Are poverty rates underestimated in China? New evidence from four recent surveys

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ABSTRACT

Knowledge of poverty prevalence is essential for any society concerned with improving public welfare and reducing poverty. In this paper, we estimate and compare poverty incidence rates in China using four nationally representative surveys: the China Family Panel Studies (CFPS) of 2010, the Chinese General Social Survey (CGSS) of 2010, the China Household Finance Survey (CHFS) of 2011, and the Chinese Household Income Project (CHIP) of 2007. Using both international and official domestic poverty standards, we show that poverty rates at the national, rural, and urban levels based on the CFPS, CGSS, and the CHFS are all much higher than the official estimates and those based on the CHIP. This study highlights the importance of using independent datasets to verify official statistics of public and policy concern in contemporary China.

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1. Introduction

Since the economic reform began in 1978, China's economic growth not only has greatly improved the average standard of living in China but also has lifted hundreds of millions of Chinese out of poverty. According to a recent study by Chen and Ravallion (2013), the poverty rate in China based on the $1.25-per-day line dropped from 84% in 1981 to 13% in 2001. This was a remarkable achievement in a relatively short period. However, because of the vast size of the Chinese population, even a seemingly low poverty rate of 13% means that there were still more than 170 million Chinese people living in poverty, a sizable subpopulation exceeding the national population of Bangladesh and falling slightly short of the total population of Nigeria. Hence, China still faces an enormous task in eradicating poverty.

Poverty reduction and common prosperity are public policy goals openly pursued by the Chinese government today. However, both the formulation and the evaluation of anti-poverty policies call for precise estimation of the actual degree of poverty. Given China's large population base, an estimated error of merely a few percentage points would have far-reaching consequences: millions of people would be wrongly classified as poor or non-poor, blunting the government's targeting ability. In the absence of

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independent national representative surveys, most poverty estimates in current use hinge exclusively on official statistics released by the Chinese government.

Poverty estimates based on official statistics, however, have been criticized. A few studies have questioned the credibility of the official poverty estimates (Chen & Ravallion, 2013; Gustafsson & Yue, 2012). First, government statistics, although useful for tracking trends, may suffer from biases due to either political interference or procedural limitations (Hvistendahl, 2013; Wu, 2007). Second, the sampling frame is not transparent. Third, until recently the official poverty lines were far below the international standard, casting doubt on China's record in poverty reduction (Park & Wang, 2001). Finally, strict restrictions on data access have prevented third parties from deriving or verifying official poverty estimates from raw unit-record data.

In this paper, we attempt to determine the current level of poverty prevalence in China. To obtain reliable estimates, we compare the results from four recently completed, nationally representative surveys and estimate the poverty level under a range of poverty lines derived from both international and official domestic standards. Finally, by calculating weighted averages of poverty estimates across different independent surveys, we make our own best estimates of China's poverty prevalence.

In the following sections, we begin by reviewing the debate regarding the degree of poverty in China. We then describe the four survey datasets, the definition of poverty lines, and the poverty measure we use. Next, we report our estimates of poverty prevalence at the national, rural, and urban levels. Finally, we conclude the study and discuss our findings.

2. Literature review

Prior to the economic reform that began in 1978, the Chinese government ran a planned economy. Along with the economy, other social structures were strictly regulated by the state. Central to pre-reform China was the *hukou* (household registration) system that severely constrained Chinese people's residential mobility (Wu & Treiman, 2004). As a result, most Chinese lived in their birthplaces throughout their lives. In 1980, less than 20% of the population was urban. Urban Chinese enjoyed more privileges than their rural counterparts, such as medical insurance, free housing, guaranteed jobs, and retirement pensions (Wu & Treiman, 2004). Such institutional arrangements in favor of urban residents also generated a large income gap between urban and rural Chinese (Kanbur & Zhang, 2005; Khan, 2008). Within cities and rural areas, however, income inequality was relatively low (Khan & Riskin, 2001; Xie & Hannum, 1996). In cities, although few residents were rich, most were not poor either.[1] By contrast, about two-thirds of the rural population lived in poverty (Ravallion & Chen, 2007). Broadly speaking, at the beginning of China's reform in the late 1970s, poverty in China was primarily a rural problem.

The rural household responsibility system adopted in the early 1980s granted peasants land cultivation rights and empowered them to make their own production decisions. With better-aligned incentives, agricultural production and rural incomes witnessed a dramatic increase in the ensuing years. As a result, the rural poverty rate dropped sharply from 76% in 1980 to 24% in 1986. In other words, more than 400 million people moved out of poverty in a short, six-year spell. After this, however, the pace of poverty reduction slowed.

For a long time, China's official poverty line for rural areas was only 300 yuan per person per year at the 1990 prices, or about US$150[2] according to the purchasing power parity exchange rates, much lower than the widely used $1.00-a-day poverty line.[3] As Ravallion and Chen (2007) showed, if one were to use the low official rural poverty line, China would have eradicated urban poverty by 2000, a time when massive numbers of urban workers were laid off and struggling for survival in the face of state-owned enterprise reform. Thus, the official poverty line seems to be too low. To address this concern, some scholars have estimated Chinese poverty rates using alternative poverty lines. For example, analyzing data from a sample of 3600 households from the National Urban Household Income and Expenditure Survey, Fang, Zhang, and Fan (2002) showed that if a higher poverty line of $1.50 a day is used, which better reflects the cost of living in cities, the urban poverty rate will be much higher than the official levels. Moreover, they found that the poverty rate based on the alternative poverty line experienced an increase from 8.4% to 8.9% from 1996 to 1998, a period of active urban reform.

Using a larger sample of more than 12,000 households during the longer period from 1986 to 2000, Meng, Gregory, and Wang (2005) reported poverty estimates according to province-specific lower and upper poverty lines that derive from different compositions of the cost of basic needs. They found that urban poverty increased in the 1990s with the urban reforms. In 2000, their expenditure-based poverty incidence rates were 10.2% according to the upper poverty line and 3.9% according to the lower poverty line. By comparison, their income-based measures were much lower, at 4.0% (upper line) and 1.7% (lower line).

Meanwhile, Appleton, Song, and Xia (2010) used the Chinese Household Income Project (CHIP) surveys to document trends and patterns of urban poverty. Although the CHIP survey questionnaires were designed by the Chinese Academy of Social Sciences, the sample was drawn from the China Household Income and Expenditure Surveys—government surveys—and fielded by the National Bureau of Statistics of China (NBS). In essence, the CHIP surveys are merely subsamples of the government's national surveys. Appleton, Song, and Xia reported different poverty estimates based on different poverty lines. For instance, according to the international $1.00-a-day line (or 1200 yuan, roughly the same as the poverty line used by Ravallion & Chen, 2007), only 0.1% of the urban population lived under poverty in 2002. Even using a higher line of $2.00-a-day per capita income (or 2400 yuan), the urban poverty rate was still as low as 1.9%. When the poverty line was further increased to $3.00 a day (3600

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[1] In 1981, the urban poverty rate was as low as 0.82% according to the official poverty line. Even using the higher poverty line based on the cost of meeting basic needs, the poverty incidence was only 6% (Ravallion & Chen, 2007).

[2] In this paper, all dollars are US dollars.

[3] There was no comparable urban poverty line.

yuan), the poverty rate rose by three times to 7.9%. Using the most recent wave of the CHIP survey in 2007, Li, Luo and Sicular (2013) also found that only 0.44% of the urban population lived under the $1.25-a-day line. The inclusion of a rural migrant sample would not change the estimate much. However, the urban poverty rate would be much higher (12.3% in 2007) if a relative poverty line—50% of the urban median income—were applied.

In rural areas, the estimation of poverty incidence is also sensitive to the choice of poverty lines. For instance, based on a survey conducted annually by China's Research Center for Rural Economy in three provinces (Zhejiang, Hubei, and Yunnan), Glauben, Herzfeld, Rozelle, and Wang (2012) showed that rural poverty incidence was only 3.9% in 2000 and 1.5% in 2004 based on the national poverty line. But when the international $1.00-a-day poverty line is used, the average poverty rate in the three provinces is much higher, at 18.6% and 10.0% for these two years. The results were driven mainly by the high concentration of poverty in Yunnan Province. In 2004, the poverty rates based on the international line in Zhejiang, Hubei, and Yunnan Provinces were 0.3%, 4.3%, and 27.5%, respectively. This suggests that rural poverty was more concentrated in the western region.

Xing, Fan, Luo, and Zhang (2009) provided further evidence for the regional concentration of poverty. Using a full-coverage survey of households in three administrative villages of a designated poverty county in Guizhou Province, one of the poorest provinces in western China, they estimated poverty rates at 31.7% and 44.6% in 2004, under the national poverty line and the international $1.00-a-day line respectively. While both Glauben et al. (2012) and Xing et al. (2009) identified geographic concentration of poverty in rural China, the datasets used in the two papers have a key limitation—they are not nationally representative. It is impossible to infer the level of national poverty from those data sources.

A recent report by Luo and Sicular (2013) documented the rural poverty rate using a nationally representative version of the 2007 CHIP data. Their estimates of the rural poverty rate range from 5.59 to 21.07, depending on which poverty line is applied. The official rural poverty line is associated with the lowest degree of poverty. Rural poverty becomes much higher if relative poverty lines are applied. No matter which poverty lines they used, Luo and Sicular found that the rural poor population decreased by one half between 2002 and 2007. However, they also found that the poverty level among the poorest improved much less than this.

In summary, past studies on poverty in China have been based primarily on official data sources, which the government claims to be nationally representative. However, poverty rates derived from these official data sources seem too low, particularly in urban areas. Since sampling frames of official surveys are not transparent, it is difficult to understand what contributes to the low estimates. Although a few papers (Glauben et al., 2012; Xing et al., 2009) have attempted to estimate poverty rates using independent surveys, their datasets are not nationally representative, and thus their results are not comparable to those based on official sources.

In this paper, we fill the knowledge gap by estimating and comparing poverty rates using four newly available nationally representative surveys. Because three of the four surveys were independently conducted with a transparent sampling framework, the comparison sheds new light on the issue of whether official data sources have underestimated poverty rates in China.

3. Data and method

In this study, we use data from four recent nationally representative surveys. These surveys are all well-known large data collection projects in China, conducted by top-tier academic institutions. Among them, the Chinese General Social Survey (CGSS) and the CHIP are repeated cross-sectional surveys that have already been conducted several times. The China Family Panel Studies (CFPS) and the China Household Finance Survey (CHFS) represent the burgeoning interest in panel studies in China. These four surveys independently provide valid data on the incomes and expenditures of Chinese households. Jointly, a comparison of poverty estimates across the four datasets constitutes a meaningful evaluation of poverty prevalence in China. The following is a brief introduction to the four surveys.

The CFPS is a large-scale panel survey project conducted by the Institute of Social Science Survey at Peking University.[4] The project is designed to study family wellbeing and its dynamics in contemporary China (Xie, Hu, & Zhang, 2014). With the household as the target of sampling, the study collects extensive information about sampled households as well as all individual household members. Our study uses the data from the CFPS baseline survey, which was carried out in 2010. The baseline survey has a nearly nationally representative sample and interviewed 14,960 households in 25 mainland provinces[5] (excluding Inner Mongolia, Xinjiang, Tibet, Hainan, Ningxia, and Qinghai), representing about 95% of the Chinese population (Xie, 2012). During the sampling, 25 provinces were divided into six independent sampling frames, i.e. Shanghai, Liaoning, Henan, Gansu, Guangdong, and other provinces. Within each frame, the households were selected using a three-stage, implicitly stratified and probability proportion to size (PPS) sampling design. In the first stage, counties/districts were stratified by their socioeconomic status (per capita GDP) and then systematically sampled according to the size of the local population. In the second stage, residential communities were sampled using a procedure similar to that used in the first stage. In the third stage, households within a village or urban neighborhood community were mapped and randomly sampled based on their geographic locations. The CFPS includes five independent subsamples in Shanghai, Liaoning, Henan, Gansu and Guangdong and has independent sampling frames for them. We selected a randomly drawn subset of samples from each of these five provinces and combined them with the sample of other provinces. Our analytical sample of the CFPS includes 9107 households, 64% in the rural area and 36% in the urban area. Xie et al. (2014) evaluated the 2010 CFPS data and found the data to be of high quality.[6]

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[4] The website of the project is http://www.isss.edu.cn/cfps/.
[5] Mainland provinces exclude Hong Kong, Macau, and Taiwan.
[6] The sex–age structure of resampling 2010 CFPS data is almost identical to that of 2010 Census, showing that CFPS data is well representative of the national population.

The CGSS is a nationwide, repeated, cross-sectional general survey project. The project was launched jointly by Renmin University and the Hong Kong University of Science and Technology in 2003.[7] The latest survey, which we analyze for this study, was conducted in 2010. The sample of the 2010 CGSS covers all 31 mainland provinces and consists of two sampling frames. One is composed of 5 major cities, i.e. Beijing, Shanghai, Guangzhou, Shenzhen and Tianjin. The other contains the remaining provinces. The survey also employs a stratified multi-stage PPS sampling design. In each sampling frame, residential districts and counties are primary sampling units; villages and urban neighborhood communities are secondary sampling units, and households are tertiary sampling units. The sampling units were stratified by socioeconomic and demographic indicators and sampled with probability proportional to size. Finally, the 2010 CGSS sampled 17,664 households in 480 urban neighborhood communities or villages of 140 residential districts or counties. Among them, 12,000 rural and urban households were successfully interviewed. The 2010 CGSS and 2010 CFPS are quite comparable because both of them collected information about household financial situations in 2009 and applied the same methods in defining rural–urban communities.[8] It has been found that the two surveys have similar distributions of household income (Xie, 2012; see also Figs. 1 and 3).

The third dataset we use for this study is the baseline of the CHFS.[9] The CHFS is a recently launched household finance-specific project with a nationally representative sample and panel design. The project is directed by the Survey and Research Center for China Household Finance at the Southwestern University of Finance and Economics. The baseline survey was carried out in 2011. We include this dataset in our study not only because of its unusual abundance of detail in collecting household financial information but also because of the amount of publicity it received. The shockingly high level of the Gini index based on this survey aroused a lot of media attention and academic debate as soon as it was released (Hvistendahl, 2013; Kao, 2012; The Economist, 2012). The survey also aroused suspicion of official figures, which are believed to either hide or underestimate the worsening wealth gap in China (Want China Times, 2013). The CHFS employs a stratified three-stage PPS random sampling design. In the first stage, 80 counties or districts were selected from 2585 counties and districts in 28 provinces (except Tibet, Xinjiang, and Inner Mongolia). In the second stage, these counties were sorted by non-agricultural population and divided into quintiles. By fixing the ratio of urban residential communities to rural villages in each quintile, they drew villages and urban neighborhood communities from separate rural and urban sampling frames. In the third stage, rural households were randomly drawn, whereas urban households were drawn from strata of neighborhood communities that were sorted by average housing price. Since the CHFS focuses on household assets, consumptions and savings, it oversamples observations from relatively wealthy regions and urban areas. We use their published weights to adjust for the oversampling of wealthy regions and urban areas.

The final data used for this study are the 2007 CHIP data. The CHIP focuses on income and inequality. The project is organized by the Chinese Academy of Social Science with cooperation from the National Bureau of Statistics of China. It was initiated in 1988, and three more waves of cross-sectional surveys (1995, 2002, and 2007) have been conducted. This study uses its most recent survey, the 2007 CHIP, which was carried out in 2008, measuring household income and expenditure in 2007. As with the other three projects, the 2007 CHIP used a stratified multi-stage PPS sampling design, but the details of the sampling design are not available to the public. The original data of 2007 CHIP contains three subsamples: the urban sample, the rural sample, and the rural-to-urban migrant sample. The urban survey collects data from 15,000 households from 302 cities in 16 provinces, whereas the rural survey contains 13,000 households from 287 counties in 16 provinces. The migrant survey has 5000 households from 15 cities in 9 provinces (Luo, Li, Sicular, Deng, & Yue, 2013). Nevertheless, we were given access to the data of only a subset of the provinces from the original sample.[10] The data we use for analysis contain 8000 rural households from Hebei, Jiangsu, Zhejiang, Anhui, Henan, Hubei, Guangdong, Chongqing, and Sichuan Provinces and 5000 urban households from Shanghai, Jiangsu, Zhejiang, Anhui, Henan, Hubei, Guangdong, Chongqing, and Sichuan Provinces. Unlike the CFPS, CGSS, and CHFS, which were conducted by three independent academic institutions, the CHIP outsourced its data collection to the National Bureau of Statistics of China. We will discuss the implications of independent surveys in the conclusion.

These four surveys are mostly comparable in region and time. Nevertheless, we note the varying coverage of provinces across datasets. Only the 2010 CGSS covered all the provinces in mainland China. The CFPS did not interview remote provinces with high concentrations of ethnic minorities, namely Qinghai, Ningxia, Xinjiang, Inner Mongolia, Tibet, and Hainan. The CHFS covered almost the same set of provinces as did the CFPS, except that it interviewed in Qinghai but not Fujian. The 2007 CHIP covered the fewest provinces. We summarize the provincial coverage of the four datasets in Appendix Table 1. The difference in sample coverage could be a source of discrepancy for the estimation of poverty prevalence across the datasets. Nevertheless, we decided not to limit the four samples to the same set of provinces, because given the great variation in economic development between

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[7] A comprehensive introduction of the agenda, themes, and designs of the Chinese General Social Survey (CGSS) project can be found in Bian and Li (2012).

[8] For the CFPS, there are no separate sampling frames for rural and urban areas. The rural/urban status of a household was post-determined in the field, judged by the interviewer based on the location, the administrative status, and the level of socioeconomic development of the community where the household was located. This kind of post-determined rural–urban definition was also adopted in the 2010 CGSS, although the sampling design of CGSS splits the rural and urban population.

[9] The website of the project is at http://www.chfsdata.org/.

[10] The CHIP can be viewed as a subsample of NBS annual household surveys in the rural and urban areas. This is because the CHIP selected samples from the NBS annual household survey's sample. The whole CHIP dataset consists of three parts: (1) 5000 urban households that were sampled from 2006 NBS's annual urban household survey. They were excluded from NBS's dataset in 2007 due to sample rotation and only interviewed by the CHIP survey. (2) 8000 rural households that were selected from the 2007 NBS's rural sample. Their information was collected by both NBS's annual rural survey and the CHIP survey. (3) 10,000 urban households and 5000 rural households in the sample of 2007 NBS's annual household surveys, in which NBS did not include the CHIP component. Our restricted CHIP dataset is from par4ts (1) and (2), which answer the CHIP questionnaire. We do not have access to part (3) of NBS's sample, which does not answer the CHIP questionnaire.
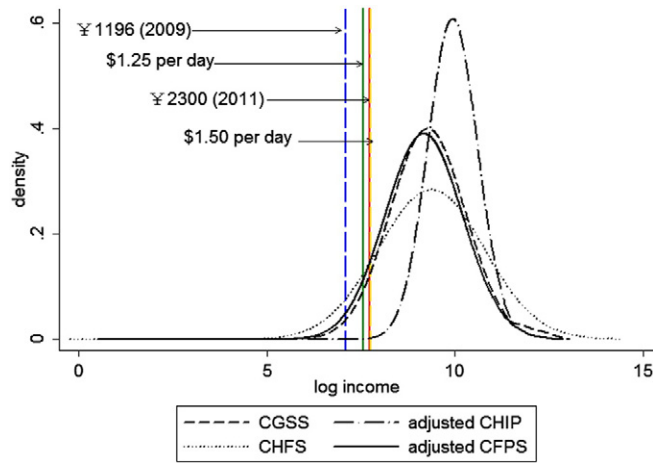
Fig. 1. The distribution of household net income per capita (rural). Note: The x-axis refers to log income per capita, and the y-axis refers to probability density function. The four vertical straight lines represent the poverty lines of 2009 (1196 yuan), $1.25 per day, $1.50 per day, and new poverty threshold in 2011 (2300 yuan). All dollars are US dollars. CGSS = Chinese General Social Survey; adjusted CHIP = Chinese Household Income Project, in which income are adjusted by income growth rate between 2007 and 2009; CHFS = China Household Finance Survey; adjusted CFPS = China Family Panel Studies, in which in-kind self-consumed produces are imputed.

different regions across China, our analysis should be grounded in a large sample including as many provinces as possible.[11] Since the population size and the distribution of rural–urban population vary by province, we weight the data using the actual size of population in each province.[12] We also weight the data using household size. The final weights for national, rural, and urban samples are calculated from the equations below:

$$W_{ij}^{rural} = \frac{P_{ri}}{P_r} * \frac{S_{ij}r_{ij}}{\sum_j S_{ij}r_{ij}} \tag{1}$$

$$W_{ij}^{urban} = \frac{P_{ui}}{P_u} * \frac{S_{ij}\left(1-r_{ij}\right)}{\sum_j S_{ij}\left(1-r_{ij}\right)} \tag{2}$$

$$W_{ij}^{national} = \frac{P_{ri}}{P_t} * \frac{S_{ij}r_{ij}}{\sum_j S_{ij}r_{ij}} + \frac{P_{ui}}{P_t} * \frac{S_{ij}\left(1-r_{ij}\right)}{\sum_j S_{ij}\left(1-r_{ij}\right)}. \tag{3}$$

In Eqs. (1) through (3), S_{ij} denotes the number of household members in the jth household of the ith province, and r_{ij} denotes whether this household is in a rural community ($r_{ij} = 1$) or in an urban community ($r_{ij} = 0$). P_{ri} and P_{ui} denote, respectively, the size of rural population and of urban population[13] in province i, and P_r, P_u and P_t are the sizes of rural population, urban population, and total population in all provinces covered by the sample.

We also note that the four surveys were conducted in different years. The CFPS and the CGSS were conducted in 2010, whereas the CHIP was conducted in 2008 and the CHFS in 2011. Changes in poverty prevalence over the years could weaken the comparability of data across the years. To make the CHIP more comparable with the CFPS and the CGSS, we adjust its income and expenditure data based on income growth rates between 2007 and 2009.[14] For the CHFS, we use its original data but inflate the poverty line in 2009 to the 2010 level or directly adopt official poverty lines from 2010.

The four surveys collect rich information on household income and expenditure. The CHIP uses self-recorded diaries to record income and expenditures that are reported monthly to the NBS, while the other three surveys use a list of retrospective questions in a one-time interview to gather income and expenditure information. Nevertheless, household income is almost consistently defined across the four surveys. It is the sum of income from agricultural activities and family business, wage income, private and public transfer income, and property income. The CFPS and CHFS measure income components in great detail, while the CGSS and CHIP measure income in relatively broad categories. Since the CHFS includes detailed information on investment gains and losses,

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[11] As a robust check, we repeated the analysis by restricting the four datasets to the same common set of provinces. The estimates of poverty prevalence did not change too much (see Appendix Tables 4–6).

[12] The data of national, rural, and urban population sizes are from the 2010 census (Population Census Office, 2012).

[13] We define urban population as residents in cities, not including residents in townships.

[14] We calculate the household income growth rates based on rural and urban household incomes in 2007, 2008, and 2009. Data are from Tables 10-5 and 10-18 in the *China Statistical Yearbook 2010* (National Bureau of Statistics of China, 2011) and Tables 9-5 and 9-18 in the *China Statistical Yearbook 2009* (National Bureau of Statistics of China, 2010a).

some families end up with negative income, though the proportion in this category is rather small. For consistency with the other surveys, we treat all negative income records as zero in this paper. This procedure does not affect the expenditure-based headcount measure of poverty. Household expenditure is measured by a variety of daily consumption items, transfer expenditure, and property expenditure. There are slight differences in expenditure coverage across surveys. We compare the components of household income and expenditure in Appendix Tables 2 and 3.

We measure poverty by absolute poverty lines. To be thorough, we adopt multiple definitions of the poverty line. The threshold of $1.25 per day is a widely used poverty line for developing countries initiated by Ravallion, Chen, and Sangraula (2009). Considering the higher cost of living in urban and developed areas, however, a higher poverty line, $1.50 per day in such areas, is considered more appropriate (Fang et al., 2002). Therefore, we use thresholds of both $1.25 and $1.50 per day to compute the poverty lines for each province in 2009 and 2010. We use more recent 2005 purchasing power parity (PPP)[15] to convert the thresholds in US dollars in 2005 to RMB. To capture regional and temporal price variation, we adjust the thresholds by spatial price differences. To construct the price data, we updated the spatial price deflators in 2000 reported by Brandt and Holz (2006) to the years 2009 and 2010 using provincial rural and urban consumer price indices (CPI) published by the NBS. In addition, we use the official poverty lines so as to compare our results with official statistics. For rural areas, the Chinese government has a well-defined national poverty line. The first official rural poverty line was developed in 1986, defining rural residents with per capita net incomes of less than 206 yuan as absolutely poor. The low-income standard was changed to 865 yuan in 2000. In 2008, the government amended the poverty line for the third time, unifying the absolute poverty standard and low-income standard, setting per capita net income of less than 1067 yuan as the poverty standard. This standard was further raised to 1196 yuan in 2009 and 1274 yuan in 2010 to reflect the change in CPI. In 2011, the government raised the poverty line again to 2300 yuan. To be thorough, we use the official rural poverty lines of 1196 yuan in 2009, 1274 yuan in 2010, and the new poverty threshold of 2300 yuan for the estimation of rural poverty prevalence. For urban areas, there is no nationwide official poverty standard. Instead, we use urban minimum living standards in 2009 and 2010 at the provincial level as the official definition of urban poverty. The urban minimum living standards are usually drawn up at the city/county level, whereas the Ministry of Civil Affairs releases the urban minimum living standard aggregated at the provincial level for each season. We combined the standards for the four seasons to obtain the yearly urban minimum living standard for each province.

In this paper, we use Foster–Greer–Thorbecke (FGT) indices based on household net income and household expenditure to compute our poverty measures. The FGT index has three variants. The first is the headcount ratio, denoted by P_0, which measures the share of population living below the poverty line. The second is the poverty gap index (P_1), which takes into account the total shortfall of individual income relative to poverty line. The third is a weighted poverty gap index (P_2), which takes into account inequality among the poor by placing greater weight on the extremely poor (Foster, Greer, & Thorbecke, 1984).[16] The FGT indices can be generalized into a single equation. In Eq. (4), x denotes per capita net income or per capita expenditure, z denotes the poverty line, and $f(x)$ denotes the density function of x. When α equals 0, 1, and 2, the index becomes P_0, P_1, and P_2.

$$P_\alpha = \int_0^z \left[\frac{z-x}{z}\right]^\alpha f(x)dx \tag{4}$$

4. Results

4.1. National poverty prevalence level

Table 1 presents the national poverty prevalence level using the thresholds of $1.25 per day and $1.50 per day. The upper panel of Table 1 shows the poverty prevalence level computed from household net income per capita. The standard errors are listed in parentheses. Among the four surveys, the poverty levels based on the CHIP are the lowest, with poverty incidences of 3.7% below the poverty line of $1.25 per day and of 6.2% below the poverty line of $1.50 per day. By contrast, CHFS provides the highest estimates of poverty prevalence: using the $1.25-per-day line, nearly one fifth of the national population are poor; using the $1.50-per-day line, about 22.5% of the national population are poor. The CGSS produces estimates close to the CHFS: the poverty incidence is 16.6 under $1.25 per day and 21.4 under $1.50 per day. The latter is not statistically significantly different from the estimate of the CHFS (see Appendix Table 7). The estimates of the CFPS are between the CGSS and the CHIP. The poverty incidences in the CFPS are 11.9% under $1.25 per day and 14.7% under $1.50 per day. The two alternative poverty measures, P_1 and P_2, provide consistent rankings among the four surveys.

When we estimate poverty prevalence levels based on household expenditure per capita, the results from the CFPS, CGSS, and CHFS are close, whereas the estimates from the CHIP are much lower. As shown in the lower panel of Table 1, the poverty incidence based on the CHIP is only 4.3% under $1.25 per day and 8.3% under $1.50 per day. These estimates are significantly lower than those from the CFPS, CGSS, and CHFS, which suggest that about 8 to 15% of the national population live under the $1.25-per-day line and about 12 to 20% live under the $1.50-per-day line.

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[15] The 2005 PPP for China is 3.46 yuan to the US dollars (Chen & Ravallion, 2010).

[16] P_2 is an index which combines information on poverty level and income inequality among the poor. When $\alpha = 2$, Eq. (4) can be also written as $P_2 = H(I^2 + (1 - I)^2 C_p{}^2)$. H is the headcount ratio, I is the income-gap ratio, and the squared coefficient of $C_p{}^2$ is the measure of inequality among the poor (Foster et al., 1984).

Table 1
Poverty for China as a whole using $1.25 and $1.50 per day poverty lines.

	$1.25 per day			$1.5 per day		
	P_0	P_1	P_2	P_0	P_1	P_2
Based on household net income per capita						
CHIP	3.67	1.04	0.47	6.18	1.67	0.74
	(0.21)	(0.08)	(0.04)	(0.27)	(0.10)	(0.06)
CFPS	11.87	5.67	3.81	14.70	6.94	4.58
	(0.61)	(0.33)	(0.27)	(0.65)	(0.37)	(0.29)
CGSS	16.59	6.68	3.90	21.38	8.72	5.07
	(0.68)	(0.34)	(0.25)	(0.78)	(0.38)	(0.28)
CHFS	19.66	11.06	8.29	22.51	12.73	9.40
	(0.76)	(0.46)	(0.39)	(0.80)	(0.49)	(0.41)
Based on household expenditure per capita						
CHIP	4.26	0.87	0.28	8.33	1.76	0.59
	(0.23)	(0.06)	(0.03)	(0.31)	(0.09)	(0.04)
CFPS	8.09	2.94	1.61	11.65	4.09	2.19
	(0.44)	(0.19)	(0.13)	(0.52)	(0.22)	(0.15)
CGSS	13.36	4.49	2.20	18.91	6.44	3.20
	(0.68)	(0.27)	(0.16)	(0.79)	(0.34)	(0.20)
CHFS	14.73	5.21	2.70	20.10	7.21	3.78
	(0.79)	(0.36)	(0.24)	(0.87)	(0.41)	(0.28)
Weighted average of poverty estimates across CFPS, CGSS and CHFS						
P_0	12.62			16.79		

Note: All dollars are US dollars. CHIP = Chinese Household Income Project; CGSS = Chinese General Social Survey; CFPS = China Family Panel Studies; CHFS = China Household Finance Survey. Numbers in parentheses are standard errors. P_0 denotes headcount ratio; P_1 denotes poverty gap index; and P_2 denotes the weighted poverty gap index. Weighted average of poverty estimates are computed by averaging all income- and expenditure-based estimates from CHFS, CGSS and CFPS, which are weighted by their inversed sampling variances.

Based on the CFPS, CGSS, and CHFS estimates, we also calculated the weighted averages of poverty prevalence rate under different poverty standards. They show that 12.6% of the national population live under $1.25-per-day line and 16.8% of national population under $1.50-per-day line.

4.2. Rural poverty prevalence level

We now investigate rural poverty prevalence based on $1.25 per day, $1.50 per day, and officially defined rural poverty lines. We use two versions of official rural poverty lines: 1196 yuan per capita in 2009 prices is the previous threshold, and 2300 yuan per capita is the newest one.

Figs. 1 and 2 plot the normal density curves of log household net income per capita and log household expenditure per capita for rural households of the four surveys. In these figures, we use vertical straight lines to represent different poverty lines. We can

Fig. 2. The distribution of household expenditure per capita (rural). Note: The x-axis refers to log expenditure per capita, and the y-axis refers to probability density function. The four vertical straight lines represent the poverty lines of 2009 (1196 yuan), $1.25 per day, $1.50 per day, and new poverty threshold in 2011 (2300 yuan). All dollars are US dollars. CGSS = Chinese General Social Survey; adjusted CHIP = Chinese Household Income Project, in which expenditure are adjusted by income growth rate between 2007 and 2009; CHFS = China Household Finance Survey; adjusted CFPS = China Family Panel Studies, in which in-kind self-consumed produces are imputed.

Table 2

Rural poverty using $1.25-per-day, $1.50-per-day, national rural poverty line at the survey year, and new rural poverty line.

	$1.25 per day			$1.50 per day			Rural poverty line			New poverty line in 2011		
	P_0	P_1	P_2	P_0	P_1	P_2	P_0	P_1	P_2	P_0	P_1	P_2
Based on household net income per capita												
CHIP	5.25	1.48	0.66	8.85	2.38	1.05	2.03	0.59	0.29	10.56	2.86	1.25
	(0.30)	(0.11)	(0.06)	(0.39)	(0.14)	(0.08)	(0.20)	(0.07)	(0.04)	(0.43)	(0.15)	(0.09)
CFPS	15.52	6.81	4.32	19.02	8.54	5.36	8.55	4.00	2.67	19.46	8.74	5.48
	(0.55)	(0.28)	(0.22)	(0.61)	(0.31)	(0.24)	(0.40)	(0.22)	(0.18)	(0.61)	(0.32)	(0.24)
CGSS	21.00	8.50	4.96	26.49	11.02	6.44	10.46	4.45	2.65	26.56	11.16	6.45
	(0.92)	(0.47)	(0.36)	(1.03)	(0.53)	(0.39)	(0.66)	(0.36)	(0.28)	(1.02)	(0.52)	(0.38)
CHFS	22.70	11.99	8.53	26.28	14.07	9.92	15.55	8.43	6.26	26.46	14.07	9.91
	(1.01)	(0.61)	(0.50)	(1.06)	(0.65)	(0.54)	(0.84)	(0.53)	(0.45)	(1.07)	(0.65)	(0.54)
Based on household expenditure per capita												
CHIP	6.03	1.23	0.40	11.77	2.48	0.83	1.35	0.25	0.07	14.27	3.06	1.04
	(0.32)	(0.09)	(0.04)	(0.44)	(0.12)	(0.06)	(0.17)	(0.04)	(0.02)	(0.49)	(0.14)	(0.07)
CFPS	12.35	4.45	2.40	17.34	6.17	3.29	5.22	1.98	1.21	18.26	6.47	3.42
	(0.55)	(0.23)	(0.16)	(0.63)	(0.27)	(0.18)	(0.37)	(0.16)	(0.12)	(0.64)	(0.28)	(0.19)
CGSS	16.53	5.65	2.75	23.12	8.01	4.00	7.13	2.20	1.00	23.21	8.00	3.95
	(0.94)	(0.38)	(0.23)	(1.08)	(0.47)	(0.28)	(0.62)	(0.22)	(0.13)	(1.06)	(0.45)	(0.27)
CHFS	19.83	7.07	3.69	26.67	9.72	5.13	9.98	3.41	1.81	26.27	9.70	5.22
	(1.02)	(0.46)	(0.31)	(1.11)	(0.53)	(0.36)	(0.82)	(0.33)	(0.23)	(1.11)	(0.54)	(0.37)
Weighted average of poverty estimates across CFPS, CGSS and CHFS												
P_0	16.27			21.17			15.94			21.63		

Note: All dollars are US dollars. CHIP = Chinese Household Income Project; CGSS = Chinese General Social Survey; CFPS = China Family Panel Studies; CHFS = China Household Finance Survey. P_0 denotes headcount ratio; P_1 denotes poverty gap index; and P_2 denotes the weighted poverty gap index. We use the official rural poverty line in 2009 (1196 yuan) for CHIP, CGSS, and CFPS and poverty line in 2010 (1274 yuan) for CHFS. New poverty line in 2011 is 2300 yuan. Numbers in parentheses are standard errors. Weighted average of poverty estimates are computed by averaging all income- and expenditure-based estimates from CHFS, CGSS and CFPS, which are weighted by their inversed sampling variances.

see that the old official line of 1196 yuan is the lowest poverty line, and $1.25 per day is the second lowest. The $1.50-per-day line is higher and close to the newly defined official line of 2300 yuan. According to Fig. 1, the distributions of household income of CFPS and CGSS are similar to each other. The CHIP has the highest mean income and the least dispersion. In contrast, the CHFS has the lowest mean income and the highest income inequality. The distribution of household expenditures from the CFPS and CHFS in Fig. 2 exhibits a similar pattern, whereas the CHIP reveals higher mean expenditures.

Table 2 presents the estimates of P_0, P_1, and P_2 for the rural population based on different poverty lines. According to the results from household net income per capita, the CHIP presents the lowest level of poverty prevalence: only 2–11% of rural residents live below the poverty lines. Results from the other three datasets are relatively close. Among them, the CHFS and CGSS indicate the highest poverty prevalence level, with about 10 to 16% of rural residents living below the lowest poverty line and almost 26% of rural residents living below the higher poverty lines, whereas the CFPS shows a less extreme picture: about 9% of rural residents live below the official line of 1196 yuan, 16% below the $1.25-per-day line, and about 19% below the official line of 2300 yuan or $ 1.50-per-day line. The estimates of P_1 and P_2 exhibit the same picture as those of P_0.

Similarly, if we look at the expenditure-based estimates, we find that the CHIP yields the lowest value, and the CGSS, CFPS, and CHFS produce consistently higher estimates. According to the three latter surveys, the rural poverty incidence (P_0) is about 5–10% based on the 1196 yuan line, about 12–20% based on the $1.25-per-day line, 18–26% based on the 2300 yuan line, and 17–27% based on the $1.50-per-day line. The estimates of P_1 and P_2 based on the three datasets are similar.

In sum, the estimates of rural poverty prevalence from expenditure data are close to, although slightly lower than, those from income data. If we trust what the majority of estimates indicate, we conclude that around 15.9% of the rural population will be considered poor according to the lowest poverty line and a quintile of the rural population will be considered poor according to the higher poverty lines.

Table 3

Comparison of household characteristics of poor households and non-poor households in the rural area: The ratios between poor households and non-poor households.

	CHIP	CFPS	CGSS	CHFS
Household size	1.28	1.15	1.12	1.22
Proportion of household member aged 14 or below	1.44	1.31	1.23	1.20
Proportion of household member aged 60 or above	1.10	1.52	1.39	1.38
Household head's years of schooling	0.89	0.69	0.75	0.78
Proportion of agricultural income	0.96	1.09	1.19	1.15
Proportion of wage income	1.05	0.89	0.81	0.37
Engel's coefficient	1.46	1.41	1.18	1.11

Note: CHIP = Chinese Household Income Project; CGSS = Chinese General Social Survey; CFPS = China Family Panel Studies; CHFS = China Household Finance Survey. The poor household is defined as its expenditure per capita being below 1.25-per-day line.
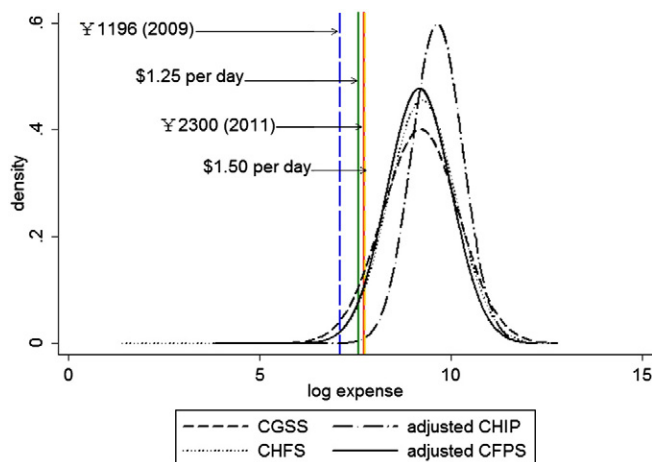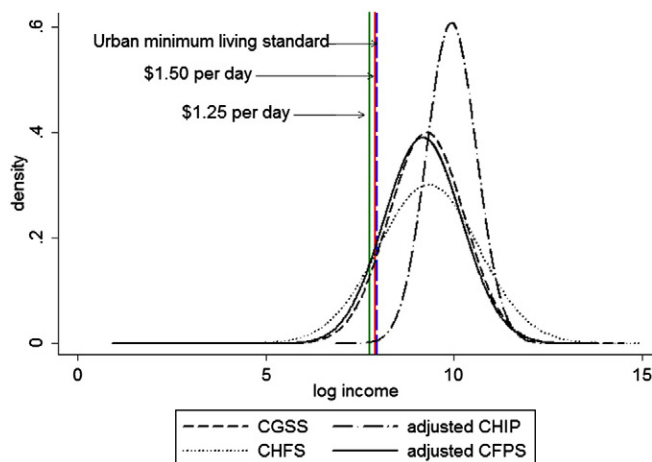
Fig. 3. The distribution of household net income per capita (urban). Note: The x-axis refers to log income per capita, and the y-axis refers to probability density function. The three vertical straight lines represent the mean of urban province-specific minimum living standards, $1.50 per day and the poverty lines of $1.25 per day. All dollars are US dollars. CGSS = Chinese General Social Survey; adjusted CHIP = Chinese Household Income Project, in which income are adjusted by income growth rate between 2007 and 2009; CHFS = China Household Finance Survey; adjusted CFPS = China Family Panel Studies, in which in-kind self-consumed produces are imputed.

Are the poor rural households in different datasets of the same type? To answer this question, we compare the household profiles between poor and non-poor households. In Table 3, we show the ratios of poor households to non-poor households in terms of household size, age structure, the mean years of schooling of household heads, income structure, and Engel's coefficient. We find that poor households are larger in size and usually have more dependents (children and the elderly). Poor households also lack human capital, as shown by the lower average years of schooling among household heads. Except for the CHIP, the other three surveys show that poor households depend more on agriculture as their income source than on wage income. Given a higher dependent ratio and lower education level of household heads, the poor households earn lower wages in the rural areas than their non-poor counterparts. The ratio in Engel's coefficient between the poor and non-poor households is larger than one, suggesting that poor households tend to spend a larger portion of their income on food. This is consistent with our perception of households in poverty. One thing setting CHIP apart from the other three surveys is that the educational gap between the poor and the non-poor in CHIP is much smaller than those in other three surveys. This suggests that the NBS may have purposely selected households whose members are literate so that they can keep a diary of household finance. In so doing, however, the illiterate households, who happen to be more likely to be poor, may have been disproportionately excluded, resulting in a systematic sample selection bias.

4.3. Urban poverty prevalence level

We now turn to the urban poverty prevalence level. The poverty lines for urban residents include $1.25 per day, $1.50 per day, and the urban minimum living standard.

Figs. 3 and 4 plot the distributions of log household net income per capita and of log household expenditure per capita for urban households in the four surveys. The vertical straight lines in the figures represent poverty lines of $1.25 per day and $1.50 per day and the urban minimum living standard.[17] We can see that the urban minimum living standard is slightly higher than the $1.50-per-day line. Among the four surveys, the CGSS and the CFPS exhibit similar income distributions, whereas the CHIP shows the highest mean income and lowest dispersion and the CHFS exhibits the lowest mean income and highest dispersion. For the distribution of expenditure, the CHFS and CFPS resemble one another. The CGSS has a slightly lower mean expenditure, and the CHIP has the highest mean.

Table 4 presents estimates of urban poverty prevalence under different poverty lines. We look first at the upper panel of the table, which presents income-based estimates. The panel shows that the poverty prevalence based on the CHIP is extremely low, less than 0.3% regardless of the poverty line being used. The CHFS presents the highest level of urban poverty prevalence: About 16% of urban residents are counted as poor under the $1.25-per-day line, and nearly a fifth of urban residents are tallied as poor under the urban minimum living standard. The CFPS and CGSS produce modest and similar estimates: about 7–8% of the urban population fall below the $1.25-per-day line and 10–11% below the $1.50-per-day line and the urban minimum living standard. The differences in income-based estimates between CGSS and CFPS are not statistically significant (see Appendix Table 7).

We next look at the urban poverty level from the expenditure data shown in the lower panel of Table 4. The urban poverty prevalence estimated from the CHIP remains extremely low. Virtually all the urban population live above the $1.25-per-day line, and only around 0.7% live under the $1.50-per-day line or the urban minimum living standard. By contrast, the CGSS, CFPS, and CHFS reveal more prevalent urban poverty. The expenditure-based estimates from the CGSS and CHFS are quite close and statistically insignificant,

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[17] The urban minimum living standard varies across cities. Here, we take the average of the urban minimum living standard aggregated at the provincial level.
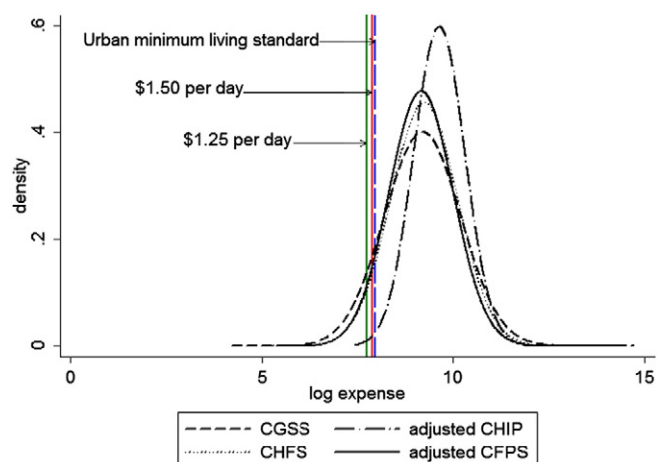
Fig. 4. The distribution of household expenditure per capita (urban). Note: The x-axis refers to log expenditure per capita, and the y-axis refers to probability density function. The three vertical straight lines represent the mean of urban province-specific minimum living standards, $1.50 per day and the poverty lines of $1.25 per day. All dollars are US dollars. CGSS = Chinese General Social Survey; adjusted CHIP = Chinese Household Income Project, in which expenditure are adjusted by income growth rate between 2007 and 2009; CHFS = China Household Finance Survey; adjusted CFPS = China Family Panel Studies, in which in-kind self-consumed produces are imputed.

whereas the estimates from the CFPS are slightly lower: the poverty incidence is 5–7% based on the $1.25-per-day line, 7–10% based on the $1.50-per-day line, 9–11% for the CGSS and CHFS, and 6% for the CFPS based on the urban minimum living standard.

Comparing the results of Tables 2 and 4, we clearly see that poverty prevalence in urban areas is much lower than that in rural areas. In urban areas, as the majority of estimates reflect, 7.6% of the population have income and expenditure below the $1.25-per-day line, and around 10.7% of the population fall below the highest poverty line, the urban minimum living standard. Again, P_1 and P_2 provide similar results.

Now we turn to look at poverty profiles across surveys. Table 5 presents the ratio of poor households to non-poor households in household size, age structure of household members, years of schooling of household heads, the share of wage income, and Engel's coefficient. As with rural poor households, urban poor households are also larger in size and have a higher dependent ratio (except for the CHIP), with household heads having fewer years of schooling. The CGSS and CHFS show that poor households have

Table 4
Urban poverty using the $1.25-per-day, $1.50-per-day, and urban minimum living standard.

	$1.25 per day			$1.50 per day			Urban minimum living standard		
	P_0	P_1	P_2	P_0	P_1	P_2	P_0	P_1	P_2
Based on household net income per capita									
CHIP	0.14	0.06	0.05	0.22	0.08	0.06	0.23	0.10	0.07
	(0.05)	(0.03)	(0.03)	(0.06)	(0.04)	(0.03)	(0.06)	(0.04)	(0.03)
CFPS	8.42	4.47	3.19	10.78	5.36	3.72	10.36	5.24	3.69
	(0.84)	(0.50)	(0.42)	(0.92)	(0.54)	(0.44)	(0.92)	(0.55)	(0.45)
CGSS	7.36	2.87	1.69	10.69	3.91	2.21	9.66	3.63	2.09
	(0.57)	(0.23)	(0.16)	(0.75)	(0.28)	(0.18)	(0.66)	(0.26)	(0.18)
CHFS	16.02	10.58	8.76	18.00	11.65	9.48	18.90	11.97	9.72
	(0.82)	(0.62)	(0.57)	(0.86)	(0.64)	(0.59)	(0.87)	(0.65)	(0.59)
Based on household expenditure per capita									
CHIP	0.31	0.08	0.03	0.66	0.15	0.05	0.64	0.13	0.05
	(0.10)	(0.04)	(0.02)	(0.14)	(0.05)	(0.02)	(0.13)	(0.04)	(0.02)
CFPS	4.86	1.74	0.96	7.14	2.45	1.31	6.20	2.41	1.38
	(0.67)	(0.28)	(0.19)	(0.77)	(0.33)	(0.22)	(0.73)	(0.36)	(0.25)
CGSS	6.70	2.08	1.04	10.10	3.15	1.52	9.31	2.96	1.47
	(0.59)	(0.22)	(0.14)	(0.78)	(0.28)	(0.17)	(0.65)	(0.25)	(0.16)
CHFS	6.07	1.73	0.76	9.30	2.73	1.21	10.74	3.22	1.47
	(0.62)	(0.18)	(0.10)	(0.81)	(0.24)	(0.13)	(0.89)	(0.29)	(0.15)
Weighted average of poverty estimates across CFPS, CGSS and CHFS									
P_0	7.61			10.79			10.69		

Note: All dollars are US dollars. CHIP = Chinese Household Income Project; CGSS = Chinese General Social Survey; CFPS = China Family Panel Studies; CHFS = China Household Finance Survey. P_0 denotes headcount ratio; P_1 denotes poverty gap index; and P_2 denotes the weighted poverty gap index. The urban minimum living standard is province-specific. Numbers in parentheses are standard errors. Weighted average of poverty estimates are computed by averaging all income- and expenditure-based estimates from CHFS, CGSS and CFPS, which are weighted by their inversed sampling variances.

Table 5
Comparison of household characteristics of poor households and non-poor households in the urban area: The ratios between poor households and non-poor households.

	CHIP	CFPS	CGSS	CHFS
Household size	1.18	1.37	1.31	1.32
Proportion of household member age 14 or below	1.14	1.35	1.24	1.19
Proportion of household member age 60 or above	0.50	1.23	1.12	1.42
Household head's years of schooling	0.75	0.59	0.69	0.67
Proportion of wage income	1.08	1.01	0.87	0.63
Engel's coefficient	1.45	1.72	1.25	1.12

Note: CHIP = Chinese Household Income Project; CGSS = Chinese General Social Survey; CFPS = China Family Panel Studies; CHFS = China Household Finance Survey. The poor household is defined as its expenditure per capita being below 1.25-per-day line. Under this definition, only 14 urban households in the CHIP sample were poor.

a lower share of wage income, while the difference is not evident in the CFPS and CHIP. As shown in Engel's coefficient, poor households spend a larger share of income on food than non-poor households. But we also notice that the difference in Engel's coefficient is smaller in the CGSS and CHFS. This probably implies that these two surveys may tend to misclassify some non-poor households into poor households.

5. Conclusion

We have examined the current poverty prevalence level in China using four nationally representative samples. The poverty estimates based on income and expenditure data from the CFPS, CGSS, and CHFS are much larger than those based on the CHIP data and reported in official statistics. The national poverty rate in 2009 was about 12.6% using the $1.25-per-day poverty threshold and 16.8% using the $1.50-per-day poverty threshold. Our estimates are also close to the estimate based on the China Health and Nutrition Survey (CHNS).[18] Yu (2013) reported that the national poverty rate is 12.8%, based on a rural poverty line of 2300 yuan and urban poverty line of 3014 yuan, which are largely in line with our findings.

Poverty in rural areas is much more severe than in urban areas. Around 16% of the rural population live below the lowest poverty line, i.e., the 2009 government rural poverty line. The prevalence of poverty in rural China is as high as 21% when the $1.50-per-day poverty threshold or the 2011 new government rural poverty threshold is used. In urban areas, the prevalence of poverty is 7.6% when measured with the $1.25-per-day threshold and 10.7% when measured with the $1.50-per-day threshold or the urban minimum living standard.

Based on the above results, we infer that about 147 to 196 million rural people and 30 to 42 million urban people in China live in poverty. Our estimates are much higher than official figures. For example, the National Bureau of Statistics of China (2010b) reported that 35 million rural people lived below the 1196 yuan line in 2009. Even with the new government rural poverty threshold, the Chinese Academy of Science (2012) reported that 128 million rural people were poor in 2010. The Chinese Academy of Social Science (CASS) also reported that around 50 million urban people, amounting to 8% of the population in cities and towns, did not meet the urban living standard by the end of 2009 (Pan & Wei, 2011). Although this number of urban poor would seem to be larger than our estimates, readers must note that the CASS researchers included towns as part of urban areas, whereas we included only cities. If we revise the base by including people in towns, the estimated size of the urban population living below the minimum living standard will increase to 71 million.

Our findings shed light on the debate concerning the true picture of poverty in China. The official statistics and government-sponsored surveys have produced much lower poverty rates than those reported in other countries with similar levels of economic development and also lower rates than people's perceptions. We have found that China's current poverty prevalence is higher than the official estimates (for example, those by the National Bureau of Statistics of China, the CHIP, and the Chinese Academy of Social Science). One potential explanation for the low poverty rates based on the CHIP can be the geographic incompleteness of the CHIP data that have been made available to us. To examine this explanation, we restricted the four datasets to the same provinces and obtained the same findings: the poverty rates estimated from the CHIP are still much lower than those from the other three datasets (see Appendix Tables 4–6). Therefore, the difference in sample coverage is not the main reason for the lower poverty rate inferred from the CHIP data. Using a nationally representative version of the CHIP data,[19] Li et al. (2013) reported higher poverty rates, but mainly for rural areas. Based on the $1.25-per-day line, their estimate of poverty rate is 13.9% in rural areas but only 0.4% in urban areas. Except for their 13.9% rural estimate, which is close to that based on the CFPS, other estimates are still much lower than those of the CFPS, CGSS, and CHFS.

The underestimation of poverty prevalence by official surveys is not merely a matter of where the poverty line is drawn but also relates to the data on which estimates are based. The possible bias could stem from poor households being underrepresented in the sample due to the NBS using the self-record diary method. To keep a diary of income and expenditure, the household members must be

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[18] The CHNS is a regional sample, covering nine eastern and central provinces. The recent wave of the CHNS does not cover detailed expenditures. Because of its smaller geographic coverage and lack of expenditure data, we do not compare it with the other four surveys in this paper.

[19] The nationally representative version of the CHIP, which is not available to us, includes 13,000 rural households and 10,000 urban households in 16 provinces and 5000 migrant households in 9 provinces.

literate. Illiterate households, which are often also poor, are thus more likely to be excluded from the survey. The fact that the educational gap between household heads of poor and non-poor households is narrower in the CHIP than in the other three surveys lends support to this argument. Since the data collection process in official surveys lacks transparency, we can only speculate about the source of bias.

We are aware that the present study has several limitations, however. First, using a one-time retrospective survey questionnaire to collect household financial information may underestimate income and expenditure if respondents fail to recall all relevant information from past months. In this regard, monthly reported diaries may provide more accurate data. Second, the CHIP's having been conducted in a much earlier year than the other three surveys could also be a factor contributing to the observed difference in poverty rates. Our adjustment to the CHIP may not fully address the temporal issue. Official statistics show that the poverty rate in 2007 was lower than the rate in either the two preceding years or the two following years. We do not, however, think that the temporal difference alone can account for the discrepancy in poverty estimates between the CHIP and the other three surveys.

The findings of this study highlight the importance of cross-source validation for evaluating poverty prevalence in China. Multiple data sources with multiple definitions of poverty allow for a fuller understanding of poverty prevalence in today's China. The inconsistency of results between independent academic surveys (CGSS, CFPS, and CHFS) and official data (National Bureau of Statistics of China and CHIP) deserves further attention. It suggests that independent surveys may help the National Bureau of Statistics of China to improve its data quality and provide more accurate assessments of poverty prevalence.

Acknowledgment

Appendix A

Appendix Table 1
The provincial coverage of the four surveys.

Code	Province	CFPS	CGSS	CHFS	CHIP
11	Beijing	✔	✔	✔ (urban only)	
12	Tianjin	✔	✔	✔ (urban only)	
13	Hebei	✔	✔	✔	✔ (rural only)
14	Shanxi	✔	✔	✔	
15	Neimenggu		✔		
21	Liaoning	✔	✔	✔	
22	Jilin	✔	✔	✔	
23	Heilongjiang	✔	✔	✔	
31	Shanghai	✔	✔	✔	✔ (urban only)
32	Jiangsu	✔	✔	✔	✔
33	Zhejiang	✔	✔	✔	✔
34	Anhui	✔	✔	✔	✔
35	Fujian	✔	✔		
36	Jiangxi	✔	✔	✔	
37	Shandong	✔	✔	✔	
41	Henan	✔	✔	✔	✔
42	Hubei	✔	✔	✔	✔
43	Hunan	✔	✔	✔	
44	Guangdong	✔	✔	✔	✔
45	Guangxi	✔	✔	✔ (rural only)	
46	Hainan		✔		
50	Chongqing	✔	✔	✔	✔
51	Sichuan	✔	✔	✔	✔
52	Guizhou	✔	✔	✔ (rural only)	
53	Yunnan	✔	✔	✔	
54	Tibet		✔		
61	Shannxi	✔	✔	✔ (rural only)	
62	Gansu	✔	✔	✔	
63	Qinghai		✔	✔ (urban only)	
64	Ningxia		✔		
65	Xinjiang		✔		
	Total #	25	31	25	10

Note: CHIP = Chinese Household Income Project; CGSS = Chinese General Social Survey; CFPS = China Family Panel Studies; CHFS = China Household Finance Survey.

Appendix Table 2
The definition of income across the four surveys.

	CHIP	CFPS	CGSS	CHFS
Income from Agriculture and family business			✔	
Gross income from agriculture	✔	✔		✔
In-kind self-consumed produces		✔ (imputed)		
Profit from family business	✔	✔		✔
Wage income			✔	
Basic wage	✔	✔		✔
Bonus	✔	✔		✔
Property income	✔			
Housing rent		✔	✔	✔
Land rent		✔	✔	✔
Rent of other items		✔		✔
Income from selling items		✔	✔	✔
Transfer income	✔			
Pension		✔	✔	✔
Social security benefit		✔	✔	✔
Minimum living allowance		✔	✔	✔
Gift/cash gift		✔	✔	✔
Other income		✔	✔	

Note: CHIP = Chinese Household Income Project; CGSS = Chinese General Social Survey; CFPS = China Family Panel Studies; CHFS = China Household Finance Survey.

Appendix Table 3
The definition of expenditure across the four surveys.

	CHIP	CFPS	CGSS	CHFS
Food	✔	✔	✔	✔
Self-consumed produce		✔		✔
Dress	✔	✔	✔	✔
Daily necessities	✔	✔	✔	✔
Housing/utilities	✔	✔	✔	✔
Transportation & communication	✔	✔	✔	✔
Durable goods/domestic appliance	✔	✔	✔	✔
Automobiles		✔		✔
Education	✔	✔	✔	✔
Entertainment/culture	✔	✔	✔	✔
Medicine/preventive	✔	✔	✔	✔
Service payment	✔	✔		✔
Luxury goods				✔
Housing montage/purchasing housing	✔	✔	✔	
Commercial insurance		✔		
Donation		✔		
Gift/cash gift	✔	✔	✔	
Other expenditure	✔	✔	✔	

Note: CHIP = Chinese Household Income Project; CGSS = Chinese General Social Survey; CFPS = China Family Panel Studies; CHFS = China Household Finance Survey.

Appendix Table 4
Poverty for China as a whole using $1.25 and $1.50 per day thresholds, restricted sample.

	$1.25 per day			$1.5 per day		
	P_0	P_1	P_2	P_0	P_1	P_2
Based on household net income per capita						
Income						
CHIP	3.67	1.04	0.47	6.18	1.67	0.74
	(0.21)	(0.08)	(0.04)	(0.27)	(0.10)	(0.06)
CFPS	10.46	4.74	3.05	13.23	5.93	3.76
	(0.65)	(0.36)	(0.27)	(0.75)	(0.40)	(0.30)
CGSS	13.72	4.95	2.76	18.38	6.83	3.72
	(0.93)	(0.43)	(0.32)	(1.14)	(0.49)	(0.36)
CHFS	18.93	11.00	8.31	21.67	12.57	9.38
	(0.89)	(0.60)	(0.50)	(0.96)	(0.63)	(0.53)

Appendix Table 4 (*continued*)

	$1.25 per day			$1.5 per day		
	P_0	P_1	P_2	P_0	P_1	P_2
Based on household expenditure per capita						
CHIP	4.26	0.87	0.28	8.33	1.76	0.59
	(0.23)	(0.06)	(0.03)	(0.31)	(0.09)	(0.04)
CFPS	8.16	3.21	1.85	11.79	4.33	2.43
	(0.68)	(0.31)	(0.21)	(0.78)	(0.36)	(0.24)
CGSS	11.39	3.67	1.76	17.27	5.46	2.61
	(0.87)	(0.33)	(0.19)	(1.09)	(0.42)	(0.24)
CHFS	14.01	5.20	2.84	18.66	7.05	3.85
	(0.93)	(0.46)	(0.34)	(1.00)	(0.51)	(0.38)

Note: All dollars are US dollars. CHIP = Chinese Household Income Project; CGSS = Chinese General Social Survey; CFPS = China Family Panel Studies; CHFS = China Household Finance Survey. Numbers in parentheses are standard errors. P_0 denotes headcount ratio; P_1 denotes poverty gap index; and P_2 denotes the weighted poverty gap index. The four survey samples are restricted to the same provinces. These provinces are Hebei, Shanghai, Jiangsu, Zhejiang, Anhui, Henan, Hubei, Guangdong, Chongqing, and Sichuan.

Appendix Table 5
Rural poverty using $1.25 per day, $1.50 per day, national rural poverty line at the survey year and new rural poverty line, restricted sample.

	$1.25 per day			$1.5 per day			Rural poverty line			New rural poverty line in 2011		
	P_0	P_1	P_2	P_0	P_1	P_2	P_0	P_1	P_2	P_0	P_1	P_2
Based on household net income per capita												
CHIP	5.25	1.48	0.66	8.85	2.38	1.05	2.03	0.59	0.29	10.56	2.86	1.25
	(0.30)	(0.11)	(0.06)	(0.39)	(0.14)	(0.08)	(0.20)	(0.07)	(0.04)	(0.43)	(0.15)	(0.09)
CFPS	13.52	6.10	3.83	16.59	7.57	4.76	8.69	3.92	2.54	18.81	8.62	5.41
	(0.74)	(0.39)	(0.29)	(0.83)	(0.43)	(0.32)	(0.60)	(0.31)	(0.24)	(0.87)	(0.46)	(0.34)
CGSS	17.11	6.13	3.43	22.29	8.41	4.61	8.68	3.54	2.04	25.12	9.84	5.41
	(1.27)	(0.60)	(0.45)	(1.54)	(0.69)	(0.50)	(0.91)	(0.49)	(0.37)	(1.61)	(0.75)	(0.53)
CHFS	21.56	11.76	8.40	24.99	13.71	9.74	16.32	8.85	6.42	26.77	14.57	10.30
	(1.26)	(0.82)	(0.67)	(1.33)	(0.87)	(0.72)	(1.14)	(0.72)	(0.59)	(1.36)	(0.88)	(0.73)
Based on household expenditure per capita												
CHIP	6.03	1.23	0.40	11.77	2.48	0.83	1.35	0.25	0.07	14.27	3.06	1.04
	(0.32)	(0.09)	(0.04)	(0.44)	(0.12)	(0.06)	(0.17)	(0.04)	(0.02)	(0.49)	(0.14)	(0.07)
CFPS	11.13	4.36	2.51	15.45	5.83	3.30	6.09	2.43	1.55	18.71	6.95	3.89
	(0.76)	(0.35)	(0.25)	(0.87)	(0.40)	(0.28)	(0.57)	(0.27)	(0.21)	(0.94)	(0.43)	(0.30)
CGSS	13.67	4.42	2.03	20.53	6.53	3.08	7.15	2.01	0.87	23.52	7.85	3.79
	(1.23)	(0.47)	(0.26)	(1.49)	(0.59)	(0.33)	(0.95)	(0.29)	(0.17)	(1.59)	(0.66)	(0.39)
CHFS	19.53	7.32	4.01	25.32	9.82	5.41	10.77	4.08	2.30	27.36	10.70	5.95
	(1.28)	(0.63)	(0.46)	(1.38)	(0.70)	(0.51)	(1.00)	(0.51)	(0.38)	(1.41)	(0.72)	(0.53)

Note: All dollars are US dollars. CHIP = Chinese Household Income Project; CGSS = Chinese General Social Survey; CFPS = China Family Panel Studies; CHFS = China Household Finance Survey. Numbers in parentheses are standard errors. We use the official poverty line in 2009 (1196yuan) for CHIP, CGSS, and CFPS and poverty line in 2010 (1274 yuan) for CHFS. New poverty line in 2011 is 2300 yuan. P_0 denotes headcount ratio; P_1 denotes poverty gap index; and P_2 denotes the weighted poverty gap index. We use the official rural poverty line in 2009 for CHIP, CGSS, and CFPS and poverty line in 2010 for CHFS. Numbers in parentheses are standard errors. The four survey samples are restricted to the same provinces. These provinces are Hebei, Jiangsu, Zhejiang, Anhui, Henan, Hubei, Guangdong, Chongqing, and Sichuan.

Appendix Table 6
Urban poverty using the $1.25-per-day, $1.50-per-day, and urban minimum living standard, restricted sample.

	$1.25 per day			$1.5 per day			Urban minimum living standard		
	P_0	P_1	P_2	P_0	P_1	P_2	P_0	P_1	P_2
Based on household net income per capita									
CHIP	0.14	0.06	0.05	0.22	0.08	0.06	0.23	0.10	0.07
	(0.05)	(0.03)	(0.03)	(0.06)	(0.04)	(0.03)	(0.06)	(0.04)	(0.03)
CFPS	8.10	3.57	2.23	10.78	4.58	2.80	9.99	4.53	2.88
	(1.07)	(0.58)	(0.43)	(1.25)	(0.64)	(0.48)	(1.24)	(0.70)	(0.53)
CGSS	6.95	2.59	1.42	10.56	3.66	1.94	9.25	3.37	1.86
	(0.86)	(0.32)	(0.22)	(1.26)	(0.42)	(0.25)	(0.93)	(0.36)	(0.24)
CHFS	15.33	9.63	7.82	16.72	10.71	8.55	17.96	11.06	8.79
	(1.05)	(0.75)	(0.67)	(1.08)	(0.78)	(0.70)	(1.10)	(0.79)	(0.70)

Appendix Table 6 (*continued*)

	$1.25 per day			$1.5 per day			Urban minimum living standard		
	P_0	P_1	P_2	P_0	P_1	P_2	P_0	P_1	P_2
Based on household expenditure per capita									
CHIP	0.31	0.08	0.03	0.63	0.15	0.05	0.64	0.13	0.05
	(0.10)	(0.04)	(0.02)	(0.14)	(0.05)	(0.03)	(0.13)	(0.04)	(0.02)
CFPS	5.87	2.38	1.39	9.11	3.22	1.82	6.95	3.16	1.97
	(1.13)	(0.52)	(0.34)	(1.30)	(0.60)	(0.40)	(1.18)	(0.67)	(0.47)
CGSS	6.85	2.17	1.22	10.74	3.30	1.68	9.45	3.14	1.70
	(0.96)	(0.36)	(0.25)	(1.36)	(0.47)	(0.29)	(1.05)	(0.41)	(0.28)
CHFS	5.79	1.80	0.85	8.92	2.75	1.28	10.46	3.27	1.55
	(0.66)	(0.25)	(0.15)	(0.81)	(0.31)	(0.19)	(0.88)	(0.34)	(0.21)

Note: All dollars are US dollars. CHIP = Chinese Household Income Project; CGSS = Chinese General Social Survey; CFPS = China Family Panel Studies; CHFS = China Household Finance Survey. Numbers in parentheses are standard errors. P_0 denotes headcount ratio; P_1 denotes poverty gap index; and P_2 denotes the weighted poverty gap index. The four survey samples are restricted to the same provinces. These provinces are Shanghai, Jiangsu, Zhejiang, Anhui, Henan, Hubei, Guangdong, Chongqing, and Sichuan.

Appendix Table 7
Statistical testing for headcount ratios between different surveys.

(1) National, $1.25 per day

	CHIP	CFPS	CGSS	CHFS
CHIP		−7.77	−12.75	−12.70
CFPS	−12.77		−6.54	−7.33
CGSS	−18.03	−5.17		−1.32
CHFS	−20.33	−3.00	−3.00	

(2) National, $1.5 per day

	CHIP	CFPS	CGSS	CHFS
CHIP		−5.50	−12.47	−12.73
CFPS	−12.09		−7.70	−8.35
CGSS	−18.41	−6.57		−1.01
CHFS	−19.32	−7.57	−1.01	

(3) Rural, $1.25 per day

	CHIP	CFPS	CGSS	CHFS
CHIP		−9.95	−10.53	−12.92
CFPS	−16.34		−3.84	−6.47
CGSS	−16.25	−5.11		−2.37
CHFS	−16.53	−6.24	−1.24	

(4) Rural, $1.5 per day

	CHIP	CFPS	CGSS	CHFS
CHIP		−7.29	−9.74	−12.46
CFPS	−14.12		−4.63	−7.30
CGSS	−15.97	−6.22		−2.29
CHFS	−15.39	−5.92	0.14	

(5) Rural, 1196 yuan

	CHIP	CFPS	CGSS	CHFS
CHIP		−9.46	−9.05	−10.33
CFPS	−14.40		−2.65	−5.29
CGSS	−12.22	−2.47		−2.78
CHFS	−15.59	−7.49	−4.76	

(6) Rural, 2300 yuan

	CHIP	CFPS	CGSS	CHFS
CHIP		−4.97	−7.68	−9.92
CFPS	−11.97		−4.00	−6.27
CGSS	−14.44	−5.96		−2.00
CHFS	−13.82	−5.68	0.07	

(7) Urban, $1.25 per day

	CHIP	CFPS	CGSS	CHFS
CHIP		−6.69	−10.71	−9.21
CFPS	−9.87		−2.05	−1.32
CGSS	−12.67	1.05		0.74
CHFS	−19.23	−6.47	−8.66	

(8) Urban, $1.5 per day

	CHIP	CFPS	CGSS	CHFS
CHIP		−8.25	−11.98	−10.45
CFPS	−11.40		−2.71	−1.93
CGSS	−13.98	0.08		0.71
CHFS	−20.60	−5.72	−6.42	

(9) Urban, minimum living standard

	CHIP	CFPS	CGSS	CHFS
CHIP		−7.49	−13.00	−11.22
CFPS	−10.94		−3.18	−3.95
CGSS	−13.53	0.61		−1.30
CHFS	−21.46	−6.74	−8.49	

Note: Numbers in upper diagonal of each table are t values of testing difference between expenditure-based estimates from each pair of two surveys. Numbers in lower diagonal are t values of testing difference between income-based estimates from each pair of two surveys.
CHIP = Chinese Household Income Project; CGSS = Chinese General Social Survey; CFPS = China Family Panel Studies; CHFS = China Household Finance Survey. The numbers in each table are t values. The threshold of t value for significance level at 0.05 is 1.96, and for significance level at 0.01 is 2.58.

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