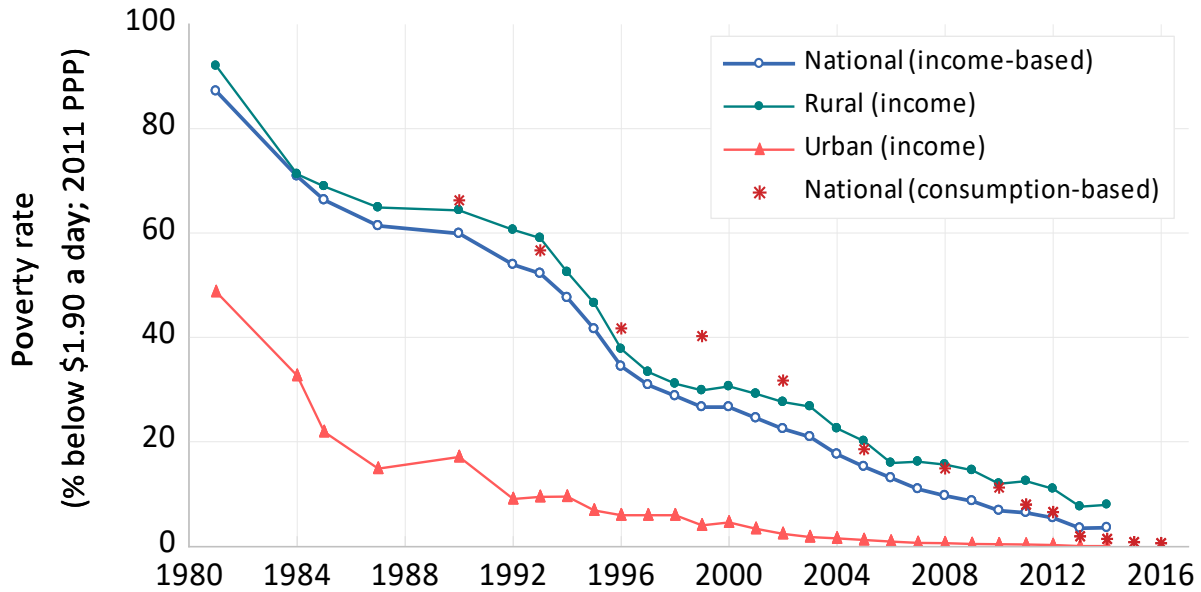
**Figure 2: Price indices for rural China**
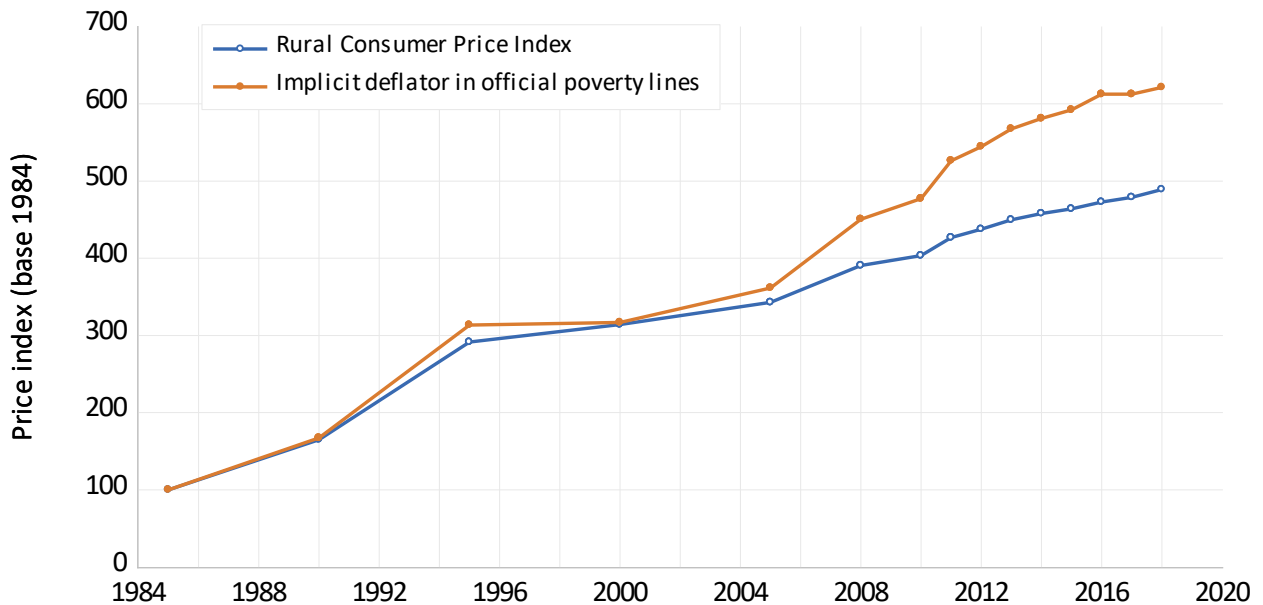
Note: Implicit deflator in the current official poverty lines (as introduced in 2011).

**Figure 3: Gini indices of household income per capita**

Source: Authors' calculations based on distributional data for China produced by the National Bureau of Statistics. See text for details on estimation methods.

**Figure 4: Absolute poverty rates using China's official poverty lines**
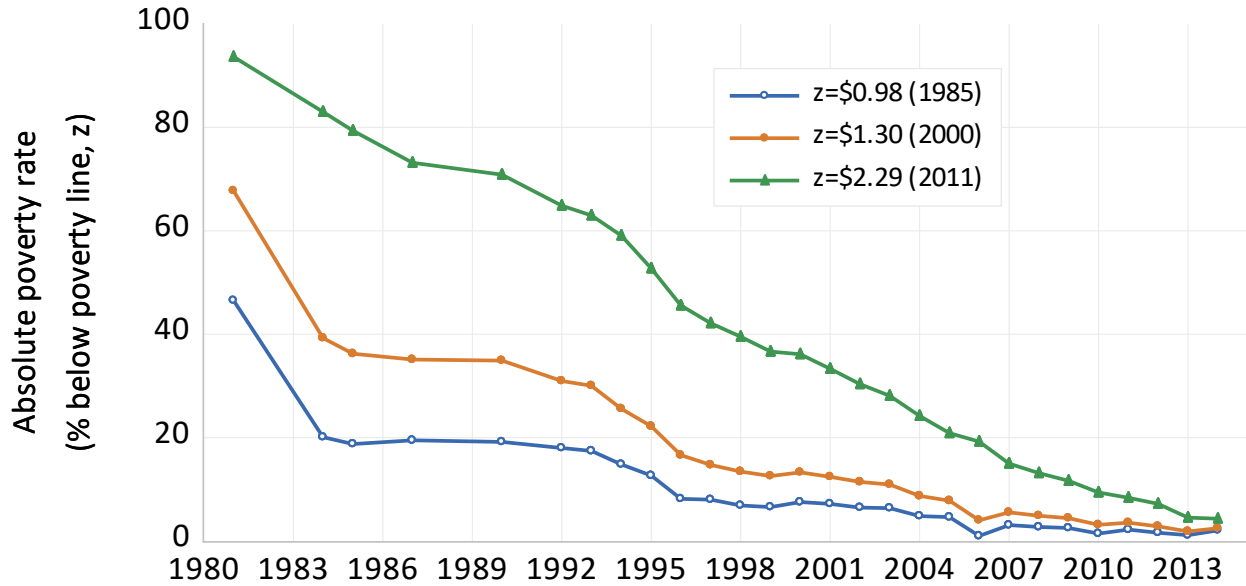
Note: Official lines by year of introduction, which was also the year of implementation in the official poverty reduction strategy, except that the 1985 line was implemented in 1986. Lines converted to constant prices and $PPP.
Source: Authors' calculations based on distributional data for China produced by the National Bureau of Statistics.

Figure 5: Income poverty measures using annual lines calibrated to the official lines
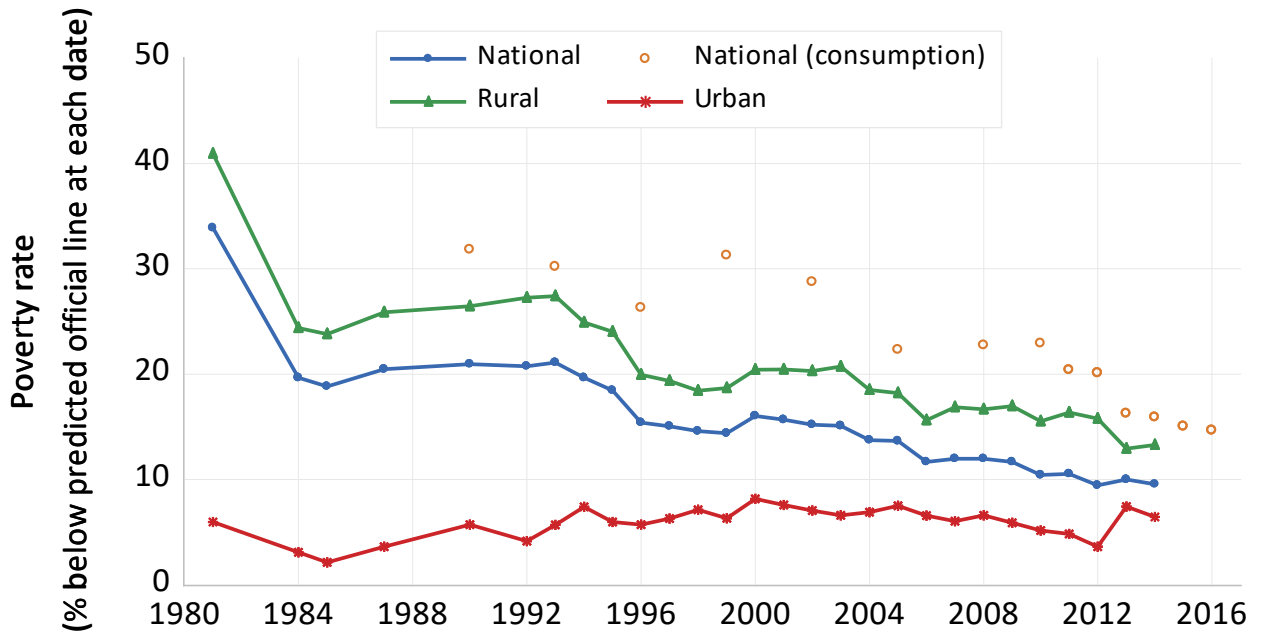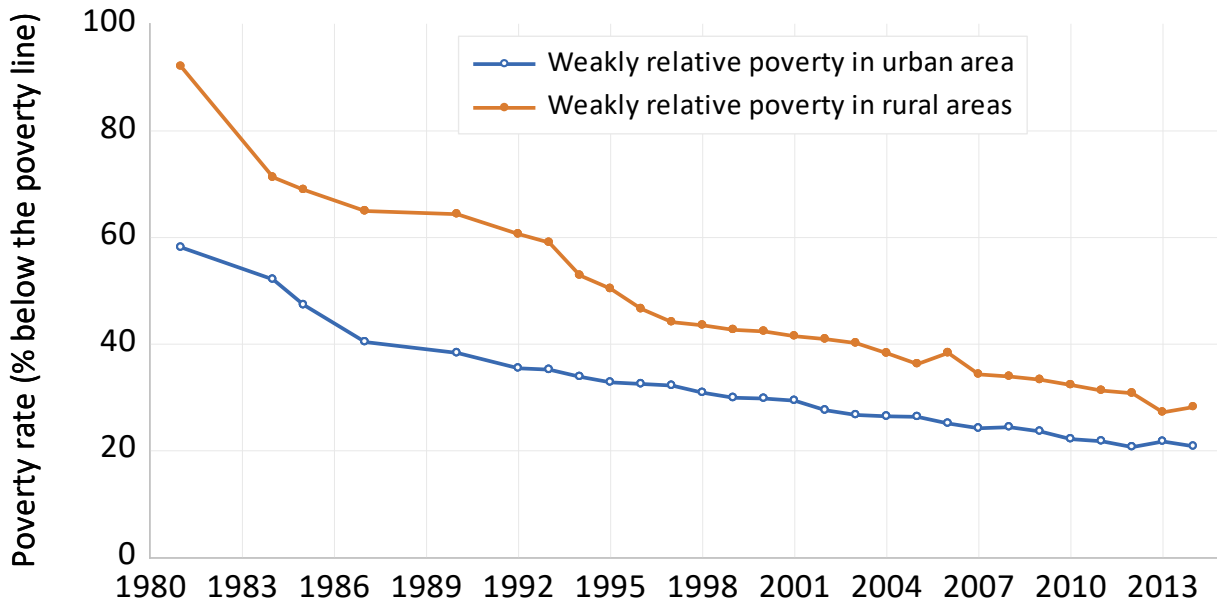

Source: Authors' calculation based on distributional data from China's National Bureau of Statistics. using the predicted official poverty line (Table I).

Figure 6: Relative measures of income poverty for China
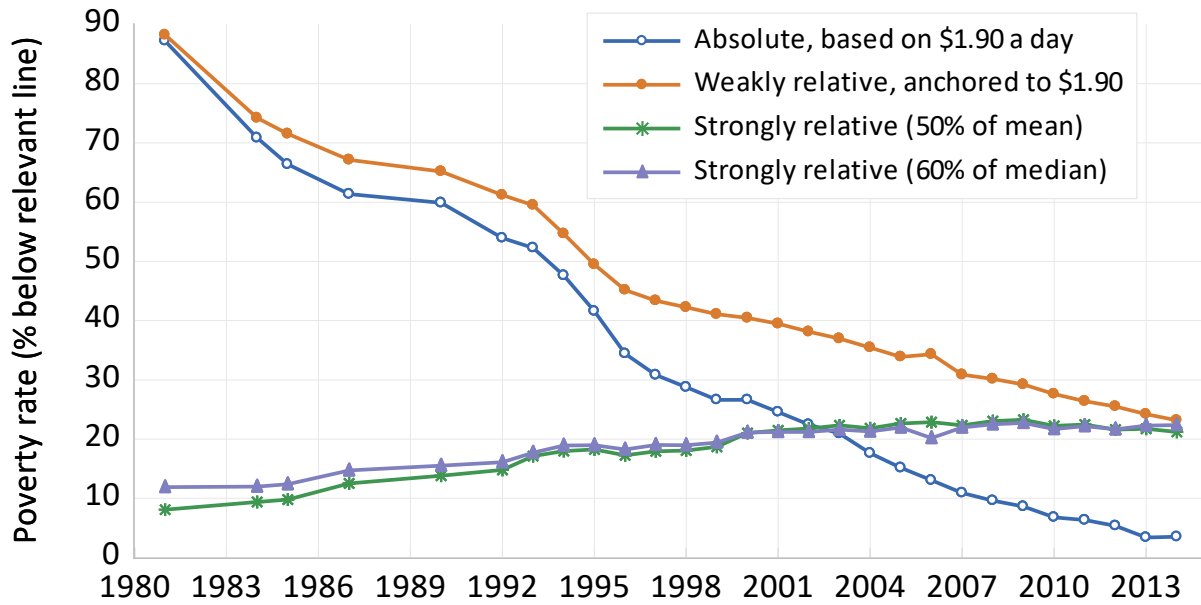
Source: Authors' calculations based on distributional data produced by China's National Bureau of Statistics.

Figure 7: Urban-rural weakly relative poverty measures for China

Source: Authors' calculations based on distributional data produced by China's National Bureau of Statistics.

Addendum

A1: Decomposition of changes in poverty measures based on official lines

Quite generally, any poverty measure (within a broad class) for date t can be written in the generic form $P(Z_t/M_t, L_t)$ where Z_t is the poverty line, M_t is the mean and L_t is a vector of parameters fully describing the Lorenz curve, representing "inequality." We can think of the changes in the poverty measures based on the official lines as the combination of two opposing effects: absolute poverty reduction and an increase attributable to the higher poverty line. There are two ways of doing this decomposition, depending on whether one uses (i) the 1985 line as the reference or (ii) the 2011 line. Thus:

$$P(Z_{11}/M_{11}, L_{11}) - P(Z_{85}/M_{85}, L_{85}) \ \text{(Total change in the poverty measure)}$$

$$= P(Z_{85}/M_{11}, L_{11}) - P(Z_{85}/M_{85}, L_{85}) \ \text{(Change in absolute poverty 1985 line)}$$

$$+ P(Z_{11}/M_{11}, L_{11}) - P(Z_{85}/M_{11}, L_{11}) \ \text{(Change in poverty line, 2011 base) (i)}$$

$$= P(Z_{11}/M_{11}, L_{11}) - P(Z_{11}/M_{85}, L_{85}) \ \text{(Change in absolute poverty 2011 line)}$$

$$+ P(Z_{11}/M_{85}, L_{85}) - P(Z_{85}/M_{85}, L_{85}) \ \text{(Change in poverty line, 1985 base) (ii)}$$

Table A1: Decompositions for the change in rural income-poverty measures 1985-2011

	Poverty index		Change in the poverty index (% point)	Components of the change (% point)			
				(i)		(ii)	
				Absolute poverty reduction	Upward revision to the poverty line,	Absolute poverty reduction	Upward revision to the poverty line,
	1985	2011		1985 line	2011 base	2011 line	1985 base
Poverty rate (%)	24.11	16.35	-7.76	-19.79	12.03	-70.91	63.15
Poverty gap (%)	5.7	6.29	0.59	-4.43	5.02	-31.82	32.41
Squared poverty gap (x100)	1.91	3.35	1.44	-1.4	2.84	-16.65	18.09

Note: China's official poverty lines are explicitly for rural areas. Authors' estimates of the poverty measures using distributions of household per capita income produced by China's National Bureau of Statistics.

Table A1 provides this decomposition. We see marked reductions in absolute poverty measures anchored to either the 1985 or 2011 official line. Naturally, the reduction is very large with respect to the 2011 line. In both cases, we also see the large poverty increasing effect of the

upward revision to the official lines. What is striking here is the size of the two opposing effects. For the poverty rate, the absolute poverty effect dominates on balance but the upward revision to the poverty line dominates for the two poverty gap indices.

A2   Theoretical derivation of the weakly relative lines in Section 5[40]

The case for using a relative poverty measure is that the welfare of an individual is influenced by how he or she is doing relative to a set of comparators. We can write this as a welfare function for household i in date j of the form:

$$u_{ij} = u(y_{ij}, y_{ij} / m_{ij}^*) \tag{A1}$$

where y_{ij} is the individual's own consumption and m_{ij}^* is the individual's <u>comparison income</u>. The welfare function $u(.)$ is taken to be smoothly and strictly increasing in relative income and smoothly non-decreasing in own income. In the literature, m_{ij}^* is either the mean or median income for the date of residence. To see one important implication of this assumption, let $m_{ij}^* = m_j$ for all i, where m_j is the mean. Then the welfare-consistent relative poverty line, z_j, is defined by:

$$u(z_j, z_j / m_j) = \overline{u}_j^z \tag{A2}$$

Here $\overline{u}_j^z$ is the fixed level of welfare to not be deemed poor at date j. Plainly, $y_{ij} < z_j$ implies (and is implied by) $u_{ij} < \overline{u}_j^z$. A welfare consistent poverty line can be defined as one based on a constant u^z for all j.

If the welfare function is independent of own income given relative income then we have the strongly relative lines discussed in Section 2. In other words, if (A1) can be written as $u_{ij} = \tilde{u}(y_{ij} / m_j)$ then the welfare-consistent poverty line takes the form $z_j = k_j m_j$ where $k_j \equiv \tilde{u}^{-1}(\overline{u}_j^z)$. However, this may be considered a very strong assumption. It is one thing to believe that people care about their relative income, but quite another to suppose that they do not care about own income, given relative income. In the more general case in which the welfare function is strictly increasing in both arguments, the welfare-consistent weakly-relative lines will rise with the mean, with a positive elasticity less than unity (Ravallion and Chen 2011). A

---

[40] Addendum A2 summarizes results from Ravallion and Chen (2019).

schedule of strongly relative lines only emerges as the limiting case in which u'_y goes to zero, such that welfare depends solely on relative income.

The literature has been largely silent on the appropriate comparison group in discussing relative poverty. The assumption of an (equally-weighted) mean or the median is very common but it is hard to find any effort to justify he assumption. In Duesenberry's (1949) formulation of the relative-income hypothesis, it was argued that an un-equally weighted mean could be more relevant, although this has been ignored in the literature on poverty since then.

When one allows the weights to vary by level of income, the extent of inequality can influence the level of the reference income used for relative comparisons (Ravallion and Chen 2019). For example, imagine that the poor and middle class are the more relevant comparators for most people. With higher inequality this reference group is seen as relatively poorer, indicating higher relative income at a given level of own income. One possible justification for using the median income as the reference is that the rich get too high a weight in the mean. Yet, while we might agree that the rich are less relevant comparators, they can still be pertinent comparators. Alternatively, one might believe that relativist comparisons are upward looking in that the rich are the comparators, in which case higher inequality requires a higher poverty line.

The approach proposed in Ravallion and Chen (2019) encompasses both these "downward" and "upward" looking relativist comparisons. Imagine that a person makes random draws of pairs of incomes in assessing how she is doing relative to others. She picks a comparison point somewhere in the (closed) interval between the two incomes according to whether she looks upward or downward. Let $\phi(y_{kj}, y_{lj})$ denote the contribution of the (k, l) pair drawn at date j to the assessment of the comparison mean for that date. We assume that:

$$\phi(y_{kj}, y_{lj}) \equiv (1-\delta)\min(y_{kj}, y_{lj}) + \delta\max(y_{kj}, y_{lj}) \text{ where } \delta \in [0,1] \tag{A3}$$

This is repeated for multiple pairs. With a large sample, in a large population of size N_j, one will end up with an unbiased estimate of the comparison mean as:

$$m_j^* \cong [1 - (1-2\delta)G_j]m_j \tag{A4}$$

where G_j is the Gini coefficient for date j. We can say that relative comparisons tend to be downward looking if $\delta < 0.5$ and upward looking if $\delta > 0.5$. If $\delta = 0.5$ then we have the current practice in the literature of treating the overall mean as the comparison income.

The measures of global relative poverty proposed in Ravallion and Chen (2019) set $\delta = 0$. This is shown to be consistent with cross-country comparisons of national poverty lines, for which the best linear predictor of the national poverty line is the Gini-adjusted mean, $(1 - G_j)m_j$, giving:

$$z_j = \alpha + \beta(1 - G_j)m_j + \varepsilon_j \qquad \text{(A5)}$$

This is equivalent to saying the comparison income for measuring relative poverty is the rank-weighted mean. More precisely, let incomes be ordered as $y_{1j} \geq y_{2j} \geq,..., \geq y_{N_j}$. Ravallion and Chen (2019) show that the comparison income is then:

$$m_j^* = \frac{2}{N_j^2} \sum_{i=1}^{N_j} i y_{ij} \qquad \text{(A6)}$$

In contrast to the median, all incomes are relevant to the comparisons made against m_j^*, but the weights fall with the rank, starting with the poorest.

For our application to China in this paper, we follow Ravallion and Chen (2019) in using parameter values for (A5) that are calibrated to their cross-county compilation of national poverty lines, namely $\hat{\alpha} = \$0.90$ and $\hat{\beta} = 0.70$. Two points should be noted: (i) β is the slope w.r.t. the Gini- adjusted mean; at the mean Gini indices, the slopes w.r.t. the mean incomes are 0.50 and 0.45 for urban and rural areas respectively. (ii) The schedule of lines is calculated for urban and rural areas separately, then applied to each of their income distributions, prior to aggregating to the national level using population weights.

References

Appleton, Simon, Lina Song and Qingjie Xia, 2010, "Growing out of Poverty: Trends and Patterns of Urban Poverty in China 1988–2002" *World Development* 38(5): 665–678.

Atkinson, Anthony B., 1998, *Poverty in Europe*, Oxford: Blackwell.

Atkinson, Anthony B., and Francois Bourguignon, 2001, "Poverty and Inclusion from a World Perspective," in J. E. Stiglitz and P-A. Muet (eds.), *Governance, Equity and Global Markets*, Oxford: Oxford University Press.

Blackburn, McKinley, 1994, "International Comparisons of Poverty," *American Economic Review* 84(2): 371-374.

Blank, Rebecca M., 2008, "How to Improve Poverty Measurement in the United States," *Journal of Policy Analysis and Management* 27(2): 233-254.

Brown, Philip H., Erwin Bulte and Xiaobo Zhang, 2011, Positional spending and status seeking in rural China, *Journal of Development Economics* 96(1): 139-149.

Chen, Shaohua, and Martin Ravallion, 1996. "Data in Transition: Assessing Rural Living Standards in Southern China," *China Economic Review* 7(1): 23-55.

_____, and _____, 2010, "The Developing World is Poorer than we Thought, but no Less Successful in the Fight against Poverty," *Quarterly Journal of Economics* 125(4): 1577-1625.

_____, and _____, 2013, "More relatively Poor People in a less Absolutely Poor World," *Review of Income and Wealth* 59(1): 1-28.

Citro, Constance, and Robert Michael, 1995, (eds.) *Measuring Poverty: A New Approach.* Washington, DC: National Academy Press.

Clark, Andrew, Paul Frijters, and Michael Shields, 2008. "Relative Income, Happiness and Utility: An Explanation for the Easterlin Paradox and Other Puzzles," *Journal of Economic Literature* 46(1): 95-144.

Clark, William A. V., Daichun Yi, and Youqin Huang, 2019. "Subjective Well-being in China's Changing Society," *Proceedings of the National Academy of Sciences* 116(34): 16799–16804.

Datt, Gaurav, and Martin Ravallion, 1992, "Growth and Redistribution Components of

Changes in Poverty Measures: A Decomposition with Applications to Brazil and India in the 1980s," *Journal of Development Economics* 38: 275-295.

Duesenberry, James S., 1949, *Income, Saving and the Theory of Consumer Behavior,* Cambridge, Mass.: Harvard University Press.

Easterlin, Richard A., Fei Wang And Shun Wang, 2017, "Growth and Happiness in China 1990-2015," in John Helliwell, Richard Layard and Jeffrey Sachs (eds) *World Happiness Report 2017*. New York: Sustainable Development Solutions Network.

Eurostat, 2005. "Income Poverty and Social Exclusion in the EU25," *Statistics in Focus 03 2005*, Office of Official Publications of the European Communities, Luxembourg.

Ferreira, F., Chen, S., Dabalen, A., Dikhanov, Y., Hamadeh, N., Joliffe, D. Narayan, A., Prydz, E., Revenga, A., Sangraula, P., Serajuddin U., Yoshida, N., 2016, "A Global Count of the Extreme Poor in 2012: Data Issues, Methodology and Initial Results," *Journal of Economic Inequality* 14: 141-172.

Foster, James, 1998, "Absolute versus Relative Poverty," *American Economic Review, Papers and Proceedings* 88(2): 335-341.

Foster, James, Joel Greer, and Erik Thorbecke, 1984. "A Class of Decomposable Poverty Measures," *Econometrica* 52: 761-765.

Fuchs, Victor, 1967, "Redefining Poverty and Redistributing Income," *The Public Interest* 8: 88-95.

Garroway, Christopher, and J.R. de Laiglesia, 2012, "On the Relevance of Relative Poverty for Developing Countries," OECD Development Centre Working Paper 314, OECD, Paris.

Gustafsson, Bjorn, Li Shi and Hiroshi Sato, 2004. "Can Subjective Poverty Line be Applied to China? Assessing Poverty Among Urban Residents In 1999," *Journal of International Development* 16: 1089–1107.

Gustafsson, Björn, and Wei Zhong, 2000. "How and Why Has Poverty in China Changed? A Study Based on Microdata for 1988 and 1995," *The China Quarterly* 164: 983-1006.

Jolliffe Dean, and Esben Prydz, 2017. "Global Societal Poverty: a Relative and Relevant Measure," Policy Research Working Paper 8073, World Bank.

Khan, Azizur, and Carl Riskin, 1998. "Income and Inequality in China: Composition, Distribution and Growth of Household Income, 1988 to 1995." *The China Quarterly* 154: 221-253

Kakwani, Nanak, 1980, "On a Class of Poverty Measures," *Econometrica* 48(2):437-446.

_____, 1986, *Analyzing Redistribution Policies: A Study using Australian Data.* Cambridge: Cambridge University Press.

Lambert, Peter, and J. Richard Aronson, 1993, "Inequality Decomposition Analysis and the Gini Coefficient Revisited," *Economic Journal* 103: 1221-1227.

Li, Shi, and Terry Sicular, 2014, "The Distribution of Household Income in China: Inequality, Poverty and Policies," *The China Quarterly* 217: 1-41.

Meng, Xin, Robert Gregory, Youjuan Wang, 2005. "Poverty, Inequality, and Growth in Urban China, 1986–2000." *Journal of Comparative Economics* 33: 710–729.

National Bureau of Statistics, Various years a. *China Household Survey Yearbook (2014-2018)*, Statistical Publish House, Beijing.

_____ b. *China Rural Household Survey Yearbook (2000-2013)*, Statistical Publish House, Beijing.

_____ c. *China Urban Household Survey Yearbook (2000-2013)*, Statistical Publish House, Beijing.

_____ d. *China Rural Poverty Monitoring Report (2000-2018)*, Statistical Publish House, Beijing.

Nolan, Brian, 2007, *A Comparative Perspective on the Development of Poverty and Exclusion in European Societies*, Bonn: International Policy Analysis.

Organization for Economic Co-Operation and Development (OECD), 2008, *Growing Unequal? Income Distribution and Poverty in OECD Countries*, Paris, OECD.

Park, Albert, and Sangui Wang, 2001, "China's Poverty Statistics," *China Economic R*eview 12: 384-398.

Ravallion, Martin, 1994, *Poverty Comparisons.* Harwood Academic Press, Chur, Switzerland.

_____, 2016, *The Economics of Poverty: History, Measurement and Policy.* New York: Oxford University Press.

_____, 2020a, "Ethnic Inequality and Poverty in Malaysia since May 1969. Part 2: Poverty," *World Development* 134.

_____, 2020b, "On Measuring Global Poverty," *Annual Review of Economics*, 12: 167-188.

Ravallion, Martin, and Shaohua Chen, 2007, "China's (Uneven) Progress Against Poverty." *Journal of Development Economics* 82(1): 1-42.

_____, and _____, 2011, "Weakly Relative Poverty," *Review of Economics and Statistics* 93(4): 1251-1261.

_____, and _____, 2019, "Global Poverty Measurement when Relative Income Matters," *Journal of Public Economics*, 177: 1-13.

Ravallion, Martin, Shaohua Chen and Prem Sangraula, 2007, "New Evidence on the Urbanization of Global Poverty," *Population and Development Review*, 33(4): 667-702.

_____, _____ and _____, 2009, "Dollar a Day Revisited," *World Bank Economic Review* 23(2):163-184.

Runciman, W.G., 1966, *Relative Deprivation and Social Justice*, London: Routledge and Kegan Paul.

Sen Amartya, 1983, "Poor, Relatively Speaking," *Oxford Economic Papers* 35(2): 153-169.

Smeeding, T.M., L. Rainwater, M. Rein, R. Hauser and G. Schaber, 1990, "Income Poverty in Seven Countries: Initial Estimates from the LIS Database," in T.M. Smeeding, M. O'Higgins and L. Rainwater, eds., *Poverty, Inequality and Income Distribution in Comparative Perspective*, Washington, DC: Urban Institute Press.

Townsend, Peter, 1979, *Poverty in the United Kingdom: A Survey of Household Resources and Standards of Living.* Harmonsworth: Penguin Books.

Villasenor, J. and B.C. Arnold, 1989, "Elliptical Lorenz Curves," *Journal of Econometrics* 2: 327-338.

World Bank, 1992, *China: Strategies for Reducing Poverty in the 1990s.* Washington DC: World Bank.

_____, 2007, *China's Evolving Poverty Reduction Agenda: An Assessment of Poverty and Inequality in China.* Washington DC: World Bank.

Xian, Zude, Wang Pingping, Wu Wei, 2016, "Rural Poverty Lines and Poverty Monitoring in China." Chinese version published in *Statistical Research* 33(9): 3-12 (*China Academic Journal* Electronic Publishing House, http:/www.cnki.net.)

Wang, Hanjie, Qiran Zhao, Yunli Bai, Linxiu Zhang and Xiaohua Yu, 2020. "Poverty and Subjective Poverty in Rural China." *Social Indicators Research* **150:** 219–242.

Yang, Lixiong and Ernest Chui W.T., 2010, "Poverty Line in China Rural Areas: A Critical Reappraisal,". *Journal of Poverty* 14(3): 329-346.

Yao, Shujie, 2000, "Economic Development and Poverty Reduction in China over 20 Years of Reforms," *Economic Development and Cultural Change* 48(3): 447- 474.

Zhang, Chunni, Qi Xu, Xiang Zhou, Xiaobo Zhang, Yu Xie, 2014. "Are Poverty Rates Underestimated in China? New Evidence from Four Recent Surveys," *China Economic Review* 31: 410-425.