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The Developing World Is Poorer Than We Thought, But No Less Successful in the Fight against Poverty

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Abstract

The paper presents a major overhaul to the World Bank's past estimates of global poverty, incorporating new and better data. Extreme poverty—as judged by what "poverty" means in the world's poorest countries—is found to be more pervasive than we thought. Yet the data also provide robust evidence of continually declining poverty incidence and depth since the early 1980s. For 2005 we estimate that 1.4 billion people, or one quarter of the population of the developing world, lived below our international line of $1.25 a day in 2005 prices; 25 years earlier there were 1.9 billion poor, or one half of the population. Progress was uneven across regions. The poverty rate in East Asia fell from almost 80 percent to under 20 percent over this period. By contrast it stayed at around 50 percent in Sub-Saharan Africa, though with signs of progress since the mid 1990s. Because of lags in survey data availability, these estimates do not yet reflect the sharp rise in food prices since 2005.

This paper—a product of the Development Research Group—is part of a larger effort in the department to monitor the developing world's progress against absolute poverty. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at schen@worldbank.org or mravallion@worldbank.org.

The Developing World is Poorer than we Thought, But no Less Successful in the Fight Against Poverty

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[1] ***This the August 2009 revised version of the working paper under the same title first issued in August 2008. In response to comments received, the revised version includes new sensitivity tests and a fully explanation of the differences with past estimates. The main results are unchanged.*** A great many colleagues at the World Bank have helped us in obtaining the necessary data for this paper and answered our many questions. An important acknowledgement goes to the staff of over 100 governmental statistics offices who collected the primary household and price survey data. Our thanks go to and Prem Sangraula, Yan Bai and Xiaoyang Li for their invaluable help in setting up the data sets we have used here. The Bank's Development Data Group has helped us with our many questions concerning the 2005 ICP and other data issues; we are particularly grateful to Yuri Dikhanov, Olivier Dupriez and Qinghua Zhao for their help. We have also benefited from the comments of Francois Bourguignon, Gaurav Datt, Angus Deaton, Massoud Karshenas, Aart Kraay, Peter Lanjouw, Rinku Murgai, Ana Revenga, Luis Serven, Merrell Tuck, Dominique van de Walle and Kavita Watsa. These are our views and should not be attributed to the World Bank or any affiliated organization. Addresses: schen@worldbank.org and mravallion@worldbank.org.

1. Introduction

In assessing the extent of poverty in a given country one naturally uses a poverty line that is considered appropriate for that country. However, the purchasing power of national poverty lines varies across countries, with richer countries tending to adopt higher lines. For the purposes of measuring poverty in the world as a whole, the World Bank's "$1 a day" measures have aimed to apply a common standard, such that any two people with the same purchasing power over commodities are treated the same way—both are either poor or not poor, even if they live in different countries. A deliberately conservative standard has been used by the Bank, anchored to what "poverty" means in the world's poorest countries. By focusing on how poverty is defined in the poorest countries, the $1 a day line gives the global poverty measure a salience in focusing on the world's poorest, though it is recognized that higher lines also need to be considered to obtain a complete picture of the distribution of living standards.

Following this approach, Ravallion, Datt and van de Walle (RDV) (1991), in research for the 1990 *World Development Report* (World Bank, 1990), compiled data on national poverty lines across 33 countries and proposed a poverty line of $1 per day at 1985 Purchasing Power Parity (PPP) as being typical of low-income countries.[2] They estimated that one third of the population of the developing world in 1985 lived below this line.[3] Since then the Bank's researchers have updated the original RDV estimates of global poverty measures in the light of new and often better data. The estimates done for the 2000/01 *World Development Report* (World Bank, 2000) used an international poverty line of $1.08 a day, at 1993 PPP, based on the original set of national poverty lines in RDV (Chen and Ravallion, 2001). In 2004, about one in five people in the developing world—slightly less than one billion people—were deemed to be poor by this standard (Chen and Ravallion, 2007).

This paper reports on the most extensive revision yet of these past estimates of poverty measures for the developing world. In the light of a great deal of new data and under various assumptions pertaining to the key methodological choices, we estimate the global poverty count for 2005 and update all our past estimates back to 1981. This puts our knowledge of the extent of poverty in the world on a firmer footing.

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[2] RDV also used a lower line of $0.75 per day, which was the predicted line in the poorest country in their data set, Somalia, though it also happened to coincide with India's line at the time.

[3] By the "developing world" we mean all low and middle income countries—essentially the Part 2 member countries of the World Bank (based on Gross National Income per capita in 2005).

New data from three sources make the need for this revision compelling. The first new data source is the 2005 *International Comparison Program* (ICP). The price surveys done by the ICP have been the main data source for estimating PPPs. This started in 1968 with PPP estimates for just 10 countries, based on rather crude price surveys.[4] Prior to the present paper, our most recent global poverty measures had been anchored to the 1993 round of the ICP. An independent evaluation (known as the *Ryten Report*; see UN, 1998) of the 1993-96 ICP rounds identified a number of methodological and operational concerns, including lack of clear standards in defining internationally comparable commodities. This is a serious concern when comparing the cost of living between poor countries and rich ones, given that there is likely to be an economic gradient in the quality of commodities consumed; without strict standards in defining the products to be priced, there is a risk that one will underestimate the cost of living in poor countries by confusing quality differences with price differences. PPPs will be underestimated in poor countries. This highlights the difficulty of doing price surveys for the purposes of international comparisons. The existence of non-traded goods is (on the one hand) the main reason why we need to use a PPP rather than market exchange rate, but (on the other hand) non-traded goods are harder to compare between countries. The only way to deal with this is through detailed product listings and descriptions, which add significantly to the cost of the data collection. A better funded round of the ICP in 2005, managed by the World Bank, has taken considerable effort to address this problem as well as introducing other improvements in the data and estimation methods for PPPs (World Bank, 2008a,b).[5] A number of methodological and operational improvements were implemented by the 2005 ICP. The new ICP data imply some dramatic revisions to past estimates, consistent with the view that the old ICP data had under-estimated the cost-of-living in poor countries.

The second data source is a new compilation of poverty lines for developing countries provided by Ravallion, Chen and Sangraula (RCS) (2008). Based on these data, we implement

[4] The ICP started as a joint project of the UN and the University of Pennsylvania, with support from the Ford Foundation and the World Bank. Prior to 2000, the Penn World Tables (PWT; see Summers and Heston, 1991) were the main source of the PPPs for consumption used in the World Bank's global poverty measures. In 2000 we switched to the PPPs estimated by the Bank's Development Data Group. There are methodological differences between the PWT and the Bank's PPPs, as discussed in Ackland et al. (2006) and World Bank (2008, Appendix G).

[5] While we do not know of any cost comparisons, there can be little doubt that the 2005 ICP entailed a far higher cost than previous rounds; as the Ryten Report had also discussed, fixing the problems with the ICP data would inevitably come at a cost.

an updated international poverty line and test robustness to that choice. Recognizing that the new PPPs also change the $US value of national poverty lines in the poorest countries, our international poverty line of $1.25 per day in 2005 is deliberately lower than the 2005 value in the US of our old international line. The new line is the mean of the national poverty lines for the poorest 15 countries in terms of consumption per capita. To test robustness of our main qualitative results to the choice of poverty line we also give results for a range of lines spanning $1.00 to $2.50 per day in 2005 prices. The lower bound (not to be confused with the old "$1-a-day" line in 1993 prices) is very close to the national poverty line used by India, while the upper bound is the median of the poverty lines for all countries except the poorest 15. The $2.00 line is the median poverty line found amongst developing countries as a whole.

The third data source is the large number of new household surveys now available. We draw on 675 surveys, spanning 1979-2006 and 115 countries. (By contrast, the original RDV estimates used 22 surveys, one per country; Chen and Ravallion, 2004, used 450 surveys.) Our methods of analyzing these data follow Chen and Ravallion (2001, 2004, 2007). The international poverty line is converted to local currencies in the ICP benchmark year and is then converted to the prices prevailing at the time of the relevant household survey using the best available Consumer Price Index (CPI) for that country. (Equivalently, the survey data on household consumption or income for the survey year are expressed in the prices of the ICP base year, and then converted to PPP $'s.) Then the poverty rate is calculated from that survey. All inter-temporal comparisons are real, as assessed using the country-specific CPI. We make estimates at three-year intervals over 1981-2005. Interpolation/extrapolation methods are used to line up the survey-based estimates with these reference years, including 2005. We also present a new method of mixing survey data with national accounts (NAS) data to try to reduce survey-comparability problems. For this purpose, we treat the national accounts data on consumption as a Bayesian prior for the survey mean and the actual survey as the new information. We show that, under log-normality with a common variance, the mixed posterior estimator is the geometric mean of the survey mean and its predicted value based on the NAS.

Based on these new data and methods we show that the incidence of poverty in the world is higher, or at least no lower, than past estimates have suggested. However, we also find that the poverty profile across regions of the developing world and the overall rate of progress against absolute poverty are fairly similar to past estimates.

2. The 2005 ICP round and its implications for global poverty measures

International comparisons of economic aggregates have long recognized that market exchange rates are deceptive, given that some commodities are not traded; this includes services but also many goods, including some food staples. Furthermore, there is likely to be a systematic effect, stemming from the fact that low real wages in developing countries entail that labor-intensive non-traded goods tend to be relatively cheap. In the literature, this is known as the "Balassa-Samuelson effect,"[6] and is the now widely-accepted explanation for an empirical finding known as the "Penn effect"—that GDP comparisons based on market exchange rates tend to understate the real incomes of developing countries.[7] Similarly, market exchange rates overstate the extent of poverty in the world when judged relative to a given $US poverty line. Global economic measurement, including poverty measurement, has relied instead on PPPs, which give conversion rates for a given currency with the aim of assuring parity in terms of purchasing power over commodities, both internationally traded and non-traded. World Bank (2008a) is the source of our PPP's based on the 2005 ICP round. Here we only point to some salient features relevant to measuring poverty in the developing world.[8]

The 2005 ICP is the most complete and thorough assessment to date of how the cost of living varies across countries. The world was divided into six regions with different product lists for each. All regions participated, although the participation rate was lower for Latin America. The ICP collected primary data on the prices for 600-1000 (depending on the region) goods and services grouped under 155 "basic headings" deemed to be comparable across countries; 110 of these relate to household consumption. The prices were typically obtained from a large sample of outlets in each country. The price surveys were done by the government statistics offices in each country, under supervision from regional authorities. The number of countries participating in the 2005 ICP is larger than in 1993, the last ICP round we used for global poverty measurement; 146 countries participated, as compared to 117 in 1993. This was the first time that a number of countries, including China, participated in the ICP. And the surveys were implemented on a more scientific basis. The 2005 ICP used stricter standards in defining internationally

[6] See Balassa (1964) and Samuelson (1964).

[7] The term "Penn effect" stems from Penn World Tables (Summers and Heston, 1991), which provided the price level indices across countries that were first used to establish this effect empirically.

[8] Broader discussions on PPP methodology can be found in Ackland et al. (2006), World Bank (2008a) and Deaton and Heston (2009).

comparable qualities of the goods identified in the ICP price surveys. Regional-specific product lists were derived, which aimed to balance the twin objectives of being internationally comparable goods within the region and being representative of the consumption bundles found in each country. Creating the product listings took about two years, as it involved extensive collaboration amongst the countries and the relevant regional ICP office. Ring comparisons were used to linking the regional PPP estimates through a common set of global prices; these comparisons were done for 18 countries in all—a marked improvement over past ICP rounds.[9] As in the past, the Bank uses a multilateral extension of the bilateral Fisher price index known as the EKS method.[10]

The changes in the methods of product listing and pricing are of particular relevance to global poverty measurement. The 2005 ICP applied more rigorous standards of specifying internationally comparable commodities for linking across countries (World Bank, 2008b). In comparison to 2005, it is likely that the 1993 ICP would have used lower qualities of goods in poor countries than would have been found in (say) the US market.[11] The goods priced by the 1993 ICP tended to be more typical of the items available in local markets. The 1993 ICP round also over-valued the services derived from government in developing countries. RCS show that a sizable underestimation of the 1993 PPP is implied by the new PPP data and the data on rates of inflation. Furthermore, the extent of this underestimation tends to be greater for poorer countries.

Given the changes in data and methodology, PPPs for different benchmark years cannot be easily compared, and cannot be expected to be consistent with national data sources (Dalgaard and Sørensen, 2002; World Bank, 2008b). We follow common practice in letting the national data override the ICP data for inter-temporal comparisons; this is the most reasonable position to take given the changes in methodology between different ICP rounds (World Bank, 2008b). Thus the PPP conversion is only done once for a given country, and all estimates are revised back in time consistently with the data for that country. So the PPPs serve the role of locating the

[9] There were other differences, less relevant to global poverty measurement. New methods were used for measuring government compensation and housing. Adjustments were also made for the lower average productivity of public sector workers in developing countries (lowering the imputed value of the services derived from public administration, education and health).

[10] On the advantages of this method over the alternative (Geary-Khamis) method see Ackland et al. (2006). In the 2005 ICP the Africa region chose a different aggregation method (African Development Bank, 2007); World Bank (2008b) describes this as a minor difference to the EKS method.

[11] There were a number of problems in the implementation of the 1993 ICP round, as discussed in Ahmed (2003).

residents of each country in the "global" distribution, but we do not mix the new PPPs with those from previous ICP rounds. We will, however, discuss the salient differences between the new results reported here using the 2005 ICP and our past estimates.

Some dramatic revisions to past PPPs are implied, not least for the two most populous developing countries, China and India (neither of which had actually participated in the 1993 ICP). For example, the 1993 consumption PPP used for China was 1.42 Yuan to the $US in 1993 (updating an earlier estimate by Ruoen and Chen, 1995), while the new estimate based on the 2005 ICP is 3.46 Yuan (4.09 if one excludes government consumption). The corresponding "price level index" (PPP divided by market exchange rate; US=100) went from 25% in 1993 to 52% in 2005. So the Penn effect is still evident, but the size of this effect has declined markedly, with a new PPP at about half the market exchange rate rather than one quarter. Adjusting solely for the differential inflation rates in the US and China one would have expected the 2005 PPP to be 1.80 Yuan not 3.46. Similarly, India's 1993 consumption PPP was Rs 7.0, while the 2005 PPP is Rs 16, and the price level index went from 23% to 35%. If one updated the 1993 PPP for inflation one would have obtained a 2005 PPP of Rs 11 rather than Rs 16.

The results for China have naturally attracted much attention, given that they suggest that China's GDP in 2005 is much smaller than we all thought; with the PPP revisions, China's GDP per capita at PPP for 2005 falls from $6,760 to $4,091 (World Bank, 2008b). Keidel (2007) claimed that the new PPP for China adds 300 million to the count of that country's poor. Some observers have gone further to claim that the new PPPs also cast doubt on the extent of China's—and (hence) the world's—progress over time against poverty. For example, the Bretton Woods Project (an NGO) claims that the new PPPs "…undermine the much-trumpeted claims that globalization has reduced the number of people living in extreme poverty".[12] This would be surprising if it were true, given that rates of economic growth at the country level are not altered by changing the PPP benchmark; with China's (remarkable) growth rates intact one must expect that progress over time will be similar using the new PPP, even if the poverty rate is higher (by international standards) at all dates.

While there were many improvements in the 2005 ICP, the new PPPs still have some limitations. Making the commodity bundles more comparable across countries (within a given region) invariably entails that some of the reference commodities are not typically consumed in

[12] See http://www.brettonwoodsproject.org/art-560008.

certain countries, generating either missing values or prices drawn from unusual outlets; for example, Deaton and Heston (2009) point out that rice is hard to find in Ethiopia and teff (the staple in Ethiopia) is hard to find in Thailand, say. One could avoid this problem by choosing more representative country-specific bundles, but this would re-introduce the quality bias discussed above, which has plagued past ICP rounds. There is also a problem of "urban bias" in the ICP price surveys for some counties; the next section describes our methods of addressing this problem. As was argued in Ravallion et al. (1991), a further concern is that the weights attached to different commodities in the conventional PPP rate may not be appropriate for the poor; section 6 examines the sensitivity of our results to the use of alternative "PPPs for the poor" available for a subset of countries from Deaton and Dupriez (2009). Another limitation is that the PPP is a national average. Just as the cost of living tends to be lower in poorer countries, one expects it to be lower in poorer regions within one country, especially in rural areas. Ravallion et al. (2007) have allowed for urban-rural cost of living differences facing the poor, and provided an urban-rural breakdown of our prior global poverty measures using the 1993 PPP. We plan to update these estimates in future work.

Given that the bulk of the PPPs have risen for developing countries, the poverty count will tend to rise at any given poverty line in $PPPs. However, the same changes in the PPPs also alter the (endogenous) international poverty line, given that it is anchored to the national poverty lines in the poorest countries. Next we turn to the poverty lines.

3. National and international poverty lines

In setting an international poverty line using the 2005 ICP we have aimed to follow the same definition used in our past work, namely that the line should be representative of the national lines found in the poorest countries—in the spirit of the original "$1 a day" line (RDV; World Bank, 1990). For this purpose, RCS have compiled a new set of national poverty lines for developing countries drawn from the World Bank's country-specific *Poverty Assessments* and the *Poverty Reduction Strategy Papers* (PRSP) done by the governments of the countries concerned. These documents provide a rich source of data on poverty at the country level, and almost all include estimates of national poverty lines. The RCS dataset was compiled from the most recent poverty assessments and PRSPs over 1988–2005. In the source documents, each poverty line is given in the prices for a specific survey year (for which the subsequent poverty

measures are calculated). In most cases, the poverty line was also calculated from the same survey (though there are some exceptions, for which pre-existing national poverty lines were updated using the consumer price index). About 80 percent of these reports used a version of the "cost of basic needs" method in which the food component of the poverty line is the expenditure needed to purchase a food bundle specific to each country (or region) that yields a stipulated food energy requirement.[13] To this amount an allowance is added for nonfood spending, which is typically anchored to the nonfood spending of people whose food spending (or sometimes total spending) is near the food poverty line.

While there are similarities across countries in how poverty lines are set, there is much scope for discretion. The stipulated food-energy requirements are similar, but the food bundles that yield a given food energy intake can vary enormously (such as in the share of calories from starchy staples and the share from meat). The nonfood component will also vary. The judgments made in setting the various parameters of a poverty line are likely to reflect prevailing notions of what poverty means in each country setting, with more frugal lines in poorer countries.

There are some notable differences between the old (RDV) and new (RCS) data sets on national poverty lines. The RDV data were drawn from sources for the 1980s (with a mean year of 1984) while the new and larger compilation in RCS is post-1990 (mean of 1999); in no case do the proximate sources overlap. The RCS data cover 75 developing countries while the earlier data included only 22 countries (plus 11 developed countries). The RDV data set used rural poverty lines when there was a choice, while the RCS data set estimated national average lines. And the RDV data set was unrepresentative of the poorest region, Sub-Saharan Africa (SSA), with only four countries from that region (Burundi, South Africa, Tanzania and Zambia), while the RCS data set has a good spread across regions, including 23 countries in SSA. The sample bias in the RDV data set was unavoidable at the time (1990) but it can now be corrected.

Figure 1 plots the poverty lines compiled by RCS in 2005 $PPPs per month against log household consumption per capita also at 2005 PPP; there are 74 countries with complete data. The Figure also gives a nonparametric regression of the national poverty lines against log mean consumption. Above a certain point, the poverty line rises with mean consumption. The overall elasticity of the poverty line to mean consumption is about 0.7. However, the slope is essentially

[13] This method, and alternatives, are discussed in detail in Ravallion (1994, 2008a).

zero amongst the poorest 20 or so countries, where absolute poverty clearly dominates. The economic gradient in national poverty lines evident in Figure 1 is driven more by the gradient in the non-food component of the poverty lines (which accounts for about 60% of the overall elasticity) than the food component, although there is still an appreciable share attributable to the gradient in food poverty lines (RCS).

Our international poverty line is $1.25 a day for 2005, which is the mean of the lines found in a reference group of countries defined as those with consumption per capita at 2005 PPP below $60.00 per month; the RCS sample has 15 countries in this group—namely Malawi, Mali, Ethiopia, Sierra Leone, Niger, Uganda, Gambia, Rwanda, Guinea-Bissau, Tanzania, Tajikistan, Mozambique, Chad, Nepal and Ghana. (Their median poverty line is $1.27 per day.) Consumption per capita for this group ranges from $1.03 to $1.87 per day with a mean of $1.40 per day. The level of this poverty line is quite robust to the choice of the poorest 15 countries (taking plus or minus five countries ranked by consumption per capita). However, it makes sense to focus on the poorest 15 since the econometric tests reported in RCS imply that national poverty lines tend to rise with consumption per person when it exceeds about $2 per day, which is near the upper bound of the consumption levels found amongst these 15 countries.[14] Of course, there is still a variance in the national poverty lines at any given level of mean consumption, including amongst the poorest countries. The poverty lines found amongst the poorest 15 countries vary from $0.70 to $1.90 per day and RCS estimate the robust standard error of the $1.25 line to be $0.10 per day.

To assess the robustness of qualitative comparisons to the choice of poverty line, we provide estimates for five lines at 2005 PPP namely: (i) $1.00 a day, which is very close to the national poverty line used by the Government of India;[15] (ii) $1.25, which is the mean poverty line for the poorest 15 countries, as proposed by RCS; (iii) $1.45, as obtained by updating the 1993 $1.08 line for inflation in the US; (iii) $2.00, which is the median of the RCS sample of national poverty lines for developing and transition economies and is also approximately the line

[14] RCS use a suitably constrained version of Hansen's (2002) method for estimating a piece-wise linear ("threshold") model. (The constraint is that the slope of the lower linear segment must be zero and there is no potential discontinuity at the threshold.) This method gave an absolute poverty line of $1.23 (t=6.36) and a threshold level of consumption (above which the poverty line rises linearly) very close to the $60 per month figure used to define the reference group.

[15] India's official poverty lines for 2004/05 were Rs 17.71 and Rs 11.71 per day for urban and rural areas. Using our urban and rural PPPs for 2005 (described below) these represent $1.03 per day.

obtained by updating the $1.45 line at 1993 PPP for inflation in the US; and (iv) $2.50, twice the $1.25 line, which is also the median poverty line of all except the poorest 15 of countries in the RCS data set of national poverty lines. The range $1.00 to $1.45 is roughly the 95% confidence interval for our estimate of the mean poverty line for the poorest 15 countries.

To test the robustness of qualitative comparisons, we also estimate the cumulative distribution functions up to a maximum poverty line, which we set at $13 per day, which is about the official poverty line for the US (at average household size and composition).[16]

We use the same PPPs to convert the international lines to local currency units (LCUs). Three countries were treated differently, China, India and Indonesia. In all three we used separate urban and rural distributions. For China, the ICP survey was confined to 11 cities.[17] We treat the ICP's PPP as an urban PPP and use the ratio of urban to rural national poverty lines to derive the corresponding rural poverty line in local currency units. For India the ICP included rural areas, but they were underrepresented. We derived urban and rural poverty lines consistent with both the urban-rural differential in the national poverty lines and the relevant features of the design of the ICP samples for India; further details can be found in Ravallion (2008b). For Indonesia, we converted the international poverty line to LCUs using the official consumption PPP from the 2005 ICP. We then unpack that poverty line to derive implicit urban and rural lines that are consistent with both the ratio of the national urban-to-rural lines for Indonesia and the fact that the national PPP from the ICP is based on expenditure-weighted prices.

Comparison with our old international poverty line. Recall that the international poverty line for 1993 proposed by Chen and Ravallion (2001) was $1.08 a day ($32.74 per month). If one adjusts only for inflation in the US one obtains $1.45 a day at 2005 prices, which is well above the average poverty line for the poorest counties in Figure 1. However, it will be recalled that the $1.08 figure at 1993 PPP was based on the RDV data set of national poverty lines for the 1980s. If we use the new data set on national poverty lines provided by RCS but evaluated at 1993 prices and converted to $'s using the 1993 PPPs we would obtain a considerably higher poverty line. Figure 2 plots both the new (RCS) and old (RDV) data on national poverty lines, both at 1993 PPP. The relationship between the RCS national poverty lines and consumption per capita

[16] See http://aspe.hhs.gov/poverty/05poverty.shtml. We used the poverty line for a four member household at 2005, which is $416 per person per month.

[17] Although the survey included some surrounding rural areas, it cannot be considered representative of rural China; evidence on this point is provided by Chen and Ravallion (2008a).

(at 1993 PPP) looks similar to Figure 1. But the RDV lines are notably lower; the gap diminishes as consumption falls, but still persists amongst the poorest countries. For the poorest 15 countries ranked by consumption per capita at 1993 PPP, the mean poverty line in the RCS data set is $44.19 ($1.45 a day[18]) versus $33.51 ($1.10 a day) using the old (RDV) series for eight countries with consumption below upper bound of consumption for those 15 countries.

This might suggest that there was an upward drift in the national poverty lines of poor countries between the 1980s and the 1990s and 2000s. However, this seems unlikely, given that it appears to be quite rare for developing countries to increase the real value of their poverty lines over time. The more plausible explanation lies with the aforementioned differences between the two samples of national poverty lines. There are two salient differences. First, recall that the RDV sample used rural poverty lines, which are invariably lower than urban lines (Ravallion et al., 2007); this will lower the schedule of poverty lines at given national mean consumption.

Second, the original RDV sample under-represented SSA. Three of the eight countries in the RDV sample that qualify to be in our reference group of countries (with consumption per capita less than $60 per month) are in SSA, yet 22 of the 29 countries with consumption less than $60 per month in the set of 115 countries for which we measure poverty are in SSA. In other words, the proportion of SSA countries in the RDV sample is about half what it should be to be considered representative of poor countries. This is not such a problem for the RCS sample; as can be seen from the list of countries above used to set the $1.25 a day poverty line, 13 out of the 15 countries are in SSA; if anything this appears to slightly over-represent SSA.

This difference between the RDV and RCS samples is relevant to understanding why the RCS lines are higher at given consumption, as seen in Figure 2. National poverty lines at 1993 PPP tend to be higher in SSA than other regions at given consumption. The difference between SSA and non-SSA poverty lines amongst the reference group of countries cannot be reliably estimated given that there are so few non-SSA countries in the reference group. In other words there is very little common support at very low consumption levels. A reasonable definition of the region of common support is the 37 countries with consumption over $50 and under $250 per month at 1993 PPP. (Only one country in the sample, Mauritius, has consumption $250, and it is well above it at $426.) On regressing the poverty line at 1993 PPP on consumption per capita for the sample in the region of common support, with a dummy variable for SSA countries, one

[18] Note that this is at 1993 PPP; $1.45 in 1993 prices represents $1.96 a day at 2005 US prices.

finds that the difference between SSA and non-SSA poverty lines was $0.41 a day (with a standard error of $0.28).[19] Amongst the samples used to calculate the above poverty lines—$1.45 a day at 1993 PPP using the RCS sample versus $1.10 a day using the RDV sample—the share from SSA went from 37.5% (three countries out of eight) to 87.7% (13/15). Assuming that SSA poverty lines are $0.41 a day higher than non-SSA lines, the change in the sample would add about $0.20 per day to the poverty line—closing slightly more than half the gap between the $1.45 a day and $1.10 lines. While the precision of this estimate is clearly rather low, given the sample sizes, but it is at least suggestive that if the RDV sample had better represented African countries then the old international line would have been appreciably higher.

Implications for global poverty measures. The impact of these various data revisions on the global poverty count is theoretically ambiguous. On the one hand, the new PPPs imply that the cost-of-living is higher in developing countries, which will put upward pressure on the poverty count, but (on the other hand) the new PPPs will put downward pressure on the international poverty line. The key factor is whether the PPP revisions tend to be larger in the countries used to set the international poverty line. RCS find that this is the case. For any fixed set of national poverty lines, the poverty rates in the sub-group of the poorest countries used to set the international line will be unchanged, while the poverty rates in the less poor countries will fall, since they will have relatively higher purchasing power. The Appendix provides a complete analysis, for which the following result emerges as an interesting special case:

Proposition 1: If the international poverty line is that of the poorest country, which also has the largest upward revision to its PPP, then the aggregate poverty rate will fall.

Intuitively, given that the international line is anchored to the national lines in the poorest countries, the poverty count for those countries is roughly constant, while that for the other (less poor) developing countries tends to fall, since the PPP revisions are smaller for those countries, which translates into a lower local currency equivalent of the international line.

This result is only of expository interest, given that our international poverty line is not in fact for the poorest country but rather for the poorest 15 countries; then there is a potentially confounding effect of the differences amongst those countries. A further confounding effect is

[19] It made negligible difference if we also allow the slope parameter on consumption to be different for SSA countries and evaluate the mean difference in poverty lines at the median or mean of consumption in the region of common support; this also gave a mean difference of $0.35 (s.e.=0.22) at the median and $0.39 (0.29) at the mean. Nor did adding a squared term in consumption have much effect.

that there is (of course) a variance in the PPP revision at a given level of consumption per capita. (For example, China, is a not one of the countries used to set the international poverty line but it had one of the highest PPP revisions.) Nonetheless, Proposition 1 is suggestive that the pure effect of the PPP revisions, for a given set of national lines, will be tend to reduce the aggregate poverty count. As we will see, this is confirmed by our empirical results in section 5. Against this effect, the upward shift in the national poverty lines implied by the RCS data will tend to increase the poverty count. The balance of these effects is an empirical question.

4. Household surveys and poverty measures

We have estimated all poverty measures ourselves from the primary sample survey data rather than relying on pre-existing poverty or inequality measures. The primary data come in various forms, ranging from micro data (the most common) to specially designed grouped tabulations from the raw data, constructed following our guidelines. All our previous estimates have been updated to assure internal consistency.

We draw on 675 surveys for 115 countries; a full listing is found in Chen and Ravallion (2008b).[20] The surveys are nationally representative. Taking the most recent survey for each country, about 1.23 million households were interviewed in the surveys used for our 2005 estimate. The surveys were mostly done by governmental statistics offices as part of their routine operations. Not all available surveys were included; a survey was dropped if there were known to be serious comparability problems with the rest of the data set.[21]

Poverty measures. Following past practice, poverty is assessed using household per capita expenditure on consumption or household income per capita as measured from the national sample surveys.[22] Households are ranked by consumption (or income) per person. The distributions are weighted by household size and sample expansion factors. Thus our poverty counts give the number of people living in households with per capita consumption or income below the international poverty line.

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[20] We had data for 116 countries but Zimbabwe had to be dropped drop due to the difficulty in converting local currency to PPP due to the high inflation rate.

[21] Also, we have not used surveys for 2006 or 2007 when we already have a survey for 2005—the latest year for which we provide estimates in this paper.

[22] The use of a "per capita" normalization is standard in the literature on developing countries. This stems from the general presumption that there is rather little scope for economies of size in consumption for poor people. However, that assumption can be questioned; see Lanjouw and Ravallion (1995).

When there is a choice we use consumption in preference to income, on the grounds that consumption is likely to be the better measure of current welfare on both theoretical and practical grounds.[23] Of the 675 surveys, 417 allow us to estimate the distribution of consumption; this is true of all the surveys used in the Middle East and North Africa, South Asia and Sub-Saharan Africa, though income surveys are more common in Latin America.[24] Given that savings and credit can be used to smooth consumption from income shocks, one expects higher inequality for incomes than consumptions, for the same place and data.

The measures of consumption (or income, when consumption is unavailable) in our survey data set are reasonably comprehensive, including both cash spending and imputed values for consumption from own production. But we acknowledge that even the best consumption data need not adequately reflect certain "non-market" dimensions of welfare, such as access to certain public services, or intra-household inequalities. For these reasons, our poverty measures need to be supplemented by other data, such as on infant and child mortality, to obtain a more complete picture of how living standards are evolving.

We use standard poverty measures for which the aggregate measure is the (population-weighted) sum of individual measures. In this paper we report three such poverty measures.[25] The first measure is the headcount index given by the percentage of the population living in households with consumption or income per person below the poverty line. We also give estimates of the number of poor, as obtained by applying the estimated headcount index to the population of each region under the assumption that the countries without surveys are a random sub-sample of the region. Our third measure is the poverty gap index, which is the mean distance below the poverty line as a proportion of the line where the mean is taken over the whole population, counting the non-poor as having zero poverty gaps.

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[23] Consumption requires fewer imputations and assumptions, is likely to be reported more accurately and is arguably a better measure of current economic welfare than income. For further discussion see Ravallion (1994, 2003) and Deaton and Zaidi (2002). It has also been argued that consumption is a better welfare indicator in developed countries; see Slesnick (1998).

[24] For a few cases we do not have consumption distributions but we still have survey-based estimates of mean consumption. Then we replace the income mean by the consumption mean leaving the Lorenz curve the same (i.e., all incomes are scaled up by the ratio of the consumption mean to the income mean). There is, however, no obvious basis for adjusting the Lorenz curve.

[25] *PovcalNet* provides a wider range of measures, drawn from the literature on poverty measurement. See http://econ.worldbank.org/povcalnet.

Having converted the international poverty line at PPP to local currency in 2005 we convert it to the prices prevailing at each survey date using the country-specific official Consumer Price Index (CPI).[26] The weights in this index may or may not accord well with consumer budget shares at the poverty line. In periods of relative price shifts, this will bias our comparisons of the incidence of poverty over time, depending on the extent of (utility-compensated) substitution possibilities for people at the poverty line.

We started the series in 1981 and made estimates at three yearly intervals, up to 2005. For the 115 countries, 14 have only one survey; 17 have two surveys; 14 have three; while 70 have four or more surveys over the period, of which 23 have 10 or more surveys. If there is only one survey for a country then we estimate measures for each reference year by applying the growth rate in real private consumption per person from the NAS to the survey mean—assuming that the Lorenz curve for that country does not change.[27] This seems the best option for dealing with this problem, though there can be no guarantee that the Lorenz curve would not have shifted or that a survey-based measure of consumption would have grown at the same rate as private consumption in the NAS. For example, growth in the latter might reflect growth in the spending by non-profit organizations— which are not separated from households in the NAS for most developing countries—rather than household spending (Ravallion, 2003).

Our benchmark estimates only use the annual NAS data for interpolation purposes given the irregular spacing of surveys; Chen and Ravallion (2004, 2008b) describe our interpolation methods. However, we provide sensitivity tests to the use of a Bayesian mixed method, combining the surveys and national accounts in estimating the mean, as a means of addressing the likely heterogeneity amongst surveys; we discuss this further below.

In the aggregate, 90% of the population of the developing world is represented by surveys within two years of 2005.[28] Survey coverage by region varies from 74% of the population of the Middle East and North Africa (MENA) to 98% of the population of South Asia. Naturally, the further back we go, the fewer the number of surveys—reflecting the

[26] Note that the same poverty line is generally used for urban and rural areas. There are three exceptions, China, India and Indonesia, where we estimate poverty measures separately for urban and rural areas and use sector-specific CPIs.

[27] For a few SSA countries, private consumption per capita is missing from the World Bank's Development Data Platform; we use the series from *Africa Development Indicators* 2007.

[28] Some countries have graduated from the set of developing countries; we apply the same definition over time to avoid selection bias. In this paper our definition is anchored to 2005.

expansion in household survey data collection for developing countries since the 1980s. And coverage deteriorates in the last year or two of the series, given the lags in survey processing.

Two guides to the reliability of our estimates are to count the number of surveys by year and to measure the coverage rate. Figure 3 gives the number of surveys; we give the three-year moving average centered on each year (given that having a survey last year or next year can help greatly in estimating poverty this year). For comparison purposes, we also give the numbers of surveys used by Chen and Ravallion (2004). By this measure, our estimates around the mid 1990s onwards are clearly the most reliable while our estimate for 1981 is the least reliable. We have a cumulative total of only 18 surveys up to 1983, though the number doubles by 1985. By contrast we have a total of 480 surveys after 1993. Naturally the number of surveys drops off in the last year or so, given the lags in availability; there has been a marked improvement in the coverage of recent surveys, though this partly reflects our unwillingness to make an estimate yet for 2006 (as we still only have seven surveys for that year, at the time of writing).

Most regions are quite well covered from the latter half of the 1980s (East and South Asia being well covered from 1981 onwards).[29] Unsurprisingly, we have weak coverage in Eastern Europe and Central Asia (EECA) for the 1980s; many of these countries did not officially exist then. More worrying is the weak coverage for Sub-Saharan Africa in the 1980s; indeed, our estimates for the early 1980s rely heavily on projections based on distributions around 1990. Table 1 gives the average survey year by region for each reference year.

By comparing Table 1 with the corresponding table in Chen and Ravallion (2004) we can see how much the lags in survey data availability have fallen. Like the present paper, Chen and Ravallion (2004) reported results for a reference year that was three years prior to the time of writing (namely 2001, versus 2005). Table 2 gives the average lag by region (where zero means no lag for the latest reference year). The overall mean has fallen by one year (1.6 to 0.6 years); for East Asia (the lowest mean lag for 2001), the average lag is down to almost zero; for SSA (the highest lag in 2001), the lag has also fallen appreciably, from 4.0 to 1.5 years, and MENA is now the region with the highest mean lag.

Note that the lags in Table 2 reflect both the frequency of surveys and our access to the data. Based on our observations in assembling the data base for this study, we would conjecture

[29] China's survey data for the early 1980s are probably less reliable than later years, as discussed in Chen and Ravallion (2004) where we also describe our methods of adjusting for certain comparability problems in the China data, including changes in valuation methods.

that the large lag for MENA is due more to access to existing surveys than to the frequency of those surveys, while for SSA it is due more to infrequent production of adequate surveys.

The second indicator is the percentage of the population covered by household surveys. Table 3 gives the coverage rate by region and for each reference year; a country is defined as being covered if there was a survey (in our data base) within two years of the reference date (a five-year window). Note that our method only strictly requires one survey per country, though we have almost six surveys per country on average. Naturally, the more surveys we have for a given country the more confident we are about the estimates.

The weak coverage for EECA, MENA and SSA in the 1980s is evident in Table 3. Our estimates for these regions in the 1980s are heavily dependent on the extrapolations from NAS data. We will discuss the likely biases.

Note that there is a "hole" in coverage for South Asia in 1999. This reflects a problem in India's National Sample Survey (NSS) for 1999/2000.[30] We dropped that NSS survey round given that we now have a new survey for 2004/05 that we consider to be reasonably comparable to the round of 1993/94. We use only the 5-yearly rounds of the NSS, which have larger samples and more detailed and more comparable consumption modules (aside from the 1999/00 round). Unfortunately, this leaves a 10-year gap in our survey coverage for India; the estimates for India over the intervening period use our interpolation method. Including all available survey rounds for India adds to the variability in the series but does not change the trend.[31]

Given the lags in survey data, our estimates do not include the impacts of the recent rise in food and fuel prices and the global financial crisis (GFC). *Ex ante* projections of the welfare impacts of the rise in food prices for a set of nine low-income countries by Ivanic and Martin (2008) predict that, on balance, the rise in food prices over 2005-07 will have been poverty-increasing. Elsewhere we have argued that the same is likely of the impact of the GFC on the incidence of poverty in the developing world as a whole in 2009; in Chen and Ravallion (2009) we estimate that the GFC added about 1% point to the headcount index for $1.25 a day in 2009.

Heterogeneity in surveys. As in past work, we have tried to eliminate obvious comparability problems, either by re-estimating the consumption/income aggregates or the more

[30] Further discussion and references can be found in Datt and Ravallion (2002).

[31] If one uses the 1999/2000 survey for India one obtains a sharp fall in that year, and a subsequent rise in poverty incidence to 2005. However, this is clearly spurious, being driven by the fact that the 1999/2000 survey over-estimates level of consumption relative to other survey rounds.

radical step of dropping a survey. However, there are problems we cannot fix. It is known that surveys differ between countries, including how the questions are asked (such as recall periods), survey response rates, whether the surveys are used to measure consumption or income, and in what gets included in the survey's aggregate for consumption or income. These differences are known to matter to the statistics calculated from surveys, including poverty measures.

The literature on measuring global poverty has dealt with such survey comparability problems in two main ways. The first makes some effort to iron out such problems using the micro data, but essentially ignores the problem beyond that, in the expectation that aggregation across surveys will reduce the problem considerably. Following this method, our past estimates have applied an international poverty line, converted to local currency at PPP, to the distributions from the surveys. This follows the practice in national poverty measurement; essentially the difference is that for global poverty measures the poverty line is fixed in real terms across countries rather than being country specific. However, it is acknowledged that when applying a common line to different national surveys one will obtain different poverty measures even if the same measure would be obtained using the same survey instrument in each country.

The second approach re-scales the survey means to be consistent with the national accounts (NAS), which are assumed to be comparable and accurate. In one version of this method, Bhalla (2002) replaces the survey mean by consumption from the NAS, but keeps the survey-based distribution. (In other words, he re-scales all survey-based consumption (or income) levels by the ratio of NAS consumption to the survey mean.) Bourguignon and Morrisson (2002) and Sala-i-Martin (2006) also re-scale the mean, although they anchor their measures to GDP per capita rather than to consumption.[32]

It is claimed by the proponents of the second method that it corrects for survey miss-measurement. It is argued that NAS consumption captures things that are sometimes missing from surveys (such as imputed rents for owner-occupied housing) and that NAS methods are more standardized across countries, since all countries are supposed to follow the UN Statistical Division's *System of National Accounts* (SNA), although, in practice, compliance with SNA guidelines appears to be quite uneven across developing countries.

[32] Given the time span of their study, Bourguignon and Morrisson (2002) had no choice. Sala-i-Martin did have a choice, though computationally convenience appears to have dictated his use of national accounts data, combined with aggregate summary tabulations of the relative distribution.

Proponents of the first class of methods do not claim that the surveys are accurate, but argue that there is no justification for assuming that the discrepancy between the survey mean and NAS consumption per capita is solely due to underestimation in the surveys or that the survey measurement errors are distribution neutral. The discrepancy between the two data sources reflects a number of factors, including differences in what is being included, [33] and selective compliance in surveys. Arguments can be made for and against both methods. For example, there is also likely to be under-reporting or selective compliance with the randomized assignment in a survey, but it would seem unlikely that this would only affect the mean and not the measure of inequality; more plausibly, the underestimation of the mean by surveys due to selective compliance comes with an underestimation of the extent of inequality.[34] To give a counter-example, suppose that the surveys exclude imputed rent for owner-occupied housing (practices are uneven in how this is treated), and that this is a constant proportion of expenditure. Then the surveys get inequality right and the mean wrong.

In our case, it is also important to note that the underlying national poverty lines were calibrated to the surveys. By the most common methods of setting poverty lines, underestimation of non-food spending in the surveys will lead to an under-estimation of the poverty line, which is anchored to the spending (as measured in the surveys) of sampled households living near the food poverty line (or with food-energy intakes near the recommended norms). Correcting for under-estimation of non-food spending in surveys would then require higher poverty lines. This provides a further justification for testing robustness to a range of poverty lines.

Arguably the more important concern is the heterogeneity of surveys given that the level of the poverty line is always somewhat arbitrary. In an interesting variation on the re-scaling method, Karshenas (2003, 2004) replaces the survey mean by its predicted value from a regression on consumption per capita from the NAS. So instead of using NAS consumption, Karshenas uses a stable linear function of NAS consumption, with mean equal to the overall mean of the survey means. As in Bhalla's method, this assumes that national accounts

[33] For example, NAS private consumption includes imputed rents for owner-occupied housing, imputed services from financial intermediaries and the expenditures of non-profit organizations; none of these are included in consumption aggregates from standard household surveys. Surveys, on the other hand, are undoubtedly better at picking up consumption from informal-sector activities. For further discussion see Ravallion (2003) and Deaton (2005).

[34] Korinek et al. (2006) examine the implications of selective compliance and Korinek et al (2007) provide an econometric method for correcting survey data for this problem.

consumption data are comparable and ignores the country-specific information on the levels in surveys. As noted above, that is a questionable assumption. However, unlike all the other examples of this second class of methods, Karshenas assumes that the surveys are correct on average and focuses instead on the problem of survey comparability, for which purpose the poverty measures are anchored to the national accounts data.

Where we depart from the Karshenas method is that we do not ignore the country-specific survey means. When one has two measures of roughly the same thing, but neither is ideal, it is natural to combine the two measures. For almost all developing countries, surveys are less frequent and more recent than NAS data. It is natural then to think of the NAS consumption series as being the basis for setting a Bayesian prior for average consumption, while treating the survey as new, posterior, data. But how should we combine the two in a mixed-method? A result from Bayesian statistics provides an interpretation of a mixing parameter under the assumption that consumption is log normally distributed with a common variance in the prior distribution as in the new survey data. In particular, the Appendix proves the following claim:

> *Proposition 2: Suppose that the prior is the expected value of the survey mean, conditional on national accounts consumption, and consumption is log normally distributed with a common variance. Then the posterior estimate is the geometric mean of the survey mean and its expected value. Over time, the relevant growth rate is the arithmetic mean of the growth rates from the two data sources.*

These assumptions can certainly be questioned. As noted, it is unlikely that the prior based on the NAS would have the same relative distribution as the survey. However, this proposition does at least offer a clear foundation for a sensitivity test, given the likely heterogeneity in surveys.

5. Benchmark estimates

We report aggregate results over 1981-2005 for the regions of the developing world and (given their populations) China and India. Jointly with this paper, we have updated the website *PovcalNet* to provide public access to the underlying country-level data set, so that users to replicate these results and try different assumptions, including different poverty measures, poverty lines and country groupings, including deriving estimates for individual countries.[35]

[35] See http://econ.worldbank.org/povcalnet. The process of updating the *PovcalNet* web site to incorporate the 2005 PPPs will be complete by September 16 2008.

Aggregate measures. The top row of Table 4, panel (a), reproduces our past estimates (from Chen and Ravallion, 2007) of the aggregate headcount indices using the $1.08 line at 1993 PPP for 1981-2005 at three-year intervals.[36] We then give our new estimates for the same reference years using the 2005 PPPs and for the range of lines from $1.00 to $2.50 in 2005 prices. Table 5 gives the corresponding counts of the number of poor. We calculate the global aggregates under the assumption that the countries without surveys have the poverty rate of their region. The bulk of the following discussion will focus on the $1.25 line, though we test the robustness of our qualitative poverty comparisons to that choice.

Our new global poverty count is appreciable higher than our past estimates suggested. Both the $1.25 and $1.45 lines indicate a substantially higher poverty count in 2005 than obtained using our old $1.08 line in 1993 prices; 1.7 billion people are found to live below the $1.45 line, and 1.4 billion live below the $1.25 line. Focusing on the $1.25 line, we find that 25% of the developing world's population in 2005 is poor, versus 17% using the old line at 1993 PPP—representing an extra 400 million people living in poverty.[37]

It is notable that the conclusion that the global poverty count has risen is also confirmed if one does not update the old 1993 poverty line. Using the $1.08 line for 2005 one obtains an aggregate poverty rate of 19% (1026 million people) for 2005. The 2005 line that gives the same headcount index for 2005 as the $1.08 line at 1993 PPP turns out to lower, at $1.03 a day. While the adjustment for US inflation clearly gives a poverty line for 2005 that is "too high," the 2005 line must exceed the 1993 line to have comparable purchasing power. So the qualitative result that the new ICP round implies a higher global poverty count is robust.

Holding constant the real value in the US of the 1993 poverty line of $1.08 per day, but revising the PPPs, the poverty rate for the developing world in 2005 rises from 17% to 32% (the latter figure corresponds to the $1.45 line). However, this does not allow for the fact that the same PPP revisions mean that the $US value of the poverty line at PPP was also overestimated. This effect brings the poverty rate down from 32% to 25%, giving the net increase of 8% points.

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[36] We have updated the 2004 estimate in Chen and Ravallion (2007) to 2005 consistently with the data sued in that paper.

[37] Note that the difference between the 25% and 17% numbers reflects other updates to the data base, besides the new PPPs. When we use the new data base for 2005 to estimate the poverty rate based on the 1993 PPPs we get a slightly higher figure, namely 17.6% (957.4 million people).

The pure PPP effect on the poverty count can only be properly isolated by using the same set of national poverty lines. For this purpose, we need to focus instead on the $1.45 a day line at 1993 PPP, rather than the $1.08 line, which was based on the old RDV compilation of poverty lines. (Recall that, using the new RCS data set on national poverty lines, the mean for the poorest 15 countries is $1.45 a day at 1993 PPP.) The 2005 poverty rate using this line, and the 1993 PPPs, is 29.0%. Thus the pure effect of the PPP revisions is to bring the poverty rate down from 29% to 25%. Following the discussion in section 3, the fact that the PPP revisions on their own bring down the overall poverty count is not surprising, given that the poverty line is set at the mean of lines for the poorest countries and that the proportionate revisions to the PPPs tend to be greater for poorer countries. Working against this downward effect of the new PPPs, there is an upward adjustment to the overall poverty count coming from the new data on national poverty lines, which (as we have seen) tend to be higher for the poorest countries than those used by RDV for the 1980s. The updating of the data on national poverty lines moved the global poverty rate from 17% to 29%, while the PPP revisions brought it back down to 25%.

Over the 25 year period, we find that the percentage of the population of the developing world living below $1.25 per day was halved, falling from 52% to 25%. (Expressed as a proportion of the population of the world, the decline is from 42% to 21%; this assumes that there is nobody living below $1.25 per day in the developed countries.[38]) The number of poor fell by slightly over 500 million, from 1.9 billion to 1.4 billion over 1981-2005 (Table 5). The trend rate of decline in the $1.25 a day poverty rate over 1981-2005 was 1% point per year; regressing the poverty rate on time the estimated trend is -0.99% per year with a standard error of 0.06% (R^2=0.97). This is slightly higher than the trend we had obtained using the 1993 PPPs, which was -0.83% per year (standard error=0.11%). Simply projecting this trend forward to 2015, the estimated headcount index for that year is 16.6% (standard error of 1.5%).

Given that the 1990 poverty rate was 41.6%, the new estimates indicate that the developing world as a whole is on track to achieving the Millennium Development Goal (MDG) of halving the 1990 poverty rate by 2015. The 1% point per year rate of decline in the poverty rate also holds if one focuses on the period since 1990 (not just because this is the base year for the MDG but also recalling that the data for the 1980s is weaker). The $1.25 poverty rate fell

[38] The population of the developing world in 2005 was 5453 million, representing 84.4% of the world's total population; in 1981, it was 3663 million or 81.3% of the total.

10% points in the 10 years of the 1980s (from 52% to 42%), and a further 17% points in the 16 years from 1990 to 2005.

It is notable that 2002-05 suggests a higher (absolute and proportionate) drop in the poverty rate than other periods. Given that lags in survey data availability mean that our 2005 estimate is more heavily dependent on non-survey data (notably the extrapolations based on NAS consumption growth rates) there is a concern that this might be exaggerated. However, that does not seem likely. The bulk of the decline is in fact driven by countries for which survey data are available close to 2005. The region for which non-survey data have played the biggest role for 2005 is Sub-Saharan Africa. If instead we assume that there was in fact no decline in the poverty rate over 2002-05 in SSA then the total headcount index (for all developing countries) for the $1.25 line in 2005 is 26.2%—still suggesting a sizeable decline relative to 2002.

China's success against absolute poverty has clearly played a major role in this overall progress. Panel (b) in Tables 4 and 5 repeats the calculations excluding China. The $1.25 a day poverty rate falls from 40% to 28% over 1981-2005, with a rate of decline that is less than half the trend including China; the regression estimate of the trend falls to -0.43% per year (standard error of 0.03%; R^2=0.96), which is almost identical to the rate of decline for the non-China developing world that we had obtained using the 1993 PPPs (which gave a trend of -0.44% per year, standard error=0.01%). Based on our new estimates, the projected value for 2015 is 25.1% (standard error=0.8%), which is well over half the 1990 value of 35% (Table 4). So the developing world outside China is <u>not</u> on track to reaching the MDG for poverty reduction.

Our estimates suggest less progress (in absolute and proportionate terms) in getting above the $2 per day line than the $1.25 line. The poverty rate by this higher standard has fallen from 70% in 1981 to 47% in 2005 (Table 4). The trend is about 0.8% per year (a regression coefficient on time of -0.84; standard error=0.08); excluding China, the trend is only 0.3% per year (a regression coefficient of -0.26; standard error=0.05%). This has not been sufficient to bring down the number of people living below $2 per day, which was about 2.5 billion in both 1981 and 2005 (Table 5). Thus the number of people living <u>between</u> $1.25 and $2 a day has risen sharply over these 25 years, from about 600 million to 1.2 billion. This marked "bunching up" of people just above the $1.25 line suggests that the poverty rate according to that line could rise sharply with aggregate economic contraction (including real contraction due to higher prices).

The qualitative conclusion that poverty measures have fallen over the period as a whole, and between 1990 and 2005, are robust to the choice of poverty line over a wide range (and robust to the choice of poverty measure within a broad class of measures).[39] Figure 4 gives the cumulative distribution functions up to $13 per day, which is the average official poverty line in the US in 2005. First order dominance is indicated. In 2005, 95.7% of the population of the developing world lived below the US poverty line; 25 years earlier it was 96.7%.

Regional differences. Table 6 gives the estimates over 1981-2005 for four lines, $1.00, $1.25, $2.00 and $2.50. There have been notable changes in regional poverty rankings over this period. Looking back to 1981, East Asia had the highest incidence of poverty, with 78% of the population living below $1.25 per day and 93% below the $2 line. South Asia had the next highest poverty rate, followed by SSA, LAC, MENA and lastly, EECA. Twenty years later, SSA had swapped places with East Asia where the $1.25 headcount index had fallen to 17%, with South Asia staying in second place. EECA had overtaken MENA. The regional rankings are not robust to the poverty line. Two changes are notable. At lower lines (under $2 per day) SSA has the highest incidence of poverty, but this switches to South Asia at higher lines. (Intuitively, this difference reflects the higher inequality found in Africa than South Asia.) Second, MENA's poverty rate exceeds LAC's at $2 or higher, but the ranking reverses at lower lines.

The composition of world poverty has changed noticeably over time. The number of poor has fallen sharply in East Asia, but risen elsewhere. For East Asia, the MDG of halving the 1990 "$1 per day" poverty rate by 2015 was already reached a little after 2002. Again, China's progress against absolute poverty was a key factor; looking back to 1981, China's incidence of poverty (measured by the percentage below $1.25 per day) was roughly twice that for the rest of the developing world; by the mid-1990s, the Chinese poverty rate had fallen well below average. There were over 600 million fewer people living under $1.25 per day in China in 2005 than 25 years earlier. Progress was uneven over time, with setbacks in some periods (the late 1980s) and more rapid progress in others (the early 1980s and mid 1990s); Ravallion and Chen (2007) identify a number of factors (including policies) that account for this uneven progress against poverty over time (and space) in China.

[39] First order dominance up to a poverty line of Z^{max} implies that all standard (additively separable) poverty measures rank the distributions identically for all poverty lines up to Z^{max}; see Atkinson (1987).

Over 1981-2005, the $1.25 poverty rate in South Asia fell from almost 60% to 40%, which was not sufficient to bring down the number of poor (Table 7). If the trend over this period in South Asia were to continue until 2015 the poverty rate would fall to 32.5% (standard error=1.2%), which is more than half its 1990 value. So South Asia is not on track to attaining the MDG without a higher trend rate of poverty reduction. Note, however, this conclusion is not robust to the choice of the poverty line. If instead we use a lower line of $1.00 per day at 2005 prices then the poverty rate would fall to 15.7% (standard error=1.3%) by 2015, which is less than half the 1990 value of 34.0%. Not surprisingly (given its population weight), the same observations hold for India, which is not on track for attaining the MDG using the $1.25 line but is on track using the $1.00 line (which is also closer to the national poverty line in India).[40]

The extent of the "bunching up" that has occurred between $1.25 and $2 per day is particularly striking in both East and South Asia, where we find a total of about 900 million people living between these two lines, roughly equally split between the two sides of Asia. While this points again to the vulnerability of the poor, by the same token it also suggests that substantial further impacts on poverty can be expected from economic growth, provided that it does not come with substantially higher inequality.

We find a trend declining in the poverty rate in LAC, by both lines, but not sufficient to reduce the count of the number of poor over the 1981-2005 period as a whole, though with more encouraging signs of progress since 1999. The MENA region has experienced a fairly steady decline in the poverty rate, though (again) not sufficient to avoid a rising count in the number of poor in that region.

We find a generally rising poverty in EECA using the lower lines ($1.00 and $1.25 a day) though there are very people are poor by this standard in EECA. The $2.50 a day line is more representative of the poverty lines found in the relatively poorer countries of EECA. By this standard, the poverty rate in EECA has shown little clear trend over time in either direction, though there are encouraging signs of a decline in poverty since the late 1990s. The paucity of survey data for EECA in the 1980s should also be recalled. Thus our estimates are heavily based on extrapolations, which do not allow for any changes in distribution. One would expect that

[40] The corresponding poverty rates for the $1.00 line in India are 42.1 (1981), 37.6, 35.7, 33.3, 31.1, 28.6, 27.0, 26.3, 24.3 (2005).

distribution was better from the point of view of the poor in EECA in the 1980s, in which case poverty would have been even lower than we estimate—and the increase over time even larger.

The incidence of poverty in Sub-Saharan Africa is virtually unchanged at slightly over 50% in both 1981 and 2005. Within this period, there was an increase until the mid 1990s, and there has been an encouraging downward trend since then. The number of poor by our new $1.25 a day standard has almost doubled in SSA over 1981-2005, from 214 million to over 390 million. The share of the world's poor by this measure living in Africa has risen from 11% in 1981 to 28% in 2005. The trend increase in SSA's share of poverty is 0.67% points per year (standard error=0.04% points), implying that one third of the world's poor will live in this region by 2015 (more precisely, the projected poverty rate for that year is 33.7%, with a standard error of 0.8%). However, there are signs of progress since the mid-1990s. The $1.25 a day poverty rate for SSA fell from 59% in 1996 to 51% in 2005. The decline is proportionately higher the lower the poverty line; for the $1 a day line, the poverty rate in 2005 is 16% lower than its 1996 value.

Poverty gaps. Table 8 gives the PG indices for $1.25 and $2.00 a day. The aggregate PG for 2005 is 7.6% for the $1.25 line and 18.6% for the $2 line. To put these in perspective, the GDP per capita of the developing world was $11.30 per day in 2005 (at 2005 PPP). The aggregate poverty gap for the $1.25 line is 0.84% of GDP, while it is 3.29% for the $2 line. World (including the OECD countries) GDP per capita was $24.58 per day, implying that the global aggregate PG was 0.33% of global GDP using the $1.25 line and 1.28% using $2.[41]

Comparing Tables 6 and 8, it can be seen that the regional rankings in terms of the poverty gap index are similar as those for the headcount index, and the changes over time follow similar patterns. What the PG measures do is magnify the inter-regional differences seen in the headcount indices. The most striking feature of the results in Table 6 is the depth of poverty in Africa, with a $1.25 per day poverty gap index of almost 21%—roughly twice the next poorest region by this measure (South Asia). For the $1.25 line, Africa's aggregate poverty gap represents 3.2% of the region's GDP; for the $2 line it is 9.0%.[42]

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[41] This assumes that nobody lives below our international poverty line in the OECD countries. Under this assumption, the aggregate poverty gap as a % of global GDP is $PG.(Z/\overline{Y}).(N/NW)$ where *PG* is the poverty gap index (in %), *Z* is the poverty line, $\overline{Y}$ is global GDP per capita, *N* is the population of the developing world and *NW* is world population.

[42] The GDP per capita of SSA in 2005, at 2005 PPP, was $8.13 per day.

Table 9 gives the mean consumption of the poor.[43] For 2005, those living below the $1.25 a day line had a mean consumption of $0.87 (about 3.5% of global GDP per capita). The overall mean consumption of the poor tended to rise over time, from $0.74 per day in 1981 to $0.87 in 2005 by the $1.25 line, and from $0.94 to $1.21 for the $2 line. Poverty has become shallower in the world as a whole.

The mean consumption of Africa's poor is not only lower than for other regions, it has shown very little increase over time (Table 8). The mean consumption of those living under $1.25 per day in SSA was $0.72 per person per day in 1981 and was almost unchanged at $0.73 in 2005. For the $2 line, the mean consumption of Africa's poor remained roughly constant. The same persistence in the depth of poverty is evident in MENA and LAC, though the poor have slightly higher average levels of living in both regions. The mean consumption of EECA's poor has actually fallen since the 1990s, even though the overall poverty rate was falling.

6. Sensitivity to methodological choices

We have already seen how much impact the choice of poverty line makes, though we have also seen that the qualitative comparisons as over time are robust to the choice of line. In this section we consider sensitivity to two further aspects of our methodology: the first is our use of the PPP for aggregate household consumption and the second is our reliance on surveys for measuring average living standards.

Alternative PPPs. The benchmark analysis has relied solely on the individual consumption PPPs ("P3s") from the ICP. One deficiency of these PPPs is that they are designed for national accounting purposes not poverty measurement. Deaton and Dupriez (DD) (2009) have estimated "PPPs for the poor" (P4s) for a subset of countries with the required data.[44] Constructing P4s requires re-weighting the prices to accord with consumption patterns of those living near the poverty line. Notice that there is a simultaneity in this problem, in that one cannot do the re-weighting until one knows the poverty line, which requires the re-weighted PPPs.

[43] The mean consumption of the poor is $(1-PG/H)Z$ where PG is the poverty gap index, H is the headcount index and Z is the poverty line.

[44] The Asian Development Bank (2008) has taken a further step of implementing special price surveys for Asian countries to collect prices on explicitly lower qualities of selected items than those identified in the standard ICP. Using lower quality goods essentially entails lowering the poverty line. In terms of the impact on the poverty counts for Asia in 2005, the ADB's method is equivalent to using a poverty line of about $1.20 a day by our methods; this calculation is based on a log linear interpolation between the relevant poverty lines.

Deaton and Dupriez (2009) implement an iterative solution to derive internally consistent P4s.[45] They do this for three price index methods, namely the Country Product Dummy (CPD) method and both Fisher and Törnqvist versions of the EKS method used by the ICP.

The Deaton-Dupriez P4s cannot be calculated for all countries and they cannot cover the same consumption space as the P3s from the ICP. The limitation on country coverage stems from the fact that P4s require suitable household surveys, namely micro data from consumption expenditure surveys that can be mapped into the ICP "basic heading" categories for prices; the DD P4s are available for 60 countries, which is about half of our sample. The 60-country sample is clearly not representative of the developing world as a whole and in some specific regions, notably EECA where the population share covered by surveys in the 60-country sample is only 8%, while overall coverage rate is 79%. As we will see, the 60-country sample is poorer, in terms of the aggregate (population-weighted) poverty count. Also, some of the 110 basic headings for consumption in the ICP were dropped by DD in calculating their P4s. These included expenditures made on behalf of households by governments and non-governmental organizations (such as on education and health care). Given that such expenditures are not included in household surveys they cannot be included in DD's P4s. DD also preferred to exclude housing rentals from their calculations on the grounds that this was hard to measure and that different practices for imputing rental for owner-occupied housing had been used by the official ICP in different countries. There are other (seemingly more minor) differences in how DD calculated their P4s and the methods used by the ICP.

Using the P4s at country level kindly provided by Deaton and Dupriez, we have re-calculated our global poverty measures. In all cases we recalculate the international poverty line under the new PPPs, as well as (of course) the poverty measures. Table 10 gives the results by region for 2005, while Figure 5 plots the estimates by year. In both cases we give our benchmark estimates for the official ICP PPP for consumption using all 110 basic headings for consumption and results for the 102 basic headings comprising those that can be matched to surveys less the extra few categories that DD chose not to include. Since the 60 countries used by DD did not include one of the 15 countries in our reference group, the poverty line is recalculated for 14

[45] In general there is no guarantee that there is a unique solution for this method, although DD provide a seemingly plausible restriction on the Engel curves that assure uniqueness. They also use an exact, one-step solution, for the Törnqvist index under a specific parametric Engel curve.

countries, giving a line of $1.23 a day ($37.41 per month). With the help of the World Bank's ICP team we also recalculated the official P3s for consumption using the set of basic headings chosen by DD. Column (1) reproduces the estimates from Table 6, while the column (2) gives the corresponding estimates for the full sample of countries using P3s calibrated to the 102 basic headings used by DD. Columns (3) and (4) gives the corresponding results to (1) and (2) using the 60 country sub-sample used by DD. Columns (5)-(7) given our estimates of the poverty measures using the P4s from DD, for each of their three methods. We give (population-weighted) aggregate results for the sample countries.[46]

It can be seen from Table 10 that the switch from 110 to 102 basic headings reduces the aggregate poverty measures by about three percentage points, while switching from the 115 country sample to the 60 country sample has the opposite effect, adding three points. The pure effect of switching from P3 to P4 is indicated by comparing column (4) with columns (5)-(7). This change has only a small impact using the EKS method (for either the Fischer or Törnqvist indices) though it has a slightly larger effect using the CPD method.

On balance, the aggregate poverty count turns out to be quite similar between the P4s and our main estimates using standard P3s on the full sample. If one assumes that the countries without household surveys have the regional average poverty rate then the Fisher P4 gives a count of 1402 million for the number of poor, while the CPD and Törnqvist P4s give counts of 1454 and 1359 respectively, as compared to 1377 million using standard P3s. The regional profile is also fairly robust, the main difference being lower poverty rates in EECA using P4s, although the poor representation of EECA countries in the 60-country sample sued by DD is clearly playing a role here. The reduction in coverage of consumption items makes a bigger difference, with a higher poverty count in the aggregate (28% for these 60 countries using the standard PPP, versus 25% using the PPP excluding housing), due mainly to higher poverty rates in East and South Asia when all 110 basic headings for consumption are included.

The trends over time are also very similar (Figure 5). This is not surprising given that, following the usual practice of doing the PPP conversion at only the benchmark year and then using national data sources over time, the real growth rates and distributions at country level are unaffected.

[46] Note that this is a slightly different aggregation method to our earlier results, which assumed that the sample was representative at regional level. That is clearly not plausible for the 60-country sample used by DD. We have re-calculated the aggregates for the 115 country sample under the same basis as for the 60-country sample.

Mixing national accounts and surveys. Next we test sensitivity to using instead the geometric mean of the survey mean and its expected value given NAS consumption; as noted in section 4, this can be given a Bayesian interpretation. Table 11 gives the estimates implied by the geometric mean; in all other respects we follow the benchmark methodology. The expected value was formed by a separate regression at each reference year; a very good fit was obtained using a log-log specification (adding squared and cubed values of tke log of NAS consumption per capita did little or nothing to increase the adjusted R^2).

In the aggregate for most years, and most regions, the level of poverty is lower using the mixed method than the survey-means only method. In the aggregate the 2005 poverty rate is 18.6% (1017 million people) using the geometric mean versus 25.2% (1374 million) using unadjusted survey means. Nonetheless, the mixed method still gives a higher poverty rate for 2005 than implied by the 1993 PPPs. Using the $2.00 line, the 2005 poverty rate falls from 47.0% to 41.0%.

Figure 6 compares the aggregate headcount indices for $1.25 a day between the benchmark and mixed method. The trend rate of poverty reduction is almost identical between the two, at about 1% point per year. (Using the mixed method, the OLS trend is -0.98% points per year, with a standard error of 0.04%, versus -0.99% with a standard error of 0.06% using only the survey means.) The linear projection to 2015 implies a poverty rate of 9.95% (s.e.=1.02%), less than one third of its 1990 value.

The mixed method gives a higher poverty rate for LAC and MENA and makes negligible difference for SSA. Other regions see a lower poverty rate. The $1.25 a day poverty rate for East Asia in 2005 falls from 17% to 12%. The largest change is for South Asia, where by 2005 the poverty rate for India falls to about 20% using the mixed method versus 42% using the unadjusted survey means; the proportionate gap was considerable lower in 1981 (42% using the mixed method versus 60% using the survey mean alone).

India accounts for a large share of the discrepancies between the levels of poverty between the benchmark and the mixed method, reflecting both the country's population weight and the large gap that has emerged in recent times between the NSS and NAS consumption aggregates for India (Ravallion, 2003). Figure 6 also gives the complete series for $1.25 a day excluding India; it can be seen that the gap between the two methods narrows over time. If we focus on the poverty rates for the developing world excluding India then the difference between

the mixed method and the benchmark narrows considerably, from 21.1% (918 million people) to 18.2% (794 million) in 2005. (The $2.00 poverty rates are 39.8% and 36.7% respectively.) In 2005, about two-thirds of the drop in the count of the number of people living under $1.25 a day in moving from the benchmark to the mixed method is due to India.

7. Conclusions

Global poverty measurement combines data from virtually all branches of the statistical system. The measures reported here bring together national poverty lines, household surveys, census data, national accounts and both national and international price data. Inevitably there are comparability and consistency problems when combining data from such diverse sources. Price indices for cross-country comparisons do not always accord well with those used for inter-temporal comparisons within countries. In some countries, the surveys give a different picture of average living standards to the national accounts, and the methods used in both surveys and national accounts differ across countries.

However, thanks to the efforts and support of governmental statistics offices and international agencies, and improved technologies, the available data on the three key ingredients in international poverty measurement—national poverty lines, representative samples of household consumption expenditures (or incomes) and data on prices—have improved greatly since global poverty monitoring began. The expansion of country-level poverty assessments since the early 1990s has greatly increased the data available on national poverty lines. Side-by-side with this, the country coverage of credible household survey data, suitable for measuring poverty, has improved markedly, the frequency of data has increased, public access to these data has improved, and the lags in data availability have been reduced appreciably. And with the substantial global effort that went into the 2005 *International Comparison Program* we are also in a better position to assure that the poverty lines used in different countries have similar purchasing power, so that two people living in different countries but with the same real standard of living are treated the same way. The results of the 2005 ICP imply a higher cost of living in developing countries than past ICP data have indicated; the “Penn effect” is still evident, but it has been over-stated.

We have combined the new data on prices from the 2005 ICP and household surveys with a new compilation of national poverty lines, which substantially updates the old lines for the

1980s previously used for the "$1-a-day" global poverty counts. Importantly, the new compilation of national lines is more representative of low-income countries, given that the sample size is larger and it corrects the sample biases in the old data set. The pure effect of the PPP revisions is to bring the poverty count down but this is outweighed by the higher level of the national poverty lines in the poorest countries, as used to determine the international line.

Our new calculations using the 2005 ICP and new international poverty line of $1.25 a day imply that 25% of the population of the developing world, 1.4 billion people, were poor in 2005, which is 400 million more for that year 2005 than implied by our old international poverty line based on national lines for the 1980s and the 1993 ICP. In China alone, which had not previously participated officially in the ICP, the new PPP implies that an extra 10% of the population is living below our international poverty line. But the impact is not confined to China; there are upward revisions to our past estimates for all regions, consistent with the higher cost of living in developing countries implied by the results of the 2005 ICP. The higher global count is in no small measure the result of correcting the sample bias in the original compilation of national poverty lines used to set the old "$1-a-day" line.

Although there are a number of data and methodological issues that caution comparisons across different sets of PPPs, it is notable that our poverty count for 2005 is quite robust to using alternative PPPs anchored to the consumption patterns of those living near the poverty line. Of course, different methods of determining the international poverty line give different poverty counts. If we use a line of $1.00 a day at 2005 PPP (almost exactly India's official poverty line) then we get a poverty rate of 16%—slightly under 900 million people—while if we use the median poverty line for all developing countries in our poverty-line sample, namely $2.00 a day, then the poverty rate rises to 50%, slightly more than two billion people.

There is greater somewhat greater sensitivity to mixing national accounts consumption with survey means. We have proposed a simple Bayesian mixed method, in which the survey mean is replaced by the geometric mean of the survey mean and its predicted value based on prior national accounts data. This is only justified under certain assumptions, notably that consumption is identically log-normally distributed between the (national-accounts-based) prior and the surveys. These assumptions can be questioned, but they do at least provide a clear basis for an alternative hybrid estimator. This gives a lower poverty count for 2005, namely 19% living below $1.25 a day rather than 25%. A large share of this gap—two thirds of the drop in

the count of the number of poor in switching to the mixed method—is due to India's (unusually large) discrepancy between consumption measured in the national accounts and that measured by surveys. Explaining this gap should be a high priority.

While the new data suggest that the developing world is poorer than we thought, it has been no less successful in reducing the incidence of absolute poverty since the early 1980s. Indeed, the overall rate of progress against poverty is fairly similar to past estimates and robust to our various changes in methodology. The trend rate of global poverty reduction of 1% point per year turns out to be slightly higher than we had estimated previously, due mainly to the higher weight on China's remarkable pace of poverty reduction. The trend is even higher if we use our Bayesian mixed-method. The developing world as a whole is clearly still on track to attaining the first Millennium Development Goal of halving the 1990s "extreme poverty" rate by 2015. China attained the MDG early in the millennium, almost 15 years ahead of the target date.

However, the developing world outside China will not attain the MDG without a higher rate of poverty reduction than we have seen over 1981-2005. The persistently high incidence and depth of poverty in Sub-Saharan Africa are particularly notable. There are encouraging signs of progress in this region since the late 1990s, although lags in survey data availability and problems of comparability and coverage leave us unsure about how robust this will prove to be.

The marked "bunching up" in the global distribution of consumption just above our international poverty line is also notable. There are a great many people who have reached the frugal $1.25 standard, but are still very poor, and clearly vulnerable to downside shocks. Two such shocks have been experienced since 2005. The first is the steep rise in international food and fuel prices and the second is the global financial crisis that emerged in late 2008. Despite the progress in reducing the lags in survey data availability, it will probably not be until 2010 that we can make a reasonably confident assessment of the *ex post* impacts of these events on the world's poor. Until then, *ex ante* assessments will be required, based on pre-crisis data and economic assumptions. Such assessments suggest that at least a few years of the progress reported here have been eroded since 2005.

Appendix

Proof of Proposition 1: Let $H_i = F_i(Z_i)$ denote the poverty rate (headcount index) in country *i*, with distribution function F_i, $Z_i = Z.PPP_i$ is the international poverty line in local currency units (LCU) while *Z* is the international line in $PPP and the PPP rate is PPP_i. The aggregate poverty rate is

$$H = \sum_{i=1}^{N} n_i F_i(Z.PPP_i) \tag{1}$$

where n_i is the population share of country *i*. It is convenient to rank countries by consumption per capita, so that *i*=1 is the poorest. The proportionate impact of the PPP revisions on the aggregate poverty rate can be written as:

$$d\ln H = \sum_{i=1}^{N} s_i \eta_i (d\ln PPP_i + d\ln Z) \tag{2}$$

where $s_i = n_i H_i / H$ is the poverty share of country *i* and $\eta_i = \partial \ln H_i / \partial \ln Z_i$ is the elasticity of the distribution function at the poverty line. The international poverty line can be represented as a (non-negatively) weighted mean of the national poverty lines:

$$Z = \sum_{i=1}^{N} w_i Z_i^{LCU} / PPP_i \tag{3}$$

The national poverty lines in LCU are data and so can be treated as fixed. Thus:

$$d\ln Z = -\sum_{i=1}^{N} w_i v_i d\ln PPP_i \tag{4}$$

where $v_i \equiv (Z_i^{LCU} / PPP_i) / Z$. Thus we can re-write (2) as:

$$d\ln H = \sum_{i=1}^{N} s_i \eta_i (d\ln PPP_i - \gamma) \tag{5}$$

where

$$\gamma \equiv \sum_{i=1}^{N} w_i v_i d\ln PPP_i$$

The sign of (5) is ambiguous based on the assumptions so far. Consider the special case in Proposition 1, whereby: (i) the international poverty line is that of the poorest country ($w_1 = 1, w_{i\neq 1} = 0$ implying that $v_1 = 1$ and hence $\gamma \equiv d\ln PPP_1$); (ii) the PPP revision is largest for the poorest country ($d\ln PPP_1 > d\ln PPP_{i\neq 1}$). Then Proposition 1 follows immediately.

Proof of Proposition 2: Let the prior estimate of the mean be denoted by M_{0i}, and assume that this is combined with new information from the survey, with mean M_i, to obtain a posterior

estimate of the mean, M_i^*. Let m_{0i} denote the mean of the prior distribution of the logs of M_{0i}, with variance σ_{0i}^2. The survey entails taking a random sample of n_i households, and the mean of this sample distribution of log consumption is m_i with variance σ_{mi}^2. It can then be shown that the mean of the posterior distribution is:[47]

$$m_i^* = \alpha_i m_{0i} + (1-\alpha_i)m_i \text{ where } \alpha_i = \frac{(\sigma_{0i}^2)^{-1}}{(\sigma_{0i}^2)^{-1} + (\sigma_{mi}^2 / n_i)^{-1}} \quad (6)$$

(The variance of the posterior distribution is $[(\sigma_{0i}^2)^{-1} + (\sigma_{mi}^2 / n)^{-1}]^{-1}$.) The mixing parameter can then be interpreted as the relative precision of the prior relative to the survey data. Next note that $\ln M_{0i} = m_{0i} + I_{0i}$, where I_{0i} is the mean log deviation measure of inequality (a member of the Generalized Entropy calls of inequality measures), and (similarly) $\ln M_i = m_i + I_{mi}$ and $\ln M_i^* = m_i^* + I_i^*$ in obvious notation.[48] One can then derive:

$$\ln M_i^* = \alpha_i \ln M_{0i} + (1-\alpha_i)\ln M_i + \nu_i \quad (7)$$

where

$$\nu_i = I_i^* - [\alpha_i I_{0i} + (1-\alpha_i)I_{mi}] \quad (8)$$

Under the assumption that the distribution of relative consumptions is identical in the prior and survey distribution we have $\sigma_{0i}^2 = \sigma_{mi}^2 / n$, implying that $\alpha_i = 0.5$, and $I_{0i} = I_{mi} = I_i^*$, implying $\nu_i = 0$. Then:

$$\ln M_i^* = (\ln M_{0i} + \ln M_i)/2 \quad (9)$$

i.e., M_i^* is the geometric mean of M_{0i} and M_i as claimed in Proposition 2.

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47 For a proof of this result see, for example, Theil (1971, pp. 665-667).

48 Note that m_{0i} and m_i are the means of the log, not log of the means.

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Table 1: Average date of the surveys used for each reference year

	Average date of the surveys used for each reference year								
Region	1981	1984	1987	1990	1993	1996	1999	2002	2005
East Asia-Pacific (EAP)	1982.2	1984.5	1987.3	1990.2	1993.0	1996.1	1999.0	2002.0	2004.9
Of which China	1981.0	1984.0	1987.0	1990.0	1993.0	1996.0	1999.0	2002.0	2005.0
Eastern Europe and Central Asia (EECA)	1988.3	1988.3	1988.5	1990.5	1993.3	1996.1	1999.0	2001.7	2004.3
Latin America and Caribbean (LAC)	1983.6	1984.1	1987.4	1990.6	1993.2	1996.1	1999.0	2002.0	2004.6
Middle East and North Africa (MENA)	1987.8	1987.8	1988.5	1990.1	1993.2	1995.8	1998.4	2000.8	2003.4
South Asia (SA)	1981.9	1983.5	1987.5	1990.2	1993.4	1996.0	1999.0	2001.9	2004.5
Of which India	1981.0	1983.0	1987.5	1990.0	1993.5	1996.0	1999.0	2002.0	2004.5
Sub-Saharan Africa (SSA)	1989.8	1991.3	1992.0	1993.3	1994.9	1997.3	1999.8	2002.1	2003.5
Total	**1984.1**	**1985.6**	**1988.1**	**1990.6**	**1993.4**	**1996.2**	**1999.1**	**2001.9**	**2004.4**

Table 2: Average lag in survey data availability for the latest reference year by region

Region	2001 (Chen and Ravallion, 2004)	2005 (Present paper)
East Asia	0.6	0.1
Eastern Europe and Central Asia	1.3	0.7
Latin America and Caribbean	0.9	0.4
Middle East and North Africa	2.2	1.6
South Asia	1.6	0.5
Sub-Saharan Africa	4.0	1.5
Total	**1.6**	**0.6**

Table 3: Proportion of the population represented by household surveys within two years

Coverage rate: % of pop. represented by a survey two years either side of each year									
Region	1981	1984	1987	1990	1993	1996	1999	2002	2005
EAP	75.5	87.5	90.3	95.1	94.9	95.0	94.1	95.4	95.4
China	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EECA	0.0	8.5	93.2	58.9	86.7	88.3	91.4	93.8	94.0
LAC	48.2	34.6	80.9	88.4	87.0	94.7	94.7	96.0	95.7
MENA	0.0	40.3	39.5	80.4	70.0	73.8	66.5	39.3	65.1
SA	58.3	89.3	96.5	65.5	97.9	81.4	19.5	77.0	96.9
India	63.6	100.0	100.0	58.3	100.0	77.3	0.0	77.3	100.0
SSA	30.7	30.5	26.3	38.0	65.5	61.4	59.6	67.6	70.9
Total	51.3	65.1	81.3	75.4	89.2	85.4	68.1	83.5	90.6

Table 4: Headcount indices of poverty (% below each line)

	1981	1984	1987	1990	1993	1996	1999	2002	2005
(a) Aggregate for developing world									
Old estimates using 1993 ICP									
$1.08 (1993)	40.6	33.0	28.7	28.7	25.6	22.8	22.3	20.4	17.2
New estimates using 2005 ICP									
$1.00	41.4	34.4	29.8	29.5	27.0	23.1	22.8	20.3	16.1
$1.25	51.8	46.6	41.8	41.6	39.1	34.4	33.7	30.6	25.2
$1.45	58.4	54.4	49.9	49.4	47.2	42.6	41.6	38.1	32.1
$2.00	69.2	67.4	64.2	63.2	61.5	58.2	57.1	53.3	47.0
$2.50	74.6	73.7	71.6	70.4	69.2	67.2	65.9	62.4	56.6
(b) Excluding China									
Old estimates using 1993 ICP									
$1.08 (1993)	32.0	30.1	28.7	27.1	24.7	24.6	23.8	22.6	21.5
New estimates using 2005 PPP									
$1.00	29.4	27.6	26.9	24.4	23.3	22.9	22.3	20.7	18.6
$1.25	39.8	38.3	37.5	35.0	34.1	33.8	33.1	31.3	28.2
$1.45	46.6	45.5	44.5	42.3	41.6	41.4	40.8	38.9	37.0
$2.00	58.6	58.1	57.2	55.6	55.6	55.9	55.6	54.0	50.3
$2.50	65.9	66.7	67.3	65.4	66.0	67.9	67.4	66.0	62.9

Note: The headcount index is the percentage of the relevant population living in households with consumption per person below the poverty line.

Table 5: Numbers of poor (millions)

	1981	1984	1987	1990	1993	1996	1999	2002	2005
(a) Aggregate for developing world									
Old estimates using 1993 ICP									
$1.08 (1993)	1488.5	1281.4	1178.5	1247.5	1172.4	1092.9	1119.8	1067.1	931.3
New estimates using 2005 ICP (number in millions below each line at 2005 PPP)									
$1.00	1515.0	1334.7	1227.2	1286.7	1237.9	1111.9	1145.6	1066.6	876.0
$1.25	1896.2	1808.2	1720.0	1813.4	1794.9	1656.2	1696.2	1603.1	1376.7
$1.45	2137.7	2111.5	2051.7	2153.5	2165.0	2048.1	2095.7	1997.9	1751.7
$2.00	2535.1	2615.4	2639.7	2755.9	2821.4	2802.1	2872.1	2795.7	2561.5
$2.50	2731.6	2858.7	2944.6	3071.0	3176.7	3231.4	3316.6	3270.6	3084.7
(b) Excluding China									
Old estimates using 1993 ICP									
$1.08 (1993)	854.9	856.1	868.1	873.1	838.2	881.5	897.1	890.5	858.2
New estimates at 2005 ICP (number in millions below each line at 2005 PPP)									
$1.00	784.5	786.2	814.9	787.6	793.4	823.2	843.2	821.9	769.9
$1.25	1061.1	1088.3	1134.3	1130.2	1162.3	1213.4	1249.5	1240.0	1169.0
$1.45	1244.0	1293.2	1348.9	1365.3	1418.9	1488.1	1541.7	1543.5	1535.2
$2.00	1563.0	1652.1	1732.7	1795.1	1895.2	2009.9	2101.9	2140.8	2087.9
$2.50	1759.5	1895.4	2037.6	2110.2	2250.4	2439.2	2546.4	2615.6	2611.0

Table 6: Regional breakdown of headcount index for international poverty lines of $1.00-$2.50 a day over 1981-2005

(a) % living below $1.00 a day

Region	1981	1984	1987	1990	1993	1996	1999	2002	2005
East Asia and Pacific	66.8	49.9	38.9	39.1	35.4	23.4	23.5	17.8	9.3
Of which China	73.5	52.9	38.0	44.0	37.7	23.7	24.1	19.1	8.1
Eastern Europe and Central Asia	0.7	0.6	0.5	0.9	2.1	2.5	3.1	2.7	2.2
Latin America and Caribbean	7.7	9.2	8.9	6.6	6.0	7.3	7.4	7.7	5.6
Middle East and North Africa	3.3	2.4	2.3	1.7	1.5	1.6	1.7	1.4	1.6
South Asia	41.9	38.0	36.6	34.0	29.3	29.1	26.9	26.5	23.7
Of which India	42.1	37.6	35.7	33.3	31.1	28.6	27.0	26.3	24.3
Sub-Saharan Africa	42.6	45.2	44.1	47.5	46.4	47.6	47.0	43.8	39.9
Total	**41.4**	**34.4**	**29.8**	**29.5**	**27.0**	**23.1**	**22.8**	**20.3**	**16.1**

(b) % living below $1.25 a day

Region	1981	1984	1987	1990	1993	1996	1999	2002	2005
East Asia and Pacific	77.7	65.5	54.2	54.7	50.8	36.0	35.5	27.6	16.8
Of which China	84.0	69.4	54.0	60.2	53.7	36.4	35.6	28.4	15.9
Eastern Europe and Central Asia	1.7	1.3	1.1	2.0	4.3	4.6	5.1	4.6	3.7
Latin America and Caribbean	11.5	13.4	12.6	9.8	9.1	10.8	10.8	11.0	8.2
Middle East and North Africa	7.9	6.1	5.7	4.3	4.1	4.1	4.2	3.6	3.6
South Asia	59.4	55.6	54.2	51.7	46.9	47.1	44.1	43.8	40.3
Of which India	59.8	55.5	53.6	51.3	49.4	46.6	44.8	43.9	41.6
Sub-Saharan Africa	53.7	56.2	54.8	57.9	57.1	58.7	58.2	55.1	50.9
Total	**51.8**	**46.6**	**41.8**	**41.6**	**39.1**	**34.4**	**33.7**	**30.6**	**25.2**

Table 6 cont.,

(c) % living below $2.00 a day

Region	1981	1984	1987	1990	1993	1996	1999	2002	2005
East Asia and Pacific	92.6	88.5	81.6	79.8	75.8	64.1	61.8	51.9	38.7
Of which China	97.8	92.9	83.7	84.6	78.6	65.1	61.4	51.2	36.3
Eastern Europe and Central Asia	8.3	6.5	5.6	6.9	10.3	11.9	14.3	12.0	8.9
Latin America and Caribbean	22.5	25.3	23.3	19.7	19.3	21.8	21.4	21.7	16.6
Middle East and North Africa	26.7	23.1	22.7	19.7	19.8	20.2	19.0	17.6	16.9
South Asia	86.5	84.8	83.9	82.7	79.7	79.9	77.2	77.1	73.9
Of which India	86.6	84.8	83.8	82.6	81.7	79.8	78.4	77.5	75.6
Sub-Saharan Africa	74.0	75.7	74.2	76.2	76.0	77.9	77.6	75.6	73.0
Total	**69.2**	**67.4**	**64.2**	**63.2**	**61.5**	**58.2**	**57.1**	**53.3**	**47.0**
(d) % living below $2.50 a day									
East Asia and Pacific	95.4	93.5	89.7	87.3	83.7	74.9	71.7	62.6	50.7
Of which China	99.4	97.4	92.4	91.6	86.5	76.4	71.7	61.6	49.5
Eastern Europe and Central Asia	15.2	12.5	11.2	12.0	15.1	18.3	21.4	17.8	12.9
Latin America and Caribbean	29.2	32.4	29.6	26.0	25.9	28.8	28.0	28.4	22.1
Middle East and North Africa	39.0	34.8	34.6	31.2	31.4	32.5	30.8	29.5	28.4
South Asia	92.6	91.5	90.8	90.3	88.6	88.5	86.7	86.5	84.4
Of which India	92.5	91.5	90.8	90.2	89.9	88.7	87.6	86.9	85.7
Sub-Saharan Africa	81.0	82.3	81.0	82.5	82.5	84.2	83.8	82.5	80.5
Total	**74.6**	**73.7**	**71.6**	**70.4**	**69.2**	**67.2**	**65.9**	**62.4**	**56.6**

Table 7: Regional breakdown of number of poor (millions) for international poverty lines of $1.00-$2.50 a day over 1981-2005

(a) Number living below $1.00 a day

Region	1981	1984	1987	1990	1993	1996	1999	2002	2005
East Asia and Pacific	921.7	721.8	590.2	623.4	588.7	404.9	420.8	326.8	175.6
Of which China	730.4	548.5	412.4	499.1	444.4	288.7	302.4	244.7	106.1
Eastern Europe and Central Asia	3.0	2.4	2.1	4.1	10.1	11.7	14.4	12.6	10.2
Latin America and Caribbean	28.0	35.8	36.9	29.0	27.6	35.6	37.8	40.7	30.7
Middle East and North Africa	5.6	4.6	4.7	3.8	3.7	4.1	4.7	3.9	4.7
South Asia	387.3	374.3	384.4	381.2	348.8	368.0	359.5	372.5	350.5
Of which India	296.1	282.2	285.3	282.5	280.1	271.3	270.1	276.1	266.5
Sub-Saharan Africa	169.4	195.9	209.0	245.2	259.0	287.6	308.4	310.1	304.2
Total	**1515.0**	**1334.7**	**1227.2**	**1286.7**	**1237.9**	**1111.9**	**1145.6**	**1066.6**	**876.0**

(b) Number living below $1.25 a day

East Asia and Pacific	1071.5	947.3	822.4	873.3	845.3	622.3	635.1	506.8	316.2
Of which China	835.1	719.9	585.7	683.2	632.7	442.8	446.7	363.2	207.7
Eastern Europe and Central Asia	7.1	5.7	4.8	9.1	20.1	21.8	24.3	21.7	17.3
Latin America and Caribbean	42.0	52.3	52.3	42.9	41.8	52.2	54.8	58.4	46.1
Middle East and North Africa	13.7	11.6	11.9	9.7	9.8	10.6	11.5	10.3	11.0
South Asia	548.3	547.6	569.1	579.2	559.4	594.4	588.9	615.9	595.6
Of which India	420.5	416.0	428.0	435.5	444.3	441.8	447.2	460.5	455.8
Sub-Saharan Africa	213.7	243.8	259.6	299.1	318.5	355.0	381.6	390.0	390.6
Total	**1896.2**	**1808.2**	**1720.0**	**1813.4**	**1794.9**	**1656.2**	**1696.2**	**1603.1**	**1376.7**

Table 7 cont.,

(c) Number living below $2.00 a day

Region	1981	1984	1987	1990	1993	1996	1999	2002	2005
East Asia and Pacific	1277.7	1280.2	1238.5	1273.7	1262.1	1108.1	1104.9	954.1	728.7
Of which China	972.1	963.3	907.1	960.8	926.3	792.2	770.2	654.9	473.7
Eastern Europe and Central Asia	35.0	28.4	25.1	31.9	48.6	56.2	67.6	56.8	41.9
Latin America and Caribbean	82.3	98.8	96.3	86.3	88.9	105.7	108.5	114.6	91.3
Middle East and North Africa	46.3	43.9	47.1	44.4	48.0	52.2	51.9	50.9	51.5
South Asia	799.5	835.9	881.5	926.0	950.0	1008.8	1030.8	1083.7	1091.5
Of which India	608.9	635.6	669.0	701.6	735.0	757.1	782.8	813.1	827.7
Sub-Saharan Africa	294.2	328.3	351.3	393.6	423.8	471.1	508.5	535.6	556.7
Total	**2535.1**	**2615.4**	**2639.7**	**2755.9**	**2821.4**	**2802.1**	**2872.1**	**2795.7**	**2561.5**
(c) Number living below $2.50 a day									
East Asia and Pacific	1315.8	1352.8	1361.9	1393.7	1393.7	1293.9	1282.8	1150.5	955.2
Of which China	987.5	1009.8	1001.7	1040.4	1019.0	930.2	899.2	788.8	645.6
Eastern Europe and Central Asia	64.3	54.4	50.2	55.7	71.0	86.4	101.2	84.0	61.0
Latin America and Caribbean	106.9	126.3	122.6	113.9	119.5	139.5	142.1	150.5	121.8
Middle East and North Africa	67.6	66.1	71.8	70.3	75.9	83.8	84.2	85.2	86.7
South Asia	855.0	902.1	954.6	1011.0	1056.1	1118.5	1156.8	1216.3	1246.2
Of which India	650.3	686.1	725.0	766.5	808.8	841.1	875.2	911.4	938.0
Sub-Saharan Africa	322.0	356.9	383.5	426.4	460.6	509.4	549.5	584.0	613.7
Total	**2731.6**	**2858.7**	**2944.6**	**3071.0**	**3176.7**	**3231.4**	**3316.6**	**3270.6**	**3084.7**

Table 8: Poverty gap index (x100) by region over 1981-2005

(a) $1.25

Region	1981	1984	1987	1990	1993	1996	1999	2002	2005
East Asia and Pacific	35.5	24.2	18.8	18.2	16.4	10.5	10.7	8.0	4.0
Of which China	39.3	25.6	18.5	20.7	17.6	10.7	11.1	8.7	4.0
Eastern Europe and Central Asia	0.4	0.3	0.3	0.6	1.6	1.7	1.6	1.3	1.1
Latin America and Caribbean	4.0	4.7	4.7	3.6	3.3	3.9	4.2	4.2	3.2
Middle East and North Africa	1.6	1.3	1.2	0.9	0.8	0.8	0.8	0.7	0.8
South Asia	19.6	17.5	16.4	15.2	12.9	12.6	11.7	11.5	10.3
Of which India	19.6	17.2	15.8	14.6	13.6	12.4	11.7	11.4	10.5
Sub-Saharan Africa	22.9	24.6	24.3	26.6	25.6	25.9	25.7	23.5	21.1
Total	**21.3**	**16.8**	**14.5**	**14.2**	**12.9**	**11.0**	**10.9**	**9.6**	**7.6**

(b) $2.00

Region	1981	1984	1987	1990	1993	1996	1999	2002	2005
East Asia and Pacific	54.7	44.9	38.0	37.4	34.8	25.9	25.5	20.2	13.0
Of which China	59.3	47.3	38.2	40.9	36.6	26.3	25.6	20.6	12.2
Eastern Europe and Central Asia	1.9	1.5	1.3	2.0	3.7	4.1	4.5	3.8	3.0
Latin America and Caribbean	8.9	10.2	9.7	7.8	7.4	8.6	8.6	8.7	6.7
Middle East and North Africa	7.4	6.1	5.9	4.8	4.8	4.8	4.6	4.1	4.0
South Asia	40.7	38.4	37.2	35.7	32.8	32.7	31.0	30.8	28.7
Of which India	40.8	38.2	36.7	35.3	34.1	32.4	31.3	30.8	29.5
Sub-Saharan Africa	38.8	40.6	39.8	42.2	41.4	42.3	42.1	39.7	37.0
Total	**36.5**	**32.5**	**29.5**	**29.1**	**27.5**	**24.7**	**24.3**	**22.1**	**18.6**

Note: The poverty gap index is the mean distance below the poverty line as a proportion of the line where the mean is taken over the whole population, counting the non-poor as having zero poverty gaps.

Table 9: Mean consumption of the poor ($ per day) by region over 1981-2005

(a) $1.25

Region	1981	1984	1987	1990	1993	1996	1999	2002	2005
East Asia and Pacific	0.68	0.79	0.81	0.83	0.85	0.88	0.87	0.89	0.95
Of which China	0.67	0.79	0.82	0.82	0.84	0.88	0.86	0.87	0.94
Eastern Europe and Central Asia	0.97	0.95	0.95	0.84	0.79	0.78	0.86	0.91	0.89
Latin America and Caribbean	0.82	0.82	0.78	0.79	0.80	0.79	0.77	0.78	0.77
Middle East and North Africa	0.99	0.99	0.99	0.99	1.01	1.01	1.00	1.01	0.98
South Asia	0.84	0.86	0.87	0.88	0.91	0.91	0.92	0.92	0.93
Of which India	0.84	0.86	0.88	0.89	0.91	0.92	0.92	0.93	0.93
Sub-Saharan Africa	0.72	0.70	0.70	0.68	0.69	0.70	0.70	0.72	0.73
Total	**0.74**	**0.80**	**0.82**	**0.82**	**0.84**	**0.85**	**0.85**	**0.86**	**0.87**

(b) $2.00

Region	1981	1984	1987	1990	1993	1996	1999	2002	2005
East Asia and Pacific	0.80	0.97	1.06	1.05	1.07	1.18	1.17	1.20	1.31
Of which China	0.79	0.98	1.09	1.03	1.07	1.19	1.17	1.19	1.33
Eastern Europe and Central Asia	1.55	1.56	1.57	1.51	1.38	1.37	1.31	1.29	1.25
Latin America and Caribbean	1.22	1.22	1.20	1.23	1.21	1.21	1.21	1.24	1.26
Middle East and North Africa	1.44	1.47	1.46	1.48	1.49	1.50	1.48	1.50	1.50
South Asia	1.05	1.10	1.11	1.14	1.19	1.18	1.20	1.20	1.22
Of which India	1.06	1.10	1.12	1.15	1.17	1.19	1.20	1.21	1.22
Sub-Saharan Africa	0.98	0.94	0.94	0.91	0.92	0.89	0.92	0.95	0.99
Total	**0.94**	**1.03**	**1.08**	**1.08**	**1.11**	**1.14**	**1.15**	**1.16**	**1.21**

Table 10: Aggregate poverty rate and regional profile for 2005 under alternative PPPs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PPP	P3	P3	P3	P3	P4: CPD	P4: Fisher	P4: Törnqvist
No. countries for poverty measures	115	115	60	60	60	60	60
No. countries for poverty line	15	15	14	14	14	14	14
Poverty line (per month)	$38.00	$33.34	$37.41	$32.88	Rs.576.86	Rs.557.00	Rs.547.83
No. basic headings	110	102	110	102	102	102	102
Poverty rate (% of population)							
East Asia and Pacific	16.8	13.4	16.1	12.9	13.2	12.7	12.5
Eastern Europe and Central Asia	3.7	3.75	7.1	8.1	4.8	4.1	4.6
Latin America and Caribbean	8.2	7.1	8.4	7.6	8.8	8.5	7.9
Middle East and North Africa	3.6	2.2	8.7	4.9	4.2	4.2	4.2
South Asia	40.3	35.1	39.1	34.0	37.9	35.6	34.0
Sub-Saharan Africa	50.9	50.4	49.9	49.6	50.4	50.9	49.8
Total (for sampled countries)	25.2	22.4	28.3	25.1	26.7	25.7	24.9

Note: The Deaton-Dupriez P4 calculations are only possible for about half the countries in the full sample, given that consumption expenditure surveys are required. Also one country drops out of the reference group for calculating the poverty line. The line for column P4s are Deaton-Dupriez "world rupees."

Table 11: Headcount index for using Bayesian mixed method (%)

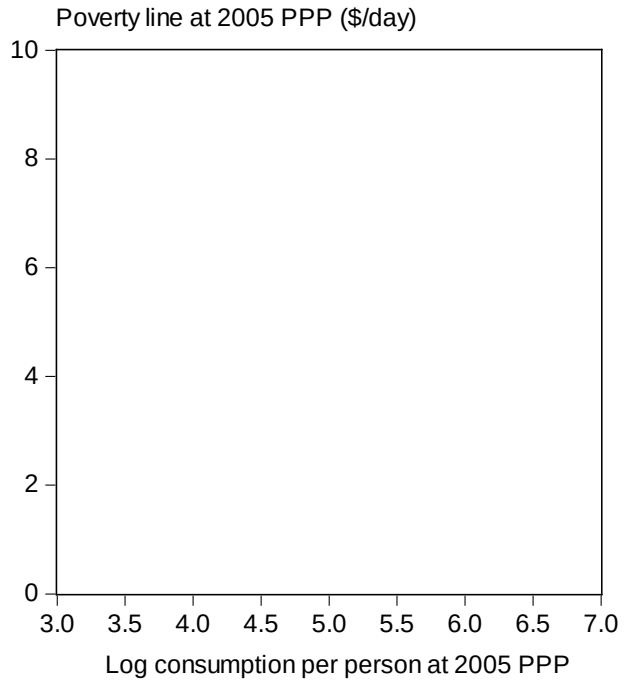
(a) $1.25 a day

	1981	1984	1987	1990	1993	1996	1999	2002	2005
East Asia & Pacific	67.1	57.4	49.4	48.5	40.6	28.4	26.5	20.3	12.1
Of which China	73.0	62.3	51.9	55.5	45.0	30.6	29.0	22.4	12.1
Europe & Central Asia	1.9	1.7	1.7	2.6	4.8	6.1	5.7	3.8	3.1
Latin America & Caribbean	13.9	16.3	16.7	18.0	15.0	15.8	14.0	15.3	9.8
Middle East & North Africa	7.6	6.5	6.4	5.0	5.0	5.4	5.4	4.4	4.4
South Asia	42.7	39.3	39.0	33.6	30.4	28.1	28.1	26.2	21.6
Of which India	42.3	38.7	38.0	32.2	30.4	26.4	26.4	25.1	20.3
Sub-Saharan Africa	51.9	54.0	53.7	55.6	55.9	56.5	56.9	55.3	51.0
Total	**43.6**	**39.6**	**36.6**	**35.3**	**31.7**	**27.2**	**26.5**	**23.7**	**18.6**

(b) $2.00 a day

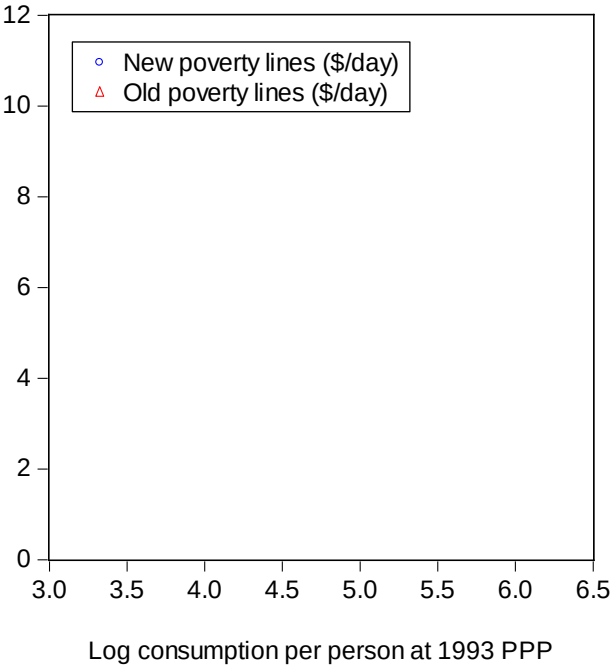
	1981	1984	1987	1990	1993	1996	1999	2002	2005
East Asia & Pacific	89.8	86.0	81.4	78.6	73.0	59.6	56.2	46.6	34.0
Of which China	95.4	91.6	85.7	85.4	78.4	63.0	58.8	48.8	33.9
Europe & Central Asia	6.9	6.4	5.8	7.4	11.8	14.7	14.8	10.8	8.2
Latin America & Caribbean	26.5	30.3	29.2	31.8	28.2	29.3	26.4	28.7	19.6
Middle East & North Africa	26.7	24.4	24.0	20.7	20.5	20.7	19.8	17.5	15.8
South Asia	77.4	75.0	74.7	70.1	67.9	65.4	64.5	62.6	56.8
Of which India	77.0	74.6	74.2	69.3	68.4	64.2	63.9	62.4	57.0
Sub-Saharan Africa	73.1	74.8	74.2	75.2	75.2	76.6	76.9	76.0	73.4
Total	**66.0**	**64.4**	**62.5**	**60.7**	**58.4**	**53.7**	**52.2**	**48.2**	**41.0**

Figure 1: National poverty lines plotted against mean consumption



Note: Bold symbols are fitted values from a nonparametric regression

Figure 2: Comparison of new and old national poverty lines at 1993 PPP



Note: Bold symbols are fitted values from a nonparametric regression

Figure 3: Number of surveys by year

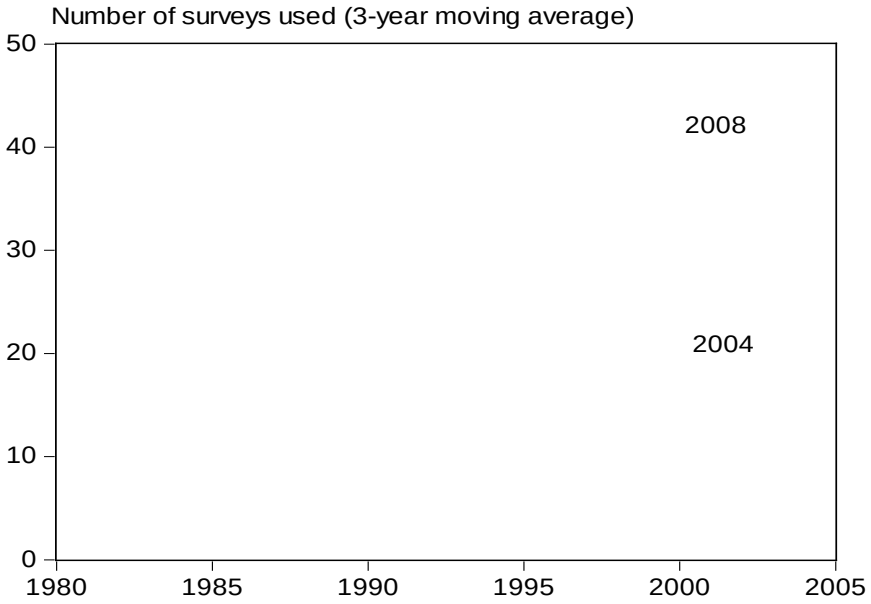


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Figure 4: Cumulative distributions for the developing world

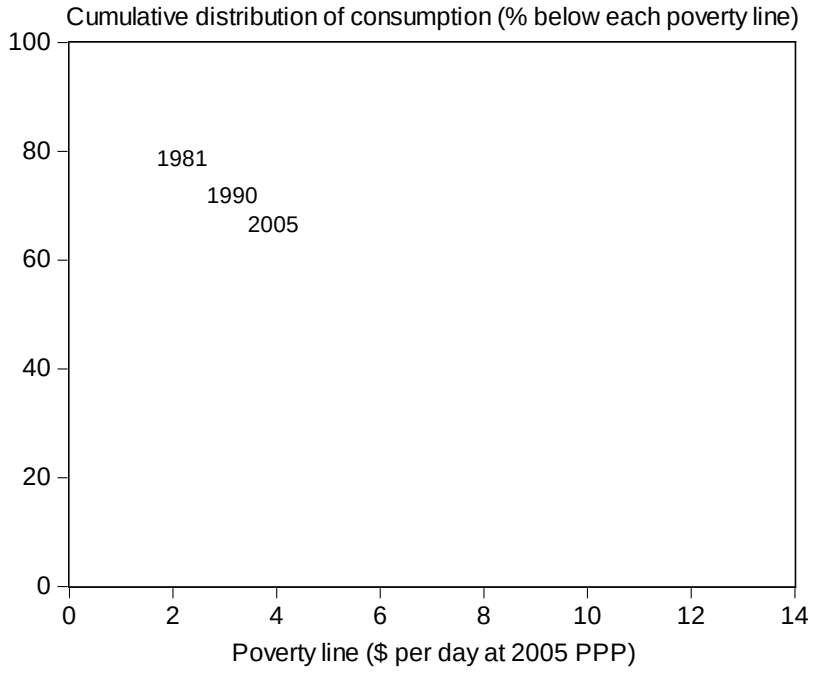

Figure 5: Aggregate poverty rates over time for alternative PPPs

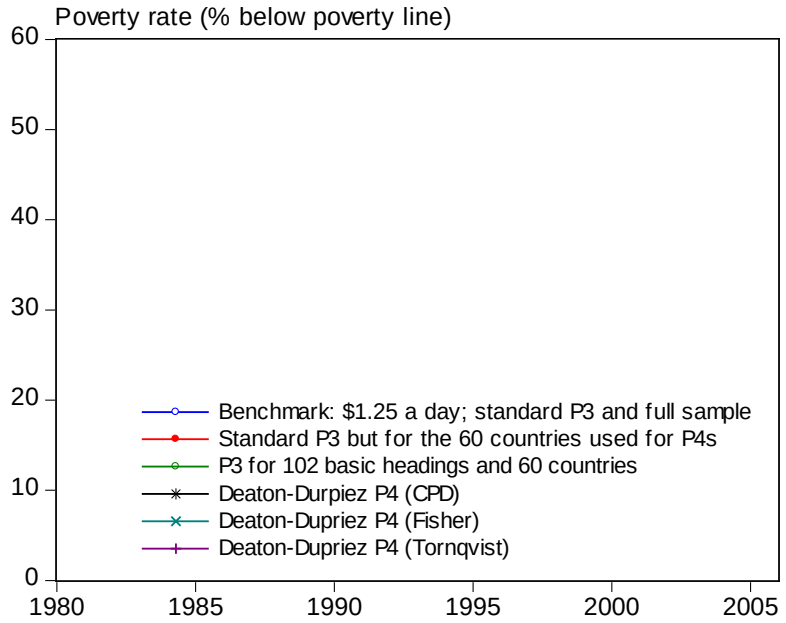

Figure 6: Aggregate poverty rates over time for benchmark and mixed method