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CHINESE POVERTY: ASSESSING THE IMPACT OF ALTERNATIVE ASSUMPTIONS

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This paper investigates how estimates of the extent and trend of consumption poverty in China between 1990 and 2004 vary as a result of alternative plausible assumptions concerning the poverty line and estimated levels of consumption. Our methodology focuses on the following sources of variation: purchasing power exchange rates (used to convert an international poverty line), alternative levels and distributions of private incomes, alternative estimates of the propensity to consume of different income groups, and alternative spatial and temporal price indices. We report national, urban and rural poverty estimates corresponding to distinct assumptions. It is widely believed that substantial poverty reduction took place in China in the 1990s, and we find this conclusion to be largely robust to the choice of assumptions, although estimates of the extent of Chinese poverty, and therefore of world poverty, in any year are greatly influenced by this choice.

1. Introduction

The extent and trend of poverty in China play a crucial role in determining the extent and trend of poverty in the world.[1] However, there is substantial uncertainty concerning Chinese poverty, despite recent studies on the topic. Some of these uncertainties are data-related. For example, multiple nationally representative household consumption surveys are not publicly available for China and poverty analysis is often undertaken on grouped data (Chen and Ravallion, 2001a, 2001b, 2004, 2007; Chen and Wang, 2001; Berry and Serieux, 2004; Sala-i-Martin, 2006),

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[1]Reddy and Minoiu (2007) show that whether $1/day poverty has fallen worldwide during the 1990s critically depends on China's experience of poverty reduction over the period. Chen and Ravallion (2004) conclude that between 1981 and 2001, the $1/day poverty headcount (as a share of the developing world population) fell by half if China is included in the analysis (from 40.4 percent to 21.1 percent). However, when China's performance is not accounted for, the reduction in the poverty headcount ratio was from 31.7 percent to 22.5 percent. Furthermore, the absolute number of "$1/day poor" rose slightly outside of China, from 848.1 million in 1981 to 877.4 million in 2001.

or unit data with limited coverage of years or provinces (Khan and Riskin, 2001; Gibson *et al.*, 2003; Meng *et al.*, 2005; Xue and Zhong, 2003; Zhang and Wan, 2006). Other uncertainties relate to methodology (for example, there is no official national poverty line for China).

This study contributes to the literature by presenting the first set of *national* consumption poverty estimates for China since 1990 that are based on *alternative* assumptions concerning relevant parameters. These estimates are moreover designed to be notionally internationally comparable. Dimensions of variation in assumptions considered include purchasing power exchange rates used to convert an international poverty line (and hence, the local currency poverty lines applied), changes in prices faced by the poor over time and space, and the basis for constructing consumption profiles (i.e. mean consumption levels of income deciles). Our analysis is particularly relevant in light of recent controversy spurred by the publication of a new set of GDP PPPs collected by the International Comparison Program for a large number of countries. Preliminary estimates of poverty based on the application of the new PPPs differ markedly, it has been claimed, from those previously employed in national and global poverty assessments for various countries, including China (Keidel, 2007). However, since PPPs of different base years are not comparable, there is no appropriate approach to such comparisons. The use of consumer price indices in making them may lead to radically different conclusions depending on the base country whose price index is used (Pogge and Reddy, 2006), and there is no global price index which is available for the purpose, either in practice or in theory. The recently increased confusion about the appropriate PPP to apply in converting an international poverty line into Chinese currency has contributed to the pre-existing doubts about the validity and robustness of published $1/day and $2/day poverty estimates for that country.[2] A sensitivity analysis of the kind undertaken in this study contributes to the literature by helping to identify what conclusions about Chinese poverty (and more generally, world poverty) are robust in an environment marked by considerable uncertainty regarding data and relevant parameters.

From the outset, it should be noted that our aim is not to present a set of authoritative poverty estimates for China. Rather, our goal is to present a sensitivity analysis of poverty estimates deriving from alternative assumptions. These are drawn from previous studies and reflect judgments that have been made in other contributions to the literature. Our analysis indicates that the trend of poverty reduction in China in the 1990s is dramatic regardless of the assumptions made, but that considerable uncertainty still attends the extent of poverty in the country (and therefore in the world as a whole).

In contrast to this study, others focus on only one set of possible assumptions. For example, Chen and Ravallion (2007) and Sala-i-Martin (2006) produce estimates of household income (as contrasted with consumption) poverty. While Chen and Ravallion (2004) (henceforth, "CR") use survey-based estimates of average

[2]The use of the 2005 PPPs also appears to generate substantial upward revisions in the estimated level of global inequality (increased by 5 percentage points to 70 Gini points in 2005) as argued by Milanovic (2007); and downward revisions by 0.5 percentage points in the IMF global growth estimates for 2002–07 and projection for 2008 (Elekdag and Lall, 2008; IMF, 2008). See Heston (2008) for a discussion of the strengths and weaknesses of the 2005 PPP estimates.

incomes of income quantiles, Sala-i-Martin (2006) takes the view that the national accounts provide a more appropriate estimate of average household income. Furthermore, these studies use either a national consumer price index (CPI) or separate rural and urban CPIs to express the poverty line in constant prices. However, a CPI that better reflects prices of the commodities necessary to achieve basic human requirements and thereby avoid poverty might be more appropriate to employ in poverty assessments. In addition, some analyses of Chinese poverty only present estimates for a small number of years, offering an incomplete picture of the trend in Chinese poverty over the past decade. For example, Khan and Riskin (2001) and Khan (2004) present national poverty estimates for only two years (1988 and 1995) and three years (1988, 1995 and 2002), respectively. Similarly, Meng *et al.* (2005) describe the evolution of poverty over the period 1986–2000 only in urban areas. Finally, few studies explicitly take account of spatial cost of living differences when assessing Chinese poverty (Brandt and Holz, 2006; Chen and Ravallion, 2007).

Due to the lack of publicly available unit data for China that are both nationally representative and available over a long period, we use grouped data in the form of income shares by decile for selected years since 1990.[3] Poverty estimates are obtained from the income shares in three steps:

First, we estimate a consumption profile from income shares. We identify alternative estimates of per capita private income and scale the income shares to obtain an income profile (i.e. ten average income levels). We then use alternative estimates of consumption to income ratios to transform the income profile into a consumption profile. We express the consumption profile in a base year's prices using alternative CPIs.

Second, we identify poverty lines expressed in currency units of a base year. First, we identify alternative poverty lines that span a plausible range that accommodates poverty lines proposed by official sources and experts in the literature on Chinese poverty. Second, to ensure international comparability of the poverty estimates, we build the poverty lines so that they can be interpreted as corresponding to the $1/day international poverty line. We translate the $1/day standard into local currency units using alternative purchasing power exchange rates (PPPs), and express it in constant prices using alternative CPIs.

Third, we estimate the poverty headcount ratio from the consumption profiles by way of Lorenz curve interpolation using the POVCAL software program developed by the World Bank. The method is discussed in Datt (1998) and has been validated by Minoiu and Reddy (forthcoming), who found that poverty is estimated from grouped data with relative accuracy using this tool.[4]

[3]We use income shares rather than expenditure shares as the latter are not available for China, as indicated by Khan and Riskin (2001, p. 63), who note that ". . . income, rather than expenditure, is the variable in terms of which the poverty threshold is defined. It has been argued that expenditure is a better measure of "permanent income" than is current income. A discussion of the validity or otherwise of this argument is operationally irrelevant because distributional data in China are available only for income." Furthermore, we use tabulations for China as a whole rather than grouped data for rural and urban areas separately because the latter are also unavailable in the public domain (Chen and Ravallion, 2007).

[4]The program and documentation are available on http://www.worldbank.org/lsms/tools/povcal/. All the results in the paper refer to the Generalized Quadratic interpolation method for the Lorenz curve. Estimates based on the Beta method are very similar, and are available from the authors upon request.

Our approach differs markedly from the typical poverty assessment based on a large, nationally representative consumption survey. Due to data limitations, our analysis is necessarily constrained in two major ways. First, the use of grouped data precludes using equivalence scales to account for household composition and economies of scale. Economies of scale in household consumption in China, if previously present, may have fallen over time, reflecting a falling average household size and requiring an appropriate (upward) revision of the welfare aggregate (in our case, consumption). Some evidence on the sensitivity of poverty estimates to alternative equivalence scales is provided by Bishop *et al.* (2006) using unit data from urban areas.[5] Second, the use of grouped data at the national level makes infeasible the construction of poverty profiles by geographical region or socioeconomic group. An important question is whether the national income shares used incorporate the necessary price adjustments to reflect adequately cost-of-living differences between China's rural and urban areas. Since the spatial price indices used by China's National Bureau of Statistics in constructing the grouped national data and separate tabulations for urban and rural areas are not available in the public domain (Chen and Ravallion, 2007), we employ a separately defined measure of inter-sectoral price differences to assess their impact.

The key dimensions of variation considered in our analysis reflect: (a) alternative purchasing power exchange rates (used to convert an international poverty line); (b) alternative levels and distributions of private incomes; (c) alternative estimates of the propensity to consume of different income groups; and (d) alternative consumer price indices. We also consider the impact of an adjustment for the cost of living differential between rural and urban areas on national poverty.

For notational purposes, we express each alternative set of poverty estimates as corresponding to a vector of five assumption "parameters" given by:

$$\left[PL, \hat{Y}, \theta, \pi, COL\right]$$

where PL refers to the poverty line; $\hat{Y}$ refers to the estimate of private incomes, θ refers to the fraction of per capita private income devoted to consumption of each income group, π is the CPI used to express consumption levels (and poverty lines) in constant (1993) prices, and COL indicates whether a price adjustment has been made to private incomes in rural vs. urban areas.

The remainder of the paper is structured as follows. Section 2 contains a review of the literature on income and consumption poverty in China. Section 3 presents the data and discusses the alternative assumptions under consideration. Consumption profiles reflecting these assumptions and national poverty estimates are presented in Section 4. Section 5 presents our conclusions.

2. Official and Unofficial Poverty Estimates

China's National Bureau of Statistics (henceforth, "NBS") monitors only rural poverty. Official estimates of poverty (Appendix Table A1) are based on a

[5]Average household size has fallen in China from 3.53 persons in 1988 to 3.13 persons per household in 1995 as noted in Bishop *et al.* (2006, p. 631).

poverty line loosely related to the cost of meeting a minimum food energy intake requirement of 2400 kcal/day (1984–97) and 2100 kcal/day (1998 to date) and incorporating an allowance for expenditure on non-food basic necessities (Park and Wang, 2001). The official poverty line was 637 Yuan in 2003 (approximately $0.75/day 1993 PPP). Estimates based on this poverty line indicate that the number of rural poor dropped from 250 million (30.7 percent) in 1978 to 125 million (14.8 percent) in 1985. This has been suggested to be the most successful era of poverty reduction in China's history (Wang and Ren, 2004).[6] During the 1990s, almost two thirds of the rural population was lifted out of poverty, with the number of poor having fallen from 85 million (9.4 percent) in 1990 to 32.1 million (3.4 percent) in 2000. A new and higher poverty line, referred to as *the lower income line* by the NBS, was created in 2000 based on the assumption of a lower (60 percent) share of food in household consumption expenditure (NBS, 2004). This poverty line amounted to 882 Yuan in 2003 (approximately $1/day 1993 PPP). The poverty headcount ratio corresponding to this poverty line was 9.1 percent in 2003, representing 85.2 million rural inhabitants (NBS, 2004).

Park and Wang (2001) catalog possible sources of bias in official rural poverty statistics. They argue that these heavily underestimate rural poverty, and overstate the pace of poverty reduction (officially estimated at 27 percentage points between 1978 and 2000). It is argued by the authors that increases in the rural cost of living are inadequately accounted for, due to insufficient efforts to capture changes in prices induced by the marketization of the economy, and a failure to adequately account for regional price differences. They also suggest that the exclusive focus on rural poverty provides an incomplete picture of poverty in China.

Other contributions to the literature reflect different ways of resolving data and methodological uncertainties (see Riskin, 2004). Various studies present poverty estimates for specific years, a specific sector (rural or urban China) or selected provinces. Where studies cover multiple years, they are based on a single set of assumptions. We summarize the main features of these studies in Appendix Table A2, focusing on the sectoral and temporal coverage of the analysis undertaken in each study, the poverty lines used, whether household surveys or grouped data were used, and the main findings. The broad conclusion which emerges from this literature is that national poverty appears to have decreased during the 1990s (see, e.g. Chen and Ravallion, 2001a, 2004; Berry and Serieux, 2004; Sala-i-Martin, 2006). There is considerably less agreement concerning the extent of poverty at moments in time, and in particular at the beginning and end of the 1990s. Furthermore, the evidence suggests that urban poverty has increased in the second half of the 1990s (Chen and Wang, 2001; Fang *et al.*, 2002; Meng *et al.*, 2005; Xue and Zhong, 2003), while rural poverty has either decreased at a slower pace (Gustaffson and Zhong, 2000; Chen and Ravallion, 2007) or risen (Zhang and Wan, 2006).

The estimates of the extent and trend of poverty in China presented in these empirical studies are the result of a mixture of methodological choices and data

[6]Yao (2000) contends that more than 200 million people in China were lifted out of poverty between 1978 and 1995—greater than the poverty reduction implied by government statistics. The author claims that the discrepancy is driven mainly by a large understatement of poverty in 1978 by the government. He argues that the poverty headcount ratio fell from 75.5–100 percent (596–790 million people) to 6.7–13.2 percent (57–114 million) over the period 1978–96.

TABLE 1

National Income Shares, 1990–2001

Decile	1990	1992	1993	1994	1995	1996	1997	1998	2001
Bottom	3.08	2.57	2.31	2.03	2.22	2.38	2.32	2.39	1.80
Second	4.25	3.60	3.31	3.32	3.28	3.51	3.52	3.47	2.86
Third	5.36	4.64	4.33	4.34	4.34	4.62	4.65	4.55	3.92
Fourth	6.49	5.73	5.40	5.40	5.48	5.75	5.80	5.65	5.08
Fifth	7.65	6.95	6.60	6.57	6.70	6.95	7.00	6.86	6.36
Sixth	8.97	8.34	7.99	7.91	8.15	8.32	8.36	8.24	7.86
Seventh	10.55	10.1	9.74	9.55	9.93	10.01	10.01	9.93	9.74
Eighth	12.66	12.51	12.18	11.79	12.41	12.31	12.27	12.27	12.39
Ninth	16.01	16.55	16.36	15.47	16.61	16.19	16.05	16.23	16.93
Top	24.98	29.01	31.78	33.62	30.88	29.96	30.02	30.41	33.06

Source: WB Global Poverty Monitoring webpage (http://www.worldbank.org/research/povmonitor/PPP1993.htm, accessed on October 22, 2003). The income shares are from the Chinese National Statistical Bureau and are based on the China Rural/Urban Household Surveys conducted in the respective years (with the exception of the data for 1996, 1997 and 2001, for which the data sources were not listed on the website). These national income shares are based on pooling of urban and rural surveys.

availability constraints which inhibits a straightforward comparison among them. Our paper contributes to the literature by presenting the first set of national Chinese poverty estimates since 1990 which reflect alternative plausible assumptions concerning poverty lines and other key parameters, and are notionally internationally comparable.

3. Data and Alternative Assumptions

To obtain consumption poverty estimates for China, we use distributional data in the form of income shares computed from underlying household surveys for the years 1990, 1992–98, and 2001 (Table 1). The income aggregate contains the (imputed) value of self-produced consumption but does not capture rents from owner-occupied housing. Moreover, the surveys underlying these tabulations only cover registered urban and rural residents, and therefore the income of migrants to urban areas is only captured through the effect of remittances. Insofar as migrants are poorer on average than registered urban residents, the poverty estimates will be biased downwards. The bias may be counterbalanced by the fact that the urban income aggregate does not account for subsidies and other entitlements received by urban residents (Chen and Ravallion, 2007, p. 4).

With the aim of translating the income shares above into consumption profiles and poverty estimates, we proceed to construct plausible ranges of variation for the poverty lines (PLs), private incomes ($\hat{Y}$), the share of consumption in total income (θ), inflation rates (π) and spatial price differences (COL). Most of the survey-based estimates of these parameters are based on the 1995 Chinese Household Income Project survey (Riskin *et al.*, 2000).[7]

[7]The survey is available through the Inter-university Consortium for Political and Social Research. The national survey (obtained by pooling together the urban and rural surveys) contains 56,437 observations.

*Poverty Lines (*PLs*)*

First, we identify a set of alternative poverty lines expressed in Chinese currency. In order to maintain international comparability, we focus on the $1/day international poverty line, adopting its official definition at the time of writing. The range of variation in the local currency equivalent of the $1/day standard is generated by alternative consumption PPP estimates.

Since China had not participated in an official benchmark survey of the International Comparison Program until only recently, judgments concerning the appropriate PPP for China have varied widely. The variation in consumption PPP estimates for China arose as a result of "differences in sectoral PPPs (especially for services), and differences in methodology" (Gulde and Schulze-Ghattas, 1993, p. 117). These widely discrepant judgments in turn have large implications in regard to estimated Chinese poverty levels corresponding to the $1/day poverty line (Reddy and Pogge, forthcoming).

As a starting point, we identify alternative consumption PPP estimates for China in 1993 (the base year in which the $1/day poverty line was defined at the time of writing) that have been presented in the literature. We focus on GDP consumption PPPs derived on the basis of alternative GDP estimates for China reported by two sources: the World Economic Outlook (Taylor, 1991) and Penn World Tables Mark 5.5, respectively.[8] The low 1993 PPP employed is 1.0267 Yuan/$, while the high 1993 PPP used is 2.1285 Yuan/$. The World Bank's consumption 1993 PPP for China (1.4185 Yuan/$) falls between the two estimates chosen for the sensitivity analysis.[9] The implied 1993 "equivalent" of the ICP's published 2005 PPP for consumption for China (generated through deflating numerator and denominator of the PPP by the relative price changes in China and in the United States over the period) is 2.74 Yuan/$, which is above the highest PPP which we use. Although such a procedure for constructing an equivalent has serious limitations, our assessment of poverty in China can be judged from this standpoint to be conservative.

Our approach avoids an endorsement of any existing approach to the construction of PPPs, all of which we consider to have a weak conceptual basis and to be grounded in empirical data which is inadequate. The reader who is unimpressed either by the international poverty line or by the use of existing PPPs might consider the poverty lines that we employ simply to reflect a plausible range of variation for poverty lines in China, in the sense that they roughly span the range of poverty lines in the literature. This does not imply that the poverty lines reflect the cost of avoiding poverty (by establishing adequate command over basic commodities) since the poverty lines in the existing literature often do not adequately reflect these costs. There is ultimately no alternative to carefully establishing appropriate criteria for identifying the poor in China. The exercise undertaken in this paper cannot

[8]The methodologies associated with the two PPP estimates are discussed in detail in Gulde and Schulze-Ghattas (1993) and Summers and Heston (1991). The estimates are based on detailed expenditure and price data from a quasi-benchmark comparison between China and the United States (Summers and Heston, 1991; Rouen and Kai, 1995). For details on the calculation of consumption GDP PPPs and the local currency "equivalents" of the $1/day poverty line, see Reddy and Minoiu (2006, appendix 3).

[9]The World Bank's estimate is derived on the basis of the expenditure and price data from a survey comparing prices in 12 Chinese cities with prices in the U.S. in the mid-1980s (Rouen and Kai, 1995).

TABLE 2
POVERTY LINES FOR CHINA (AT 1993 PRICES)

Study	Type of Poverty Line	Poverty Line (Yuan/year)
NBS (2004)	Rural—official	399.8
Our lower poverty line (PL_{LOW})	*National—low*	*404.7*
Chen and Ravallion (2007)	Rural	542
NBS (2004)	Rural (updated since 2000)—official	553.5
Khan and Riskin (2001)	Rural—low	558.5
Chen and Ravallion (2001a, 2004)	National—$1/day	559.7
Chen and Ravallion (2007)	National	645.8
Chen and Ravallion (2007)	Urban	743.2
Khan and Riskin (2001)	Rural—high	798.3
Our higher poverty line (PL_{HIGH})	*National—high*	*839.1*
Khan and Riskin (2001)	Urban—low	1098.7
Chen and Ravallion (2001a, 2004)	National—$2/day	1113.6
Xue and Wei (2003)	Urban	1359.9
Khan and Riskin (2001)	Urban—high	1569.4

Source: Authors' calculations.

substitute for that effort—which is best undertaken within China on the basis of adequate normative judgments, empirical evidence and contextual considerations.

The upper and lower poverty lines corresponding to the low and high PPPs (and the $1/day international standard) are 404.7 and 839.1 1993 Yuan/year. These two poverty lines are also close to the opposite ends of the range of national poverty lines for China proposed in the literature and therefore reflect bounds for these poverty lines (Table 2).

We note that our lower poverty line (404.7 Yuan/year) is lower than the lowest national poverty line proposed by Chen and Ravallion (2001a, 2004). Moreover, our highest poverty line (839.1 Yuan/year) is lower than the highest national poverty line of Chen and Ravallion (2001a, 2004). Nevertheless, we are capturing a broad range of poverty lines that have been viewed as appropriate to employ in the literature on China.

Per Capita Private Incomes ($\hat{Y}$)

In this section, we discuss per capita private income estimates used to obtain an income profile from income shares.

There are discrepant views in the literature on what constitutes an appropriate method for estimating private incomes. In particular, some authors take the view that GDP estimates offer the superior measure of per capita real income and consumption (Bhalla, 2002; Sala-i-Martin, 2006); in contrast, others advocate the use of survey-based estimates (Deaton, 2005). Deaton analyzes survey and national accounts (NA) estimates of consumption and income, and finds discrepancies for both levels and rates of growth. He shows that, on average, survey-based mean income is 60 percent of GDP (based on data from 272 household surveys), and the same ratio is 51 percent in the East Asia and Pacific region (32 surveys). Furthermore, in non-OECD countries, consumption estimates from surveys in the 1990s appear to have grown slower than NA consumption estimates, while

for income estimates the opposite holds.[10] Naturally, discrepancies of this extent between surveys and NA data can generate large differences in the estimated mean income for different population groups (e.g. income deciles), and consequently affect estimated poverty levels.

We investigated the differences in levels and growth rates between per capita GDP (World Development Indicators, 2003) and survey-based per capita household disposable income (NBS, 2003). We found that the average annual growth rate of survey-based income between 1990 and 2001 was 7.54 percent—a figure very close to the 7 percent reported by Chen and Ravallion (2001a). In contrast, the average annual growth rate of per capita GDP was 8.74 percent. Furthermore, the levels of the two income series were markedly different: the ratio between the two estimates varied between 1.81 (in 1990) and 2.11 (in 1997 and 1998).[11] In our analysis, we choose to accommodate both views concerning the appropriate method, without endorsing either, in keeping with our goal of exploring the implications of alternative assumptions. We therefore consider both NA and survey-based estimates of private incomes (denoted in the remainder of the paper as $\hat{Y}_{NA}$ and $\hat{Y}_S$, respectively) to scale the income shares and obtain income profiles.

Shares of Consumption in Total Income (θ)

In this section, we identify estimates of the average propensity to consume, with a view to translating income profiles into consumption profiles. Since the existing international poverty lines are specified in terms of levels of consumption but only *income* tabulations are available for China, researchers have made a number of simplifying assumptions. Specifically, it has been generally assumed that the consumption to income ratio is decile-invariant and equal to the share of total household consumption in GDP. We denote this approach by θ_{NA}, noting that it has been widely employed in the literature (Chen and Ravallion, 2001a, 2004; Chen and Wang, 2001; Bhalla, 2002; Sala-i-Martin, 2006), notwithstanding several critiques (Sundaram and Tendulkar, 2001; Deaton, 2005; Havinga and Kamanou, forthcoming).

We also adopt (in our view more realistic) decile-specific survey-based consumption to income ratios (θ_S) calculated from the 1995 Chinese Household Income Project surveys (Appendix Table A3).[12] We believe that θ_S improves on θ_{NA} in two ways. First, one may argue that survey-based estimates of the average propensity to consume are more appropriate than NA-based estimates for poverty analysis since the latter reflect much information that is irrelevant to estimating the consumption of households (Deaton, 2005). Second, survey-based C/I ratios are decile-specific. However, they come at the cost of being based solely on the data from the 1995 China Household Income Project survey. We therefore make the assumption that the decile-specific C/I ratios did not change over time in the 1990s.

[10]Furthermore, Deaton argues that China's ratio of survey-to-NA consumption has been declining in the 1990s, from 95 percent in 1990 to 80 percent in 2000. Growth rates of household consumption series from surveys and NA also differ by 1.7 percent a year during the 1990s.

[11]For details of this analysis, see Reddy and Minoiu (2006, appendix 4).

[12]The income and expenditure variables from the 1995 Chinese Household Income Project rural and urban surveys are described in detail in Reddy and Minoiu (2006, appendix 5A).

Inflation Rates (π)

An immediate candidate for this parameter is the official general CPI (π_{off}). However, this price index may not accurately reflect the cost of purchasing the commodities needed to achieve elementary human requirements and thereby to avoid poverty.[13] In order better to account for the prices faced by the poor, we also consider a set of adjusted CPIs. The approach is close in spirit to contributions such as that of Grimm and Günther (2007), who show that better accounting for the purchasing power of the poor in constructing a poverty line can lead to meaningful changes in poverty estimates (explaining away the apparent paradox of sustained growth accompanying increasing poverty in Burkina Faso in 1994–2003).

We use data from the 1995 China Household Income Project survey to estimate shares of food (and implicitly of non-food) in total expenditure for the lower income groups (Appendix Table A3). We use this information to construct an adjusted price index with weights for food and non-food items that correspond to the expenditure shares on these items for the lower income deciles. Although this is not a wholly satisfactory procedure, it does permit us to improve upon the general CPI, by more closely reflecting the average pattern of consumption of lower-income groups. Noting that the share of food expenditure in total expenditure is about 60 percent for the first 6 deciles of the population, we employ this weight on food together with the food CPI in constructing our adjusted overall CPI. For non-food prices, we use a weighted average of the price indices for clothing, articles for daily use, and durable consumer goods, where the weights—60, 30 and 10 percent, respectively—are drawn from the 1995 survey. This approach to constructing the non-food inflation rate is preferable since it does not rely on producer prices.[14]

We note that the overall trend of prices described by the official and adjusted CPIs is similar although not identical (Appendix Table A4). Therefore, the use of an adjusted CPI is unlikely to reverse the conclusion of a downward trend in the estimated poverty headcount ratio and, as shown in the next section, has little effect on the estimated extent of poverty. However, the choice of price index has some effect on our conclusions regarding the pace of poverty reduction during the 1990s.[15]

[13]In particular, the official Chinese CPI reflects weights based on an overall average consumption pattern (in which food accounts for only about one third of expenses in the average basket of goods, while expenditures on entertainment, education, culture, transportation and communication account for one fifth) (see Singapore Department of Statistics, 2001). This method renders it inappropriate for assessments of the costs of avoiding absolute poverty.

[14]In an exercise of this kind, the first-best CPI to apply would be that corresponding to the cost of poverty avoidance in China, but this is unknown since it cannot be specified without first fully defining a criterion for identifying the poor (on the basis of which the cost of poverty avoidance should be determined). Thus, the CPI employed here is a makeshift alternative. For a discussion of alternative indices we have constructed, see Reddy and Minoiu (2006, appendix 6). Notably, there are no marked differences in the evolution of prices between the official CPI and the various alternative CPIs considered.

[15]Khan and Riskin (2001) also construct adjusted price indices to reflect better living costs faced by individuals at or near the poverty line. They find that whereas the use of the official CPI leads to an apparent fall in urban poverty between 1988 and 1995, the substitution of an adjusted CPI leads to an apparent increase. A direct comparison between their results and ours is not possible for a number of reasons: we analyze Chinese *national* poverty, whereas they disaggregate the analysis at the urban and rural level, using distinct poverty lines for each sector. Our adjusted CPI is different from theirs, and our comparison of poverty in different years is conducted over a distinct time period.

*Urban–Rural Cost-of-Living Adjustment (*COL*)*

As a robustness check, we take account of possible variations in a final parameter, namely price differentials between rural and urban areas. Although such differentials were already taken into account by the NBS in constructing the national income distributions we use, this process was not transparent. It has been suggested that price differentials between sectors were large and may have increased over time due to structural changes in the Chinese economy (e.g. the privatization of urban public housing). The rural–urban cost of living differential was found to be high and rising during the 1990s (from 25 percent to 41 percent) according to one recent study (Chen and Ravallion, 2007). According to the authors, the application of an alternative inter-sectoral *COL* adjustment which they construct leads the estimated national (per capita) income in the period between 1990 and 2001 to be between 10 and 20 percent lower than otherwise (Appendix Table A4).

A major obstacle to using this additional source of variation in the analysis is the lack of publicly available sectoral distributional data (income shares) of the kind that are available nationally. However, by constructing rural and urban distributions from World Bank data[16] and making assumptions concerning the appropriate inter-sectoral price adjustment on the basis of recent literature (in particular Chen and Ravallion, 2007), we are able to generate sectoral income (and consumption) profiles. Thus, we extend the analysis to assess the sensitivity of estimated poverty to the application of an alternative inter-sectoral *COL* adjustment to that employed by the NBS. Our central conclusions hold up to this robustness check.

4. Consumption Profiles and Poverty Estimates for China

Consumption Profiles

As a first step in constructing consumption profiles (estimates of the mean consumption of each decile in each year), we scale the income shares by estimates

[16]Specifically, we use the World Bank's POVCALnet website (http://iresearch.worldbank.org/PovcalNet) to calculate for each sector-year the headcount ratio for various poverty lines spanning a wide range from very low to very high headcount ratios. A grouped data structure ensues, representing the upper bound of the class interval given by the various poverty lines, and the shares of the population associated with each class interval (given by the first difference in headcount ratios previously obtained). We then estimate Lorenz curves for rural and urban China from this data (employing the World Bank's POVCAL software), and once again take first differences of the estimated cumulative income shares to obtain the income shares accruing to each population decile (not reported here in the interest of space, but available upon request). Finally, we transform the sectoral income shares into income (and consumption) profiles reflecting the same range of assumptions employed elsewhere in the paper as well as the alternative inter-sectoral *COL* adjustment. We follow Chen and Ravallion (2007, table 1), in assuming that the currency units used in our calculations so far ("national Yuan") can be converted to "urban Yuan" and to "rural Yuan" according to the accounting convention that one national Yuan is equal in purchasing power to one rural Yuan, and one urban Yuan is equal in purchasing power to one rural Yuan multiplied by the urban/rural (spatial) price index. We assume, moreover, that for each year the ratio of the mean rural to the mean national income and the ratio of the mean urban to the mean national income are exactly the same when applied to our mean national income assumptions as they are in the estimates of the *COL*-adjusted sectoral and national means produced by Chen and Ravallion (2007). The ratios of rural and *COL*-adjusted urban mean incomes to the *COL*-adjusted national income calculated by them are shown in Table 4A (last two columns). We thus obtain *COL*-adjusted sectoral income profiles to which we apply the parameters we use elsewhere (such as θ and π) to obtain the sectoral consumption profiles necessary for poverty analysis.

TABLE 3

National Income Profile (at current prices), $\hat{Y}_{NA}$, 1990–01

Decile	1990	1992	1993	1994	1995	1996	1997	1998	2001
Bottom	503.3	587.8	678.9	796.4	1077.6	1327.1	1404.5	1507.4	1377.2
Second	694.5	823.3	972.8	1302.4	1592.1	1957.2	2131.0	2188.5	2188.2
Third	875.8	1061.2	1272.6	1702.6	2106.6	2576.1	2815.1	2869.7	2999.2
Fourth	1060.5	1310.5	1587.1	2118.4	2660.0	3206.2	3511.3	3563.5	3886.7
Fifth	1250.0	1589.5	1939.7	2577.4	3252.2	3875.3	4237.8	4326.6	4866.0
Sixth	1465.7	1907.4	2348.3	3103.1	3956.0	4639.2	5061.1	5197.0	6013.7
Seventh	1723.9	2309.9	2862.6	3746.5	4820.0	5581.6	6060.1	6262.9	7452.1
Eighth	2068.6	2861.0	3579.7	4625.2	6023.8	6864.1	7428.3	7738.7	9479.6
Ninth	2616.0	3785.0	4808.2	6068.9	8062.5	9027.5	9716.7	10236.3	12953.1
Top	4081.7	6634.6	9340.1	13189.1	14989.2	16705.7	18174.1	19179.6	25294.2

Source: Authors' calculations.

TABLE 4

National Income Profile (at current prices), $\hat{Y}_S$, 1990–01

Decile	1990	1992	1993	1994	1995	1996	1997	1998	2001
Bottom	278.4	289.2	319.9	379.5	524.7	669.7	712.2	776.8	730.5
Second	384.2	405.1	458.5	620.7	775.2	987.7	1080.6	1127.8	1160.7
Third	484.5	522.1	599.7	811.4	1025.7	1300.0	1427.5	1478.9	1590.9
Fourth	586.6	644.8	747.9	1009.6	1295.1	1618.0	1780.5	1836.4	2061.7
Fifth	691.5	782.0	914.1	1228.4	1583.4	1955.7	2148.9	2229.7	2581.2
Sixth	810.8	938.4	1106.7	1478.9	1926.1	2341.2	2566.4	2678.2	3190.0
Seventh	953.6	1136.5	1349.0	1785.5	2346.8	2816.7	3072.9	3227.5	3953.0
Eighth	1144.3	1407.7	1687.0	2204.3	2932.9	3463.9	3766.6	3988.1	5028.5
Ninth	1447.1	1862.2	2266.0	2892.4	3925.5	4555.7	4927.0	5275.2	6871.1
Top	2257.9	3264.3	4401.7	6285.8	7298.0	8430.5	9215.5	9884.0	13417.5

Source: Authors' calculations.

of private incomes. Specifically, we multiply each income share by ten times the per capita private income ($\hat{Y}_{NA}$ and $\hat{Y}_S$) expressed in current local currency units to arrive at income profiles (Tables 3 and 4).

Next, from these income profiles we construct our "least refined" consumption profiles by applying to them the national accounts based decile-invariant C/I ratio (θ_{NA}), expressed in 1993 prices using the official CPI (Tables 5 and 6).

Finally, we construct our "most refined" consumption profiles based on survey-based decile-specific C/I ratios (θ_S), expressed in 1993 prices using the adjusted CPI (Tables 7 and 8).

Since the official and adjusted CPIs do not differ much, we conclude that most of the difference in consumption means presented in the preceding four tables is explained by the difference between θ_S and θ_{NA}. When using θ_S, average consumption levels of the bottom income decile are twice as high as those based on θ_{NA}. For the second income decile, the survey-based mean consumption levels are higher by about 50 percent. This difference in estimated means greatly affects the estimated poverty headcount ratios in each year, as described in the following section.

We also report the *COL*-adjusted rural and urban consumption profiles (Tables 9 and 10) by combining the alternative inter-sector *COL* adjustment

TABLE 5

National Consumption Profile (at 1993 prices), ($\hat{Y}_{NA}$, θ_{NA}, π_{off}), 1990–01

Decile	1990	1992	1993	1994	1995	1996	1997	1998	2001
Bottom	308.3	317.5	305.5	286.7	341.9	397.3	410.0	445.6	407.1
Second	425.4	444.8	437.8	468.9	505.1	585.9	622.1	646.9	646.8
Third	536.4	573.3	572.7	612.9	668.3	771.2	821.8	848.3	886.6
Fourth	649.5	707.9	714.2	762.6	843.9	959.8	1025.0	1053.3	1148.9
Fifth	765.6	858.7	872.9	927.9	1031.7	1160.1	1237.1	1278.9	1438.4
Sixth	897.7	1030.4	1056.7	1117.1	1255.0	1388.8	1477.5	1536.2	1777.6
Seventh	1055.9	1247.9	1288.2	1348.7	1529.1	1670.9	1769.1	1851.3	2202.8
Eighth	1267.0	1545.6	1610.9	1665.1	1911.0	2054.8	2168.5	2287.5	2802.1
Ninth	1602.3	2044.8	2163.7	2184.8	2557.8	2702.5	2836.5	3025.8	3828.9
Top	2500.1	3584.2	4203.1	4748.1	4755.2	5001.1	5305.5	5669.4	7476.9

Source: Authors' calculations.

TABLE 6

National Consumption Profile (at 1993 prices), ($\hat{Y}_{S}$, θ_{NA}, π_{off}), 1990–01

Decile	1990	1992	1993	1994	1995	1996	1997	1998	2001
Bottom	170.5	156.2	144.0	136.6	166.4	200.5	207.9	229.6	215.9
Second	235.3	218.8	206.3	223.5	245.9	295.7	315.4	333.4	343.1
Third	296.7	282.1	269.9	292.1	325.4	389.2	416.7	437.1	470.3
Fourth	359.3	348.3	336.6	363.5	410.9	484.4	519.8	542.8	609.4
Fifth	423.5	422.5	411.4	442.2	502.3	585.5	627.3	659.1	763.0
Sixth	496.6	507.0	498.0	532.4	611.0	700.9	749.2	791.7	943.0
Seventh	584.1	614.0	607.1	642.8	744.5	843.2	897.0	954.0	1168.5
Eighth	700.9	760.5	759.2	793.6	930.4	1037.0	1099.6	1178.9	1486.4
Ninth	886.4	1006.0	1019.7	1041.3	1245.3	1363.8	1438.3	1559.3	2031.1
Top	1383.0	1763.5	1980.8	2262.9	2315.2	2523.8	2690.3	2921.7	3966.2

Source: Authors' calculations.

TABLE 7

National Consumption Profile (at 1993 prices), ($\hat{Y}_{NA}$, θ_{S}, π_{adj}), 1990–01

Decile	1990	1992	1993	1994	1995	1996	1997	1998	2001
Bottom	627.7	652.4	678.9	644.5	704.0	790.6	834.9	916.7	901.6
Second	666.9	703.7	749.1	811.6	800.9	897.8	975.4	1024.8	1103.0
Third	808.3	871.6	941.7	1019.6	1018.4	1135.7	1238.3	1291.4	1453.0
Fourth	925.8	1018.2	1110.9	1200.0	1216.4	1337.0	1461.0	1516.9	1781.1
Fifth	1060.1	1199.7	1319.0	1418.3	1444.8	1569.9	1713.0	1789.2	2166.2
Sixth	1389.3	1609.0	1784.7	1908.5	1964.2	2100.5	2286.4	2401.9	2992.1
Seventh	1548.0	1846.0	2061.1	2182.9	2267.2	2394.1	2593.6	2742.2	3512.6
Eighth	1831.8	2254.8	2541.6	2657.5	2794.1	2903.3	3135.0	3341.3	4406.2
Ninth	2186.0	2814.9	3221.5	3290.6	3529.0	3603.3	3869.8	4170.7	5681.6
Top	2799.9	4050.4	5137.1	5870.4	5385.8	5473.7	5941.7	6415.0	9107.6

Source: Authors' calculations.

method with the different assumptions we otherwise consider, which involve variation in estimates of per capita private incomes ($\hat{Y}_{NA}$ and $\hat{Y}_{S}$), consumption to income ratios (θ_{NA} and θ_{S}) and inflation rates (π_{off}—representing here the official urban and rural CPIs).

TABLE 8

National Consumption Profile (at 1993 prices), ($\hat{Y}_S$, θ_S, π_{adj}), 1990–01

Decile	1990	1992	1993	1994	1995	1996	1997	1998	2001
Bottom	347.2	321.0	319.9	307.1	342.8	399.0	423.3	472.4	478.3
Second	368.9	346.2	353.0	386.8	389.9	453.1	494.6	528.1	585.1
Third	447.1	428.9	443.8	485.9	495.9	573.1	627.9	665.5	770.7
Fourth	512.1	501.0	523.6	571.9	592.3	674.7	740.9	781.7	944.8
Fifth	586.4	590.3	621.6	676.0	703.4	792.2	868.6	922.0	1149.1
Sixth	768.5	791.7	841.1	909.6	956.3	1060.0	1159.4	1237.8	1587.2
Seventh	856.3	908.3	971.3	1040.4	1103.9	1208.2	1315.1	1413.2	1863.3
Eighth	1013.3	1109.4	1197.8	1266.5	1360.4	1465.1	1589.7	1721.9	2337.3
Ninth	1209.2	1384.9	1518.2	1568.2	1718.2	1818.4	1962.3	2149.3	3013.8
Top	1548.8	1992.8	2420.9	2797.8	2622.3	2762.3	3012.9	3305.9	4831.2

Source: Authors' calculations.

TABLE 9

Rural Consumption Profile (at 1993 prices), 1990–00

	($\hat{Y}_{NA}$, θ_{NA}, π_{off}, COL)					($\hat{Y}_S$, θ_S, π_{off}, COL)				
Decile	1990	1993	1996	1999	2000	1990	1993	1996	1999	2000
Bottom	292.3	222.6	480.6	511.9	571.3	297.4	245.8	507.4	534.0	595.4
Second	416.1	541.2	706.5	812.9	792.7	326.0	460.1	574.3	653.0	636.1
Third	510.9	720.0	884.3	1031.5	984.2	384.7	588.4	690.8	796.3	759.1
Fourth	593.4	854.2	1041.4	1216.0	1164.2	422.7	660.2	769.5	888.0	849.3
Fifth	672.4	971.4	1193.0	1389.1	1345.6	465.3	729.4	856.4	985.4	953.6
Sixth	754.9	1086.3	1351.8	1567.0	1542.3	583.8	911.7	1084.6	1242.4	1221.6
Seventh	849.7	1211.9	1534.2	1768.6	1774.9	622.6	963.5	1166.1	1328.4	1331.8
Eighth	973.6	1368.5	1770.7	2028.0	2085.3	703.4	1072.9	1327.2	1502.1	1543.0
Ninth	1176.3	1610.8	2148.7	2442.7	2601.3	802.0	1191.8	1519.8	1707.3	1816.4
Top	2094.2	2347.0	3358.4	3871.0	4773.4	1172.1	1425.4	1950.0	2221.0	2736.0

Source: Authors' calculations.

TABLE 10

Urban Consumption Profile (at 1993 prices), 1990–00

	($\hat{Y}_{NA}$, θ_{NA}, π_{off}, COL)					($\hat{Y}_S$, θ_S, π_{off}, COL)				
Decile	1990	1993	1996	1999	2000	1990	1993	1996	1999	2000
Bottom	332.1	683.5	652.4	902.8	806.2	338.0	754.8	688.7	941.8	840.2
Second	666.2	907.1	924.4	1262.4	1032.9	522.0	771.3	751.4	1014.0	828.9
Third	889.5	1113.7	1175.4	1581.8	1275.9	669.8	910.0	918.2	1221.1	984.0
Fourth	1070.3	1316.3	1421.3	1884.6	1544.4	762.4	1017.4	1050.3	1376.2	1126.7
Fifth	1235.8	1526.7	1676.8	2188.8	1852.2	855.2	1146.4	1203.7	1552.7	1312.6
Sixth	1403.3	1759.2	1959.4	2513.0	2222.4	1085.3	1476.4	1572.1	1992.4	1760.3
Seventh	1591.3	2036.5	2297.3	2882.5	2698.2	1165.9	1619.1	1746.1	2165.1	2024.6
Eighth	1832.1	2405.0	2748.6	3342.3	3376.7	1323.8	1885.5	2060.1	2475.5	2498.5
Ninth	2219.2	2997.1	3482.4	3997.2	4554.3	1513.1	2217.4	2463.1	2793.8	3180.0
Top	3775.9	4669.5	5703.7	5227.2	8627.6	2113.3	2835.9	3311.7	2999.2	4945.2

Source: Authors' calculations.

TABLE 11
NATIONAL POVERTY HEADCOUNT RATIOS, 1990–04

Set of Parameters	1990	1992	1993	1994	1995	1996	1997	1998	2001	2004
(PL_{LOW}, $\hat{Y}_{NA}$, θ_{NA}, π_{off})	13.2	11.8	12.5	11.7	8.8	5.40	4.70	3.0	4.9	2.9
Chen and Ravallion (2004)	33.0	. . .	28.4	. . .	. . .	17.4	. . .	. . .	16.6	9.9
Chen and Wang (2001)	31.5	29.6	29.4	25.0	22.0	17.2	17.0	17.1	17.4	. . .
(PL_{LOW}, $\hat{Y}_{S}$, θ_{NA}, π_{off})	42.2	42.8	44.2	40.2	34.4	26.7	23.8	21.9	19.9	22.7
(PL_{HIGH}, $\hat{Y}_{NA}$, θ_{NA}, π_{off})	50.8	43.8	43.0	39.5	34.8	28.7	25.8	24.6	23.0	23.4
(PL_{HIGH}, $\hat{Y}_{S}$, θ_{NA}, π_{off})	83.3	79.2	79.1	77.7	70.7	64.9	61.5	58.3	49.5	51.3

Source: Authors' estimates using POVCALnet and POVCAL.

National Poverty Estimates

The national poverty headcount ratios (not incorporating the intersectoral *COL* adjustment, which we introduce subsequently) that correspond to the two poverty lines are summarized below. For purposes of comparison, we include the estimates of Chen and Ravallion (2004) and Chen and Wang (2001) in the same tables, the latter being available for a larger number of years. Finally, wherever possible we add poverty estimates for 2004 which correspond to the various combinations of parameters and have been computed using the World Bank's POVCALnet website.

First, in Table 11 we report national poverty headcount ratios for China based on the "least refined" estimates of the consumption profile (from Tables 5 and 6).

These results show that the trend of substantial consumption poverty reduction over the entire period identified in the literature is robust to the choice of poverty line. The poverty headcount fell (between 1990 and 2001) by at least half if per capita GDP is taken to be an accurate measure of private incomes, and by at most 45 percent if survey estimates of incomes are considered instead. Although the trend of poverty reduction is robust to the alternative assumptions, this is not true of the extent of poverty in any given year. In particular, poverty headcount estimates vary by a multiplicative factor of between 0.3 and 5 of those presented by CR. There is evidence of a small increase of poverty at the end of the period under certain combinations of assumptions, which suggests, at a minimum, a diminishment in the trend of poverty reduction over time. Although this is concerning, it is perhaps also expectable.

In Table 12 we report the national poverty headcount ratios for China based on the "most refined" consumption profiles (from Tables 7 and 8).

As expected, the scenario (PL_{LOW}, $\hat{Y}_{NA}$) corresponding to the lower of the two poverty lines and the higher per capita income estimates produces negligible headcount ratios (which we do not report because these estimates cannot be judged to be significantly different from zero). In contrast, the highest poverty line in association with the lower per capita income estimates (PL_{HIGH}, $\hat{Y}_{S}$) produces headcount ratios that are twice higher than those of CR. However, the estimates still robustly display a downward trend, although there is once again some evidence of slight increases in poverty toward the end of the (here shorter) period considered, under certain combinations of assumptions.

TABLE 12
NATIONAL POVERTY HEADCOUNT RATIOS, 1990–01

Set of Parameters	1990	1992	1993	1994	1995	1996	1997	1998	2001
(PL_{LOW}, $\hat{Y}_{NA}$, θ_S, π_{adj})	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
(PL_{LOW}, $\hat{Y}_S$, θ_S, π_{adj})	. . .	20.2	19.5	16.6	15.2	9.3	6.7	4.0	3.7
(PL_{HIGH}, $\hat{Y}_{NA}$, θ_S, π_{adj})	. . .	21.1	18.4	16.2	15.6	11.0	8.4	6.2	6.1
Chen and Ravallion (2004)	33.0	. . .	28.4	. . .	. . .	17.4	. . .	. . .	16.6
Chen and Wang (2001)	31.5	29.6	29.4	25.0	22.0	17.2	17.0	17.1	17.4
(PL_{HIGH}, $\hat{Y}_S$, θ_S, π_{adj})	. . .	61.9	58.3	54.1	51.3	44.9	39.7	36.1	27.8

Notes: Estimates from POVCALnet for 2004 are unavailable as decile-specific changes in the consumption profile cannot be generated using this tool, since it incorporates a fixed set of distributional assumptions.

Source: Authors' calculations using POVCAL.

It is notable that our poverty estimates depart markedly in magnitude from official estimates and those of CR. In particular, the "most refined" estimates we present differ from CR's by a multiplicative factor varying between 0.2 and 2.6. Of course, this difference partially reflects the choice of poverty lines. To single out any one set of poverty estimates as "more likely" than others is impossible in the absence of a fuller exercise of poverty line construction based on appropriate normative judgments and empirical evidence.

Is the pace of poverty reduction (measured by the yearly percentage decrease in the poverty headcount ratio) different, according to our estimates relative to official figures? According to the latter (shown in Appendix Table A1), poverty reduction rates were uneven throughout the 1990s, with the highest achievements recorded between 1995 and 1999 (ranging between 13 and 20 percent annually). This may have been a result of post-1994 grain marketing system reforms, which boosted procurement prices received by poor farmers (Cheng, 1996). In contrast, poverty reduction was slower after 2000 and an increase was noticeable between 2002 and 2003. The pattern of accelerating poverty reduction in the mid-1990s followed by small increases in the 2000s is consistent with our findings (Appendix Table A5). Notably, although no other study has documented rising national Chinese poverty since 1990, a number of authors have found evidence of increasing *urban* poverty during the 1990s, including Khan and Riskin (2001), Fang *et al.* (2002), Xue and Wei (2003) and Meng *et al.* (2007).

We also analyze the trend in the income elasticity of poverty (often referred to as the "growth elasticity of poverty"). Appendix Table A6 suggests that across parameter combinations, the income elasticity of poverty seems to have temporarily picked up in the mid-1990s but remained uneven until the end of the decade. The trend of "pro-poor growth" appears to have been interrupted in 2004 (for three out of four parameter combinations). Overall, a clear trend in the "growth elasticity of poverty" is hardly discernible.

Finally, we employ the headcount ratios shown in Table 13 (based on the consumption profiles from Tables 9 and 10) to evaluate the impact of applying a rural–urban *COL* adjustment on our conclusions regarding the extent and trend of poverty in China since 1990 (sectoral headcount ratios are shown in Appendix Table A7). We find that the poverty estimates are broadly consistent with those

TABLE 13
POVERTY HEADCOUNT RATIOS (*COL* ROBUSTNESS CHECK), 1990–00

Set of Parameters	1990	1993	1996	1999	2000
(PL_{LOW}, $\hat{Y}_{NA}$, θ_{NA}, π_{off}, COL)	11.9	6.8	1.5	1.4	0.0
(PL_{HIGH}, $\hat{Y}_{NA}$, θ_S, π_{off}, COL)	25.1	. . .	1.4	. . .	0.0
(PL_{LOW}, $\hat{Y}_S$, θ_{NA}, π_{off}, COL)	50.5	22.6	17.5	10.5	10.1
(PL_{HIGH}, $\hat{Y}_{NA}$, θ_{NA}, π_{off}, COL)	53.1	24.3	19.0	11.6	11.0
(PL_{HIGH}, $\hat{Y}_S$, θ_S, π_{off}, COL)	73.8	. . .	32.2	. . .	19.4
(PL_{HIGH}, $\hat{Y}_S$, θ_{NA}, π_{off}, COL)	88.0	62.8	63.5	49.5	39.0

Notes: Also consistent with the elimination of poverty by 2000 are the scenarios (PL_{LOW}, $\hat{Y}_S$, θ_S, π_{off}, COL) and (PL_{LOW}, $\hat{Y}_{NA}$, θ_S, π_{off}, COL), for which we do not report the results to save space.
Source: Authors' estimates using POVCALnet and POVCAL.

derived from the preceding exercise. Overall poverty reduction is once again remarkable, with the poverty headcount ratio having fallen by at least 56 percent under all combinations of assumptions and having been reduced to zero by 2000 under the most favorable assumptions. Again, the poverty headcount ratios obtained differ markedly from those based on CR's methodology, highlighting the importance of considering *jointly* the impact of alternative assumptions on poverty estimates for China. In contrast to our previous results, the poverty figures reflecting a rural–urban *COL* adjustment do not show poverty increases at the end of the period analyzed. The conclusions, however, are broadly comparable to the earlier ones—the judgment that there has been substantial poverty reduction is not dependent on the assumptions made, although estimates of the *level* of poverty continue greatly to depend on these assumptions.

5. CONCLUSIONS

The record of poverty reduction in China has a large impact on our assessment of the extent and trend of global consumption poverty. In this paper we have analyzed the robustness of Chinese poverty estimates to the choice of assumptions concerning purchasing power exchange rates, private incomes, inflation rates and spatial differences in the cost of living. We have identified a number of poverty lines which enjoy notional comparability with those used in international poverty assessments and span the range of poverty lines proposed in the literature. Our data sources are diverse and overlapping.

We find that the conclusion that China has achieved substantial reductions in consumption poverty since 1990 is robust to variation in assumptions. This conclusion may not appear surprising, but could not have been assumed *ex ante*, not least because of the uncertainties concerning data and methodology which abound in the literature on Chinese poverty. We find some evidence that the rate of poverty reduction has accelerated in the second half of the 1990s. Under certain assumptions, there is a small *increase* in estimated poverty after 2001, a finding consistent with both official poverty figures and a number of recent studies of urban poverty.

Unlike the trend of poverty, the *extent* of poverty estimated to prevail in any year is greatly influenced by the assumptions made, and often differs markedly from estimates reported in other studies. For example, some of the assumptions

considered result in poverty estimates that are as large as five times those of Chen and Ravallion (2004). However, in view of the uncertainties concerning the appropriate assumptions to apply, and the absence of adequate information on the real costs of achieving basic human requirements in China, there is reason to be hesitant in accepting any one set of poverty estimates as correct.

Three additional cautionary notes are in order. First, it should be noted that after the completion of our research, China's NBS upwardly revised historical data for GDP for the years between 1993 and 2004. This revision affects those of our poverty estimates that use the national accounts as a basis for estimating income. However, we concluded that this revision would not materially affect our conclusions.[17]

Second, when interpreting the patterns found at the national level, one should keep in mind that such figures might conceal important variations at the provincial, or county levels, which have been considered only partially in this analysis, through the gross lens of rural–urban differences, and which are likely to be of great importance in China. There is considerable evidence of poverty trends differing between provinces in China (Khan and Riskin, 2001; Fang *et al.*, 2002; Xue and Wei, 2003; Meng *et al.*, 2004, 2005).

Third, in light of our findings, it is important to know whether China has had comparable achievements in other dimensions of development. Some evidence on health outcomes is provided by Reddy (2007), for instance, who notes that province-level rates of improvement in male and female life expectancy were generally higher in the 1990s than in the previous two decades. However, it took China a larger number of years to obtain the same improvements that other countries obtained, starting from similar initial life expectancies and levels of income. Moreover, there was considerable variation in the rate of improvement across provinces. Complementarily, Meng *et al.* (2004) argue that the nutritional intake for lower income groups in urban China *decreased* in the 1990s, despite the improvements in aggregate consumption identified in this study and others. It follows that the evidence, even in this case of apparently extraordinary consumption poverty reduction, cannot be considered unambiguous.

Despite these concerns, it is clear that China's progress against consumption poverty provides a perhaps unique instance of dramatic poverty reduction over a short period of time. It is also clear that consumption poverty reduction in China is a central reason why poverty reduction might have taken place worldwide (Reddy and Minoiu, 2007), although its estimated impact on global poverty continues to depend on the assumptions made concerning the initial level of poverty in China and the initial level and subsequent trend of poverty elsewhere in the world.

[17]According to the revised GDP data, the average annual GDP growth rate between 1993 and 2001 is higher by 1.4 percentage points as compared to the earlier reported GDP growth rate. Furthermore, the revised GDP is higher than the earlier reported GDP for each year by multiplicative factors monotonically rising from 1.02 in 1993 to 1.13 in 2001. Taking account of this upward revision, therefore, would lead (for those poverty rates dependent on income estimates from the national accounts, i.e. GDP) to the conclusion that (a) the estimated average consumption levels were slightly higher and poverty levels were correspondingly lower than shown in this paper, and (b) poverty reduction rates were higher throughout the period. Due to the relatively small magnitude of the revision, however, we judged that it was not warranted to re-estimate poverty in each year to take account of the upward revision of GDP data.

Appendix

TABLE A1

Official Poverty Estimates

	Official (Rural) Poverty Line ~$0.75/day PPP			Official Updated (Rural) Poverty Line ~$1/day PPP		
	% Poor	# of Poor (mil.)	Year on Year % Decrease in Headcount Ratio	Average pp Decrease in Headcount Ratio	% Poor	# of Poor (mil.)
1978	30.7	250.0				
1984	15.1	128.0	–0.11	–2.6		
1985	14.8	125.0	–0.02	–0.3		
1986	15.5	131.0	0.05	0.7		
1987	14.3	122.0	–0.08	–1.2		
1988	11.1	96.0	–0.22	–3.2		
1989	11.6	102.0	0.05	0.5		
1990	9.4	85.0	–0.19	–2.2		
1992	8.8	80.0	–0.03	–0.3		
1994	7.7	70.0	–0.06	–0.6		
1995	7.1	65.4	–0.08	–0.6		
1997	5.4	49.6	–0.13	–0.9		
1998	4.6	42.1	–0.15	–0.8		
1999	3.7	34.1	–0.20	–0.9		
2000	3.4	32.1	–0.08	–0.3		
2001	3.2	29.2	–0.06	–0.2	9.7	90.3
2002	3.0	28.2	–0.06	–0.2	9.2	86.5
2003	3.1	29.0	0.03	0.1	9.1	85.2

Source: National Bureau of Statistics (2004).

TABLE A2

SELECTED CHINESE POVERTY ANALYSES

Spatial Coverage	Sectoral Coverage	Poverty Line	Temporal Coverage	Type of Data	Notable Findings
NBS (2004)	Rural	Official (approx. \$0.75/day and \$1/day)	1978–2000	Unit	Substantial reduction in rural poverty
Zhang and Wan (2006)	Rural	Official, \$1/day	1988–1999	Unit	Rural poverty increase in the second half of the 1990s
Fang *et al.* (2002)	Urban	\$1/day, \$1.5/day	1992–1998	Unit	Urban poverty increased in the second half of the 1990s
Xue and Zhong (2003)	Urban	Official NBS income standard	1988, 1995, 1999	Unit	Urban poverty increased in the second half of the 1990s
Bishop *et al.* (2006)	Urban	\$4/day, \$5/day, \$6/day	1988, 1995	Unit	Urban poverty declined but there are regional differences
Meng *et al.* (2005)	Urban	"Cost of basic needs" approach	1986–2000	Unit	Substantial increase in urban poverty in the 1990s
Gustaffson and Zhong (2000)	Rural, some cities	50% of 1988 median equivalent income	1988, 1995	Unit	Slight decrease in poverty
Khan and Riskin (2001)	Rural, urban	Nutritionally-based high and low PLs	1988, 1995	Unit	Slight decrease in rural poverty and increase in urban poverty by 1995
Chen and Wang (2001)	Rural, urban, national	\$0.50–\$2.50/day	1990–1999	Grouped	Urban and national poverty increased in the second half of the 1990s
Chen and Ravallion (2007)	Rural, urban, national	Official and urban- "equivalent" of rural PL	1980–2001	Grouped	"Poverty reduction stalled in the late 1990s" (Chen and Ravallion, 2007, p. 2)
Berry and Serieux (2004)	National	\$500/year, and \$1500/year	1980, 1990, 2000	Grouped	Reduction by 50% in poverty according to the higher poverty line and by 75% according to the lower poverty line
Chen and Ravallion (2001a, 2004)	National	\$1/day and \$2/day (consumption)	1981–2001	Grouped	Substantial reduction in national poverty
Sala-i-Martin (2006)	National	\$1.5/day (income)	1970–2000	Grouped	Tenfold decrease in the share of poor

Source: Authors' analysis.

TABLE A3

SURVEY-BASED CONSUMPTION TO INCOME RATIOS AND FOOD SHARES IN TOTAL EXPENDITURE

Decile	Average Consumption to Income Ratio	Food Share in Total Expenditure
Bottom	100%	62%
Second	77%	63%
Third	74%	62%
Fourth	70%	61%
Fifth	68%	59%
Sixth	76%	58%
Seventh	72%	56%
Eighth	71%	54%
Ninth	67%	52%
Top	55%	49%

Notes: In our calculations, individuals in the bottom income decile appeared to consume, on average, 124% of their income. Our procedure requires us to assume that this ratio is representative of the true C/I ratio throughout the 1990s. We were therefore concerned that the 124% figure implies a degree of persistent dissaving that is implausibly high. This figure also implies that consumption levels for the bottom income decile are greater than for the second income decile, which is also implausible. To address both of these problems, we assume that the C/I ratio for the bottom decile is 100%.

Source: Authors' calculations.

TABLE A4

Consumer Price Indices and Alternative Urban–Rural Cost-of-Living (*COL*) Adjustment

	Official CPI NBS (2003)	Adjusted CPI	Urban–Rural *COL* Differential (percent)	Ratio Between Unadjusted and *COL*-Adjusted National Per Capita Income	Ratio Between Rural Per Capita Income (Base) and *COL*-Adjusted National Per Capita Income	Ratio Between *COL*-Adjusted Urban Per Capita Income and *COL*-Adjusted National Per Capita Income
1990	79.25	80.18	25.9	0.91	0.85	1.41
1991	81.94	82.95	29.4	0.90	0.84	1.44
1992	87.18	90.09	34.2	0.88	0.84	1.43
1993	100.00	100.00	37.1	0.87	0.82	1.46
1994	124.10	123.57	38.9	0.86	0.82	1.45
1995	146.07	153.07	38.1	0.86	0.83	1.41
1996	158.19	167.86	39.2	0.86	0.86	1.33
1997	162.62	168.23	40.1	0.86	0.86	1.29
1998	161.32	164.44	40.6	0.85	0.85	1.29
1999	159.06	157.73	40.9	0.84	0.83	1.32
2000	159.70	152.95	42.2	0.83	0.81	1.33
2001	158.42	152.75	42.0	0.82	0.79	1.35
Overall increase	199.91%	190.51%				

Source: The first two columns are based on authors' calculations. The last four columns are obtained using data from Chen and Ravallion (2007, table 1).

TABLE A5

AVERAGE ANNUAL PERCENTAGE CHANGE IN HEADCOUNT RATIOS (%)

Parameters	90/92	92/93	93/94	94/95	95/96	96/97	97/98	98/01	01/04
(PL_{LOW}, $\hat{Y}_{NA}$, θ_{NA}, π_{off})	–5.5	5.9	–6.4	–24.8	–38.6	–13.0	–36.2	17.8	–16.0
(PL_{LOW}, $\hat{Y}_{S}$, θ_{NA}, π_{off})	0.7	3.3	–9.0	–14.4	–22.4	–10.9	–8.0	–3.1	4.5
(PL_{HIGH}, $\hat{Y}_{NA}$, θ_{NA}, π_{off})	–7.1	–1.8	–8.1	–11.9	–17.5	–10.1	–4.7	–2.2	0.6
(PL_{HIGH}, $\hat{Y}_{S}$, θ_{NA}, π_{off})	–2.5	–0.1	–1.8	–9.0	–8.2	–5.2	–5.2	–5.3	1.2
(PL_{LOW}, $\hat{Y}_{NA}$, θ_{S}, π_{adj})	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
(PL_{LOW}, $\hat{Y}_{S}$, θ_{S}, π_{adj})	. . .	–3.5	–14.9	–8.4	–38.8	–28.0	–40.3	–2.6	. . .
(PL_{HIGH}, $\hat{Y}_{NA}$, θ_{S}, π_{adj})	. . .	–12.8	–12.0	–3.7	–29.5	–23.6	–26.2	–0.5	. . .
(PL_{HIGH}, $\hat{Y}_{S}$, θ_{S}, π_{adj})	. . .	–5.8	–7.2	–5.2	–12.5	–11.6	–9.1	–8.3	. . .

Source: Authors' calculations.

TABLE A6

GROWTH ELASTICITY OF POVERTY (AVERAGE ANNUAL CHANGE IN POVERTY/AVERAGE ANNUAL GDP GROWTH)

Parameters	90/92	92/93	93/94	94/95	95/96	96/97	97/98	98/01	01/04
(PL_{LOW}, $\hat{Y}_{NA}$, θ_{NA}, π_{off})	–0.5	0.5	–0.5	–2.6	–4.4	–1.6	–5.3	2.5	–1.8
(PL_{LOW}, $\hat{Y}_{S}$, θ_{NA}, π_{off})	0.1	0.3	–0.8	–1.5	–2.5	–1.3	–1.2	–0.4	0.5
(PL_{HIGH}, $\hat{Y}_{NA}$, θ_{NA}, π_{off})	–0.7	–0.1	–0.7	–1.2	–2.0	–1.2	–0.7	–0.3	0.1
(PL_{HIGH}, $\hat{Y}_{S}$, θ_{NA}, π_{off})	–0.2	0.0	–0.1	–0.9	–0.9	–0.6	–0.8	–0.7	0.1
(PL_{LOW}, $\hat{Y}_{NA}$, θ_{S}, π_{adj})	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
(PL_{LOW}, $\hat{Y}_{S}$, θ_{S}, π_{adj})	. . .	–0.3	–1.3	–0.9	–4.4	–3.4	–6.0	–0.4	. . .
(PL_{HIGH}, $\hat{Y}_{NA}$, θ_{S}, π_{adj})	. . .	–1.0	–1.0	–0.4	–3.3	–2.9	–3.9	–0.1	. . .
(PL_{HIGH}, $\hat{Y}_{S}$, θ_{S}, π_{adj})	. . .	–0.5	–0.6	–0.5	–1.4	–1.4	–1.3	–1.2	. . .

Source: Authors' calculations.

TABLE A7

RURAL AND URBAN POVERTY HEADCOUNT RATIOS (*COL* ROBUSTNESS CHECK), 1990–00

	Rural					Urban				
Parameters	1990	1993	1996	1999	2000	1990	1993	1996	1999	2000
(PL_{LOW}, $\hat{Y}_{NA}$, θ_{NA}, π_{off}, *COL*)	13.8	9.4	2.1	2.1	0.0	6.5	0.0	0.0	0.0	0.0
(PL_{HIGH}, $\hat{Y}_{NA}$, θ_{S}, π_{off}, *COL*)	30.8	13.2	2.0	0.3	0.0	9.2	. . .	0.0	. . .	0.0
(PL_{LOW}, $\hat{Y}_{S}$, θ_{NA}, π_{off}, *COL*)	61.1	31.4	20.5	14.7	15.8	21.0	10.5	10.6	2.6	5.2
(PL_{HIGH}, $\hat{Y}_{NA}$, θ_{NA}, π_{off}, *COL*)	64.1	33.7	22.3	16.0	17.3	22.4	11.8	11.7	3.3	6.5
(PL_{HIGH}, $\hat{Y}_{S}$, θ_{S}, π_{off}, *COL*)	86.1	52.4	38.2	28.4	30.5	39.5	. . .	18.4	. . .	14.0
(PL_{HIGH}, $\hat{Y}_{S}$, θ_{NA}, π_{off}, *COL*)	94.8	87.3	71.6	60.9	61.2	69.2	51.7	45.1	28.2	39.1

Source: Authors' estimates using POVCALnet and POVCAL.

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