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HOW DID THE WORLD'S POOREST FARE IN THE 1990s?

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Drawing on 297 national sample surveys spanning 88 countries, we find that there was a net decrease in the overall incidence of both absolute and relative consumption poverty between 1987 and 1998. But it was not enough to reduce the total number of poor by various definitions. The incidence of absolute poverty fell in Asia, Latin America, and the Middle East–North Africa, while it rose in Sub-Saharan Africa and Eastern Europe–Central Asia. Over the whole data set, interpersonal distribution improved slightly from the point of view of the poor, due mainly to growth in China.

INTRODUCTION

This paper tries to assess progress in reducing consumption poverty in the developing and transition economies in 1987–98. We consider various definitions of what it means to be "poor." One definition says that someone is poor if she lives in a household with a per capita expenditure (whether in cash or kind) that is insufficient when judged by what "poverty" typically means in the world's poorest countries. This definition judges poverty by standards common in South Asia and much of Sub-Saharan Africa, no matter where one actually lives.

We also consider two broader definitions. In one, we count as poor all those who would be judged so by standards more typical of developing countries in East Asia (except China), North Africa, and poorer countries in Eastern Europe and Central Asia. In another definition, we say someone is poor if she would probably be judged so if living in the poorest countries, or if she has an unusually low consumption level relative to others in the actual country of residence.

While we try to be eclectic about the definition of consumption poverty, we recognize that there are limitations of all our definitions—limitations that we cannot do anything about with the data available. Potentially important examples are the fact that our definition of poverty does not directly reflect inequality within the household, and that differences in command over non-market goods are ignored.

Implementing even our somewhat narrow definitions is nonetheless difficult given the data available. Our assumptions in this paper closely follow those of Chen, Datt, and Ravallion (1994) and Ravallion and Chen (1997), which provide more complete descriptions of the pros and cons of the methods used. Here we focus on the differences with our past methods, and present the main results of our update, drawing on new survey data and new price data for exchange rate

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conversions. These estimates override all our previous estimates, in that we have re-calculated everything back in time in the light of the new data.[1]

The next section describes country coverage of the data set we have constructed. Section 3 describes the poverty line and exchange rates, while section 4 focuses on the measures of poverty. Our main results for absolute poverty are discussed in section 5. Section 6 tests their sensitivity to using instead a measure that takes account of relative consumption when deciding who is poor. Section 7 discusses the role played by changes in distribution. Section 8 concludes.

2. Coverage of the Data Set

In a previous attempt to assess progress against absolute poverty, Chen *et al.* (1994) provided estimates for 1985 and 1990 using data for 44 countries. The last update prior to this paper used data from 122 surveys for 67 countries to make estimates for 1987 and 1993 (World Bank, 1996; Ravallion and Chen, 1997). The data set represented 85 percent of the population of the developing world (by which we mean Part 2 member countries of the World Bank). The present paper provides new estimates for 1987 and 1998 using distributions from 297 national surveys from 88 countries, representing 89 percent of the total population of the developing world.[2]

We estimated all our poverty measures from the primary (unit record or tabulated) survey data. We have not used any secondary sources (unlike all other compilations of distributional data that we know of). The measures of household living standards are normalized by household size. The distributions are weighted by household size and sample expansion factors (when relevant) so that a given fractile (such as the poorest decile) should have the same share of the country-specific population across the sample.[3] The data come in various forms, ranging from micro data to specially-designed grouped tabulations from the raw data; Chen *et al.* (1994) and Ravallion and Chen (1997) discuss our estimation methods for grouped data.

As in past work, we have tried to eliminate any obvious comparability problems, either by re-estimating the consumption/income aggregates or the more radical step of dropping a survey. However, there are comparability problems that we cannot deal with; for example, it is known that differences in survey method (such as in questionnaire design) and definitions can create non-negligible differences in the estimates obtained for consumption or income. For example, while one-week recall for food consumption is common in surveys, there are some

[1]Further details, including the latest individual country estimates, can be found at the web site: http://www.worldbank.org/research/povmonitor/. The latest year's estimates at country level are also published in the World Bank's *World Development Indicators* (see, for example, World Bank, 2000a).

[2]The working paper (WP) version of this paper also gives results for intermediate years, namely 1990, 1993 and 1996; see Chen and Ravallion (2000). The estimates in that paper for 1998 differ slightly from those in the present paper because we have updated them since the WP version to include extra survey data that became available since the WP version.

[3]It is still surprisingly common to mix household fractiles and person fractiles in data sets, and it is often unclear which is which; this matters since household size is negatively correlated with consumption per person, and the size of this correlation varies from country to country.

countries (including India) which use a longer period—almost certainly giving a lower estimate of consumption and hence higher measured poverty.[4]

Table 1 lists the surveys used, with their dates, welfare indicators and population coverage. Coverage varies greatly by region, ranging from 53 percent of the population of the Middle East and North Africa to 98 percent of the population of South Asia. Not all of the surveys available were included. We also had access to survey data for Cambodia, Djibouti, Guinea, Guinea-Bissau, Papua New Guinea, Tajikistan and Vietnam, but data were missing on either the purchasing power parity exchange rates of consumer price indices. (These data are discussed further in the next section.) We also had surveys for Tanzania (1993) and Ghana (1992 and 1997) but we chose not to use them because of serious comparability problems that we could not resolve satisfactorily.

3. Exchange Rates and Poverty Lines

We have used the Purchasing Power Parity (PPP) estimates produced by the World Bank.[5] The Bank's 1993 PPPs are based on new price and consumption basket data collected by the 1993 International Comparison Project (ICP) which covered 110 countries. The PPPs used in our previous estimates (Ravallion and Chen, 1997) were from PWT 5.6 and were based on 1980s ICP data and covered only 60 countries. The two sets of PPPs are not comparable with each other even for the same year.

The international poverty line in our past work was set at $1 per day at 1985 PPP. We re-assessed this poverty line to be consistent with the 1993 PPPs. The original $1/day poverty line was chosen as being representative of the poverty lines found amongst low-income countries (Ravallion, Datt, and van de Walle, 1991). The same principle was applied in updating the poverty line with the new PPPs. The equivalent line in 1993 PPP is $1.08 a day in 1993 price ($32.74 per month); this is the median of the lowest ten poverty lines within the same set of countries used by Ravallion *et al.* (1991).[6] This is the main poverty line we will focus on here, and we will simply call it the $1/day line.[7]

Since we have switched the base of the PPP rates—also incorporating new price data—there is no simple way of comparing our new poverty line at 1993 PPP with the original $1 per day line at 1985 PPP from Ravallion *et al.* (1991). In effect, the whole structure of relative prices (embodied in the PPPs) has

[4]Comparisons of the two methods for the same population and time are rare. In one example, Visaria (2000) reports an experiment in which different sampled households in India were asked about food consumption for different recall periods; some were asked one week recall and others one month. The differences in the implied poverty rates using the same poverty line were large; the poverty rate estimated using one week recall for Rural India in 1997 is 21 percent, as compared to 36 percent using one month recall.

[5]Past estimates used the Penn World Tables (PWT) as the source of PPP exchange rates for consumption (Ravallion *et al.*, 1991; Chen *et al.*, 1994; Ravallion and Chen, 1997). The PWT based on the 1993 price data from the International Comparison Project were not available at the time of writing.

[6]The ten countries are Bangladesh, China, India, Indonesia, Nepal, Pakistan, Tanzania, Thailand, Tunisia, and Zambia.

[7]The original "$ per day" line was also rounded off; it was actually $31 per month (Ravallion *et al.*, 1991). Later this was changed to $30.42 per month (Chen *et al.*, 1994).

TABLE 1

COVERAGE OF THE DATA SET

Region	% of 1998 Population Represented	Country	Survey Dates	Welfare Indicator
East Asia	91.6	China	1985, 1990, 1992–98	Income
		Indonesia	1984, 1987, 1990, 1993, 1996, 1999	Expenditure
		Korea	1988, 1993	Income
		Laos	1992, 1997	Expenditure
		Malaysia	1984, 1987, 1992, 1995	Income
		Mongolia	1995	Expenditure
		Philippines	1985, 1988, 1991, 1994, 1997	Expenditure
		Thailand	1981, 1988	Income
			1988, 1992, 1996, 1998	Expenditure
Eastern Europe and Central Asia	95.7	Albania	1997	Expenditure
		Armenia	1996	Expenditure
		Azerbaijan	1995	Expenditure
		Belarus	1988, 1993, 1995, 1998	Income
		Bulgaria	1989, 1992, 1994, 1995, 1997	Expenditure
		Croatia	1998	Expenditure
		Czech Republic	1988, 1993, 1996	Income
		Estonia	1988, 1993, 1995, 1998	Income
		Georgia	1996	Expenditure
		Hungary	1989, 1993, 1998	Income
		Kazakhstan	1988, 1993	Income
			1993, 1996	Expenditure
		Kyrgyz Republic	1988, 1993	Income
			1993, 1997	Expenditure
		Latvia	1988, 1993, 1995, 1998	Income
		Lithuania	1988, 1993, 1994, 1996	Income
		Moldova	1988, 1992, 1997	Income
		Poland	1985, 1987, 1989, 1993, 1998	Income
			1990, 1992, 1993–96	Expenditure
		Romania	1989, 1992, 1994	Income
		Russian Federation	1988, 1993	Income
			1993, 1996, 1998	Expenditure
		Slovak Republic	1988, 1992	Income
		Slovenia	1987, 1993, 1998	Income
		Turkey	1987, 1994	Expenditure
		Turkmenistan	1988, 1993, 1998	Income
		Ukraine	1988, 1992	Income
			1995, 1996, 1999	Expenditure
		Uzbekistan	1988, 1993	Income
Latin America and Caribbean	88.0	Bolivia	1990, 1997	Income
		Brazil	1985, 1988–89, 1993, 1995–97	Income
		Chile	1987, 1990, 1992, 1994, 1996	Income
		Colombia	1988, 1991, 1995–96	Income
		Costa Rica	1986, 1990, 1993, 1996, 1997	Income
		Dominican Republic	1989, 1996, 1998	Income
		Ecuador	1988, 1994–95	Expenditure
		El Salvador	1989, 1995–97	Income

TABLE 1—continued

Region	% of 1998 Population Represented	Country	Survey Dates	Welfare Indicator
		Guatemala	1987, 1989, 1998	Income
		Guyana	1993	Expenditure
		Honduras	1989–90, 1992, 1994, 1996, 1997	Income
		Jamaica	1988–90, 1993, 1996	Expenditure
		Mexica	1984, 1992	Expenditure
			1989, 1995, 1996	Income
		Nicaragua	1993, 1998	Expenditure
		Panama	1989, 1991, 1995–98	Income
		Paraguay	1990, 1995, 1998	Income
		Peru	1985, 1994, 1996	Expenditure
			1994, 1996	Income
		St Lucia	1995	Income
		Trinidad and Tobago	1988, 1992	Income
		Uruguay	1989	Income
		Venezuela	1981, 1987, 1989, 1993, 1995–97	Income
Middle East and North Africa	52.5	Algeria	1988, 1995	Expenditure
		Egypt, Arab Rep.	1991, 1995	Expenditure
		Jordan	1987, 1992, 1997	Expenditure
		Morocco	1985, 1990, 1999	Expenditure
		Tunisia	1985, 1990, 1995	Expenditure
		Yemen	1992, 1998	Expenditure
South Asia	98.0	Bangladesh	1984–85, 1988, 1992, 1996	Expenditure
		India	1983, 1986–90, 1992, 1994–97	Expenditure
		Nepal	1985, 1995	Expenditure
		Pakistan	1986/87, 1990/91, 1992/93, 1996/97	Expenditure
		Sri Lanka	1985, 1990, 1995	Expenditure
Sub-Saharan Africa	73.0	Botswana	1985/86	Expenditure
		Burkina Faso	1994	Expenditure
		Central African Rep.	1993	Expenditure
		Cote d'Ivoire	1985–88, 1993, 1995	Expenditure
		Ethiopia	1981, 1995	Expenditure
		Gambia	1992	Expenditure
		Ghana	1987, 1989, 1998	Expenditure
		Kenya	1992, 1994	Expenditure
		Lesotho	1986, 1993	Expenditure
		Madagascar	1980, 1993, 1997	Expenditure
		Mali	1989, 1994	Expenditure
		Mauritania	1988, 1993, 1995	Expenditure
		Mozambique	1996/97	Expenditure
		Namibia	1993	Expenditure
		Niger	1992, 1995	Expenditure
		Nigeria	1985, 1992, 1997	Expenditure
		Rwanda	1983/85	Expenditure
		Senegal	1991, 1994	Expenditure
		Sierra Leone	1989	Expenditure
		South Africa	1993	Expenditure
		Tanzania	1991	Expenditure
		Uganda	1988, 1992, 1996	Expenditure
		Zambia	1991, 1993, 1996, 1998	Expenditure
		Zimbabwe	1990/91	Expenditure

changed. So the fact that $1.08 in 1993 has a US purchasing power less than $1 in 1985 does not mean that the real value of the poverty line has fallen. Indeed, if we had simply adjusted the $1 per day line for inflation in the US between 1985 and 1993 we would have obtained a poverty line which is well above the median of the ten lowest poverty lines at 1993 PPP. Arguably a better way to compare the two poverty lines is to compare the implied aggregate poverty rates for the same year. We return to this point.

We also re-ran the regression model for poverty lines reported in Ravallion *et al.* (1991), using the new PPPs. That paper regressed the log of the country-specific poverty line on a quadratic function of consumption per capita, also at PPP; we can rewrite that specification in the equivalent form:

$$\ln z_i = \alpha + \beta(c_i - c^{\min}) + \gamma(c_i - c^{\min})^2 + \varepsilon_i \qquad (i = 1, \ldots, n) \tag{1}$$

where z_i is the poverty line for country i with consumption per capita c_i (with $c_i \geq c^{\min}$, the lowest consumption per capita in the sample) in a sample of n countries while α, β, γ are parameters and ε_i is a zero mean i.i.d. error term. Notice that the intercept in (1) gives the lower bound to the log poverty line, for the poorest country in the sample.

We estimated equation (1) on the Ravallion *et al.* (1991) data set of poverty lines for 33 countries (though one was dropped because the 1993 PPP rate was not available). Our estimate of α was 3.46 (with a t-ratio of 40.5, based on the White standard error), representing $1.05 per day ($31.96 per month), with a 95 percent confidence interval of ($0.88, $1.24). (The regression coefficients on mean consumption and its squared value were 0.0040 and -1.56×10^{-6} with t-ratios of 6.54 and 2.81 respectively, and $R^2 = 0.88$.) So our $1.08 poverty line is a close approximation to the poverty line one would expect to find in the poorest country. The fact that there is such close agreement between the estimated intercept of equation (1) and the median poverty line amongst the poorest ten countries in this sample illustrates that the relationship is very flat amongst poor countries.

The poverty rate on this basis must thus be deemed a conservative estimate, whereby aggregate poverty in the developing world is defined by perceptions of poverty found in the poorest countries. We also give results for twice this line (to give a poverty line more typical of low–middle income countries), as well as a relative poverty line, which varies with mean consumption in the country of residence. Naturally these give higher estimates of the extent of poverty, though our main concern here is with how much impact they have on our assessment of the extent of progress in reducing poverty.

4. Measuring Absolute Consumption Poverty

In keeping with past work, we measure poverty in terms of household consumption expenditure per capita. Of the 297 surveys, 193 allow us to estimate the distribution of consumption expenditures; this is true of all the surveys used in the Middle East and North Africa, South Asia and Sub-Saharan Africa (Table 1). For about one quarter of the cases in which we do not have consumption distributions we still have survey-based estimates of mean consumption. For those

cases we replace the income mean by the consumption mean. (There is however no obvious basis for adjusting the Lorenz curve; one expects higher inequality in an income distribution than a consumption distribution for the same place and data.) When only an income distribution is available, we follow past practice of re-scaling mean income by one minus the national saving rate.[8]

Having converted the international poverty line to local currency at PPP in 1993 we convert to the prices prevailing at each survey date using the country-specific official Consumer Price Index (CPI).[9] 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 the people at the poverty line.

To estimate regional poverty at a given reference year (1998, say) we "line up" the surveys in time using the same method described in Chen *et al.* (1994) and Ravallion and Chen (1997). Within 88 countries in our data set, 20 have only one survey; 18 have two surveys and 50 have three or more surveys over the period 1980 to 1998. 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 national accounts to the survey mean—assuming in other words that the Lorenz curve for that country does not change.[10] 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 national accounts; for example, growth in the latter might reflect growth in the spending by non-profit organizations (that are not separated from households in the national accounts for most developing countries) rather than household spending.

When the reference date (1993 say) is between two surveys (1989 and 1995 say), we do the following. We first estimate the mean consumption at the reference year using the NA growth rate between the survey year and the reference year. Based on the example here, we have two means at the reference year based on two surveys, M93(89) and M93(95) where M93(t) is the estimated mean for 1993 using the survey for year t. Then we calculate the mean at the reference year M93 using a time weighted average of M93(89) and M93(95). Next we estimate the poverty rate at the reference year. Based on the 1989 distribution and M93, we get the H93(89). Similarly, based on the 1995 distribution and M93, we get H93(95). Then the poverty headcount for 1993 is the average of H93(89) and H93(95).

[8]We also re-estimated the poverty measures without this assumption; our main findings on trends over time and regional comparisons are unaffected; the main quantitative effect is to decrease the poverty rate in Latin America (for which income distributions are more common than other regions) by a few percentage points.

[9]There are two exceptions. In the two largest countries, China and India, we estimate poverty measures separately for urban and rural areas and use sector specific CPIs. In the case of India, we also use a corrected version of the rural CPI (the Consumer Price Index for Agricultural Laborers) as discussed in Datt and Ravallion (1998).

[10]For some countries (Kazakhstan, Kyrgyz, Latvia, Lithuania, Moldova, Turkmenistan) the NA consumption data was incomplete. Then we used instead the GDP per capita growth rate.

5. Results

Table 2 gives our estimates of the headcount indices for $1.08 at 1993 PPP and twice this poverty line. The choice of twice the line is arbitrary. However, it is useful to see how robust our results are to this choice. The comparison also directly indicates how many people who are not actually poor by the "$1" standard would become so with an income loss of no more than this amount. We focus mainly on the lower poverty line in the following discussion.

TABLE 2

Population Living Below $1.08 and $2.15 per day at 1993 PPP by Region

	$1.08 per day				$2.15 per day			
	Headcount Index (%)		Number of Poor (millions)		Headcount Index (%)		Number of Poor (millions)	
Region	1987	1998	1987	1998	1987	1998	1987	1998
East Asia	26.60	14.71	417.53	267.30	67.04	48.72	1052.32	885.29
(excluding China)	23.94	9.47	114.14	53.87	62.90	44.29	299.92	252.01
Eastern Europe and Central Asia	0.24	3.75	1.07	17.80	3.59	20.70	16.35	98.24
Latin America and Caribbean	15.33	12.13	63.66	60.86	35.54	31.72	147.56	159.14
Middle East and North Africa	4.30	2.11	9.31	6.03	30.03	29.85	65.09	85.28
South Asia	44.94	40.00	474.41	521.84	86.30	83.93	911.04	1094.95
Sub-Saharan Africa	46.61	48.05	217.22	301.32	76.52	77.95	356.64	488.82
Total	28.31	23.45	1183.19	1175.14	61.00	56.11	2549.01	2811.73
(excluding China)	28.51	25.56	879.81	961.71	58.22	57.90	1796.61	2178.44

Note: The headcount index is the percentage of the population living in households with a consumption or income per person less than the poverty line.

When we compare the most recent common year (1993) we get approximately the same poverty rate as we found in Ravallion and Chen (1997) using $1/day at 1985 PPP; the old poverty rate for 1993 was 29.4 percent vs. 28.2 percent using the new poverty line for 1993 (Chen and Ravallion, 2000).

In common with past estimates, we find that the decrease in the average poverty rate was not sufficient to reduce the aggregate number of poor, with 1.2–1.3 billion people living below the $1 per day line. If we exclude China, the total number of poor has risen steadily over the period (Table 2).

There are some notable differences in the regional composition of poverty. The estimated poverty rate has risen in Sub-Saharan Africa, but fallen sharply in Latin America and the Middle East and North Africa; there is little difference for other regions.[11]

[11]The working paper version (Chen and Ravallion, 2000) gives results for 1993 which can be compared with those in Ravallion and Chen (1997). In Sub-Saharan Africa we get 49.7 percent in 1993 using our new data, versus 39.1 percent in Ravallion and Chen (1997). In Latin America we get 15.3 percent versus 23.5 percent on the earlier data set. For the Middle East and North Africa the respective estimates are 1.9 percent and 4.1 percent, while for South Asia they are 42.4 percent versus 43.1 percent, and East Asia, 25.2 percent versus 26.0 percent. The difference is also modest for Eastern Europe and Central Asia (4.0 percent versus 3.5 percent).

The higher share of poverty attributed to Sub-Saharan Africa (when compared to Ravallion and Chen, 1997) arises from two factors. The household survey coverage in Sub-Saharan Africa (SSA) has increased, with distributional data included for a number of countries with high poverty incidence (Central African Republic, Gambia, Mali, Sierra Leone).[12] Secondly, for some countries in SSA, the switch to the 1993 PPP base has increased the measured number of poor.[13]

The new estimates suggest that the aggregate poverty rate has fallen over the period, from 28.3 percent of the 1987 population living in households with consumption per capita below $1 per day to 23.4 percent in 1998. Over the longest comparable period (1987–93) our new results suggest less progress in reducing poverty. (In Ravallion and Chen (1997), we found that the aggregate poverty rate fell from 30.7 percent in 1987 to 29.4 percent in 1993; over the same period, we find almost no decline.) This reflects the higher share of poverty attributed to Sub-Saharan Africa, where (by both sets of estimates) the poverty rate increased over the period 1987–93.

We find that a marked reduction in the poverty rate for East Asia over the period.[14] We find an increase in poverty in Eastern Europe and Central Asia. The number of people in this region estimated to live below the $1 per day line increased from 1 million to 18 million over this period. Over the whole period, the poverty rate has changed little in Latin America and the Caribbean. There is a marked fall in the incidence of poverty in the Middle East and North Africa. There is a decrease in the poverty rate in South Asia, with a five percentage-point drop in the percentage of the population living under $1 per day. This was not enough to prevent a rising total number of poor in this region. There was an increase in the poverty rate of Sub-Saharan Africa over the period.

Throughout the period, the region with the highest poverty incidence relative to the $1 per day line is Sub-Saharan Africa, followed closely by South Asia, though the ranking reverses if one uses the "$2" poverty line. Together these two regions accounted for 70 percent of those living below $1 per day in 1998, up from 58 percent in 1987; six percentage points of this increase was in Sub-Saharan

[12]This is what one would expect if there is a tendency for relatively poorer countries to be less likely to have poverty data; expanding survey coverage would thus put upward pressure on the mean poverty rate. However, this does not appear to be a general patter, but rather is specific to the recent expansion in survey coverage for SSA.

[13]Nigeria is a case in point, and with a high population weight. The PPP from Penn World Tables 5.6 is 0.897 in 1985 prices and the World Bank's PPP is 11.52 in 1993 prices. The poverty incidence is 29 percent under one dollar a day using PWT 5.6 PPP vs. 67 percent using the Bank's 1993 PPP for the same poverty line at the same year (1992–93). The difference of PPP is attributable to the new ICP survey for 1993.

[14]The WP version (Chen and Ravallion, 2000) gives more detailed results at intervals between 1987 and 1998 which suggest that the trend reduction in poverty in East Asia reversed at the time of the crisis in 1997. The aggregate change is small—a 0.4 percentage point increase in the proportion of the population living under $1 per day in the region between 1996 and 1998. Of course, this "before–after" comparison does not take account of what the poverty rate in the region would have been without the crisis. Chen and Ravallion (2001) assess the counter-factual by forecasting forward from the data prior to the East Asia crisis, assuming that the pre-crisis pace of poverty reduction would have been sustainable without the crisis. They obtain an estimate of 7.42 percent for the head-count index in 1998 (with a standard error of 1.06). Comparing this to the estimate for 1998 in Table 2 suggests that the crisis increased the incidence of poverty in the region (excluding China) by four percentage points, representing 22 million people.

Africa, which accounted for 26 percent of the poor in 1998 by this measure, up from 18 percent in 1987.

East Asia came third in terms of the incidence of poverty, followed by Latin America. Eastern Europe and Central Asia started the period as the region with the lowest poverty incidence, but by the end of the period it had overtaken the Middle East and North Africa, though this is not robust to the choice of poverty line (Chen and Ravallion, 2000).

Comparing the "$1" and "$2" lines in Table 2 we see sizable differences in how much doubling the poverty line adds to the headcount index. This has a bearing on the poverty impact of consumption growth. From Table 2 we can calculate the percentage reduction in the $2 per day headcount index from a doubling of mean consumption holding the Lorenz curve constant.[15] The aggregate impact is a 58 percent reduction. The lowest impact is in Sub-Saharan Africa for which the $2 poverty rate falls by 38 percent, and the highest is the Middle East and North Africa, where it falls by 92 percent. Between these extremes, a doubling of mean consumption reduces the $2 poverty rate by 70 percent in East Asia, 82 percent in Eastern Europe and Central Asia, 62 percent in Latin America, and 52 percent in South Asia.

Of course by the same token, these calculations also provide an indication of how much vulnerability there is to an income decline. The above figures directly give the proportion of those living *below* $2/day who live *above* $1/day. Almost one third (33 percent) of the total proportion of the developing world live between the $1 and $2 lines. Across regions, this varies from 17 percent in Eastern Europe and Central Asia to 44 percent in South Asia, with East Asia the second highest, at 34 percent.

Table 3 gives the poverty gap indices, which follow a similar pattern to the headcount indices.[16] The regional rankings are identical to the headcount index, but there are some differences in magnitudes. A case in point is the proportionately larger difference in the poverty gap index between Sub-Saharan Africa and South Asia. Although the headcount index is only slightly higher in Africa, the poverty gap index for the $1 per day line is far higher, indicating that the mean consumption of the poor is lower in Africa.

Thus there is greater depth of poverty in Africa, suggesting that (unless inequality falls) it will take more growth to have the same proportionate impact on Sub-Saharan Africa's poverty gap as South Asia's, similarly to what we found for the headcount index. This is borne out by the Kakwani (1993) elasticities of the poverty gap index to distribution-neutral growth, which are -1.67 for Sub-Saharan Africa vs. –2.84 in South Asia (for the $1 per day line in 1998).[17] The corresponding elasticities for other regions are –2.68 for East Asia (–3.72 excluding China), –3.36 for Eastern Europe and Central Asia, –2.06 for Latin America, –4.41 for the Middle East and North Africa (though this is deceptive, given that

[15]This calculation uses the fact that the headcount index is homogeneous of degree zero between the mean and the poverty line, holding the Lorenz curve constant.

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

[17]The elasticity of the poverty gap index (PG) to growth in the mean holding the Lorenz curve constant is $1 - H/PG$, where H is the headcount index (Kakwani, 1993).

TABLE 3

POVERTY GAP INDICES

Region	Poverty Gap Index (%) ($1.08)		Poverty Gap Index (%) ($2.15)	
	1987	1998	1987	1998
East Asia	6.82	4.00	28.61	18.26
(excluding China)	5.64	2.00	25.92	14.68
Eastern Europe and Central Asia	0.05	0.86	0.88	6.75
Latin America and Caribbean	5.22	3.97	15.54	13.02
Middle East and North Africa	1.01	0.39	12.78	7.92
South Asia	12.97	10.41	41.90	38.86
Sub-Saharan Africa	19.96	18.09	42.11	38.93
Total	8.64	6.93	28.33	24.01
(excluding China)	9.10	7.59	27.82	25.37

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

proportionately fewer people live below the $1 per day line in this region; using the $2 line the elasticity falls sharply, to –2.77). The overall elasticity for the developing world is –2.39. This has changed little over time (the value for 1987 is –2.28), and it has also proved quite resistant to changes in the data and assumptions (the first estimate for 1985 was –2.2; see Ravallion *et al*., 1991).

Poverty-gap comparisons over time are similar to the headcount index. One noticeable point is how much faster the poverty gap has fallen in South Asia than the region's headcount index. We find a 25 percent drop over 1987–98 in South Asia's poverty gap index for the $1 per day line, versus 11 percent for the headcount index—indicative of rising mean consumption for the region's poor.

6. Allowing for Low Relative Consumption

So far we have aimed to treat the same consumption level (at PPP) the same way, no matter what country a person lives in. This does not capture relative deprivation, such that a poor person needs higher consumption when living in a rich country, so as to participate fully in that society.

While one might accept this point in principle, it is far from clear how exactly one should implement it empirically. A common practice in measuring poverty in OECD countries is to use a poverty line that is half of mean income in each country (Smeeding, 1997; Atkinson, 1998). However, this would entail counting people as not being poor in poor countries even though they fall below prevailing poverty lines in those countries. One could instead draw on the poverty measures that are actually used in the countries concerned. (World Bank (2000a) provides a compilation from the World Bank's own poverty assessments.) However, this raises further concerns about comparability in the country-specific welfare indicators used; for example, some countries prefer to use income, while others prefer

consumption. And the measures do not line up in time. Yet another option is to use the poverty lines actually found in country studies, but apply them to our distributional data. However, there are clearly idiosyncratic factors in these poverty lines; they are often geared to specific features of the welfare indicator used, and they are not immune from local political manipulation. Nor do they span the same set of countries in our data set. A more attractive option might be to adjust the poverty line according to equation (1).[18] However, while this equation makes sense as a basis for estimating the expected poverty line in the poorest country, it is not the most obvious way one can think about setting relative poverty lines.[19]

Atkinson and Bourguignon (1999) propose an alternative approach in which the poverty line is \$1/day in the poorest country but does not rise with average consumption until it reaches a critical value, after which it rises proportionately to consumption. They derive this specification by assuming that a person is deemed poor if she does not attain either the \$1 per day consumption level (loosely interpretable as physical needs), or a given proportion of mean consumption ("social needs").

In principle one can also generate a smooth convex curve such as in equation (1) by allowing for a list of social needs, each proportional to consumption, but at different rates. Then the Atkinson–Bourguignon specification will be smoothed out, depending on how many of these needs there are. With this extension to their model one can also rationalize the type of smooth convex model in Ravallion *et al.* (1991) and Ravallion (1998). However, the Atkinson–Bourguignon proposal offers a more intuitive and parsimonious representation of the relationship than equation (1), and fits the data quite well, with a sum of squared residuals only slightly higher than the specification in equation (1).

We chose a slightly modified version of the Atkinson–Bourguignon specification in measuring relative poverty. In particular, we assume that to be deemed "not poor" a person must meet *both* the "\$1 per day" absolute consumption standard and consume more than some proportion of the mean consumption in the country of residence. We set the constant of proportionality to avoid social exclusion at one third; this gave the best fit to the data used in setting the \$1.08 poverty line.[20] The poverty line in dollars per day at 1993 PPP for any country is then given by $\max(\$1.08, c_i/3)$ where c is mean consumption per capita in 1993 at 1993 PPP.[21]

While this seems a defensible method of setting relative poverty lines between countries, it is not so clear that one should use it for updating the poverty line over

[18]In comments on Ravallion *et al.* (1991), the late Bela Balassa suggested that equation (1) should be used for this purpose. The suggestion was not pursued for the World Bank's poverty measures, on the grounds that the focus should remain absolute poverty in terms of consumption. (For an example of relative poverty lines constructed this way, see Ali and Thorbecke, 2000.) If instead one defines absolute poverty in the space of utility and assumes that utility depends on both own consumption and relative consumption, then it is easy to see that the consumption poverty line will rise with mean consumption (Ravallion, 1998). A similar argument can be made in the space of capabilities, following Sen (1985).

[19]The elasticity of the poverty line to mean consumption is unbounded above using equation (1). However, unity would seem a plausible upper bound.

[20]By eye-balling the data, Atkinson and Bourguignon chose a slope of 0.37, based on the Ravallion *et al.* (1991) data. On the new 1993 PPP rates, a slope of one in three fits the data slightly better in terms of the sum of squared errors (based on a line search at 0.01 intervals between 0.30 and 0.50).

[21]Countries in a neighborhood of the kink ($\pm$ 15 percent of \$3.23 consumption per day in 1993) include Cote d'Ivoire, Gambia, Ghana, Moldova, Pakistan, Senegal, and Zimbabwe.

time. Doing so will mean that for those countries with mean consumption above $3.23 per day, the poverty measures will be independent of absolute levels of consumption (and depend solely on the percentile of the population for which the Lorenz curve has a slope of 1/3). Furthermore, while less poor countries tend to have higher poverty lines, it appears to be rare to observe changes (in either direction) in the real value of the poverty line with changes in average consumption over the length of time we are considering here. Against these concerns, the same factors that lead a richer country to have a higher poverty line will presumably operate over time to put upward pressure on the poverty line in a developing poor country, and to attenuate perceptions of what constitutes poverty in contracting economies. Since arguments can be made both ways, we present calculations of relative poverty for both a constant poverty line over time (differing only between countries) and for a poverty line that varies over time according to the survey mean, whenever the poverty line is above $1.08 per day.

Table 4 gives the results. As one would expect, the poverty rate rises sharply in East Asia (outside China), Eastern Europe and Central Asia, Latin America, and the Middle East and North Africa. The overall headcount of the poor rises to 1.6 billion when the relative poverty line is fixed over time, and 1.7 billion when it rises with growth.

The greatest proportionate impacts on the 1987 headcount index of allowing for low relative consumption are for the Middle East/North Africa and Eastern Europe/Central Asia. However, the impact on Latin America and the Caribbean is probably more notable because this region now emerges as the one with the second highest incidence of poverty, with slightly over half the region's population living in poverty by this definition. The mean poverty line for Latin America is three times the $1.08 line (Table 4).[22] With this magnitude of upward adjustment to the poverty line it is not surprising that this region overtakes South Asia. Of course, as one can already guess from Table 2, much more than half of the populations of South Asia and Africa live below Latin America's mean poverty line.

For all regions, the directions of change over time in the incidence of relative poverty are the same as for the absolute "$/day" measures in Table 2. This is true even when the poverty line varies with the mean, though naturally this attenuates the rate of poverty reduction in growing economies, and the rate of increase in contracting ones. A notable difference is for East Asia, where allowing for changes over time in the relative poverty line suggests that the absolute number of poor remained about the same in 1998 as 1987; indeed, excluding China we see rising numbers of relatively poor people in this region.

7. Did Rising Inequality Put a Brake on Aggregate Poverty Reduction?

There is a seemingly widespread view that rising income inequality between and within countries in the 1990s has been stifling the prospects for poverty reduction through economic growth.[23] As was shown in Ravallion *et al.* (1991),

[22]We present the (population-weighted) mean poverty lines in Table 4 for expository purposes only; country-specific poverty lines were used for the calculations.

[23]Ravallion (2001) reviews the recent debate on this issue.

TABLE 4

Relative Poverty

Region	Mean Poverty Line ($/day, 1993 PPP)		Headcount Index			Number of Poor (millions)		
	1987	1998	1987	1998 (no change in the poverty line over time)	1998 (poverty lines above $1.08 rise with mean)	1987	1998 (no change in the poverty line over time)	1998 (poverty lines above $1.08 rise with mean)
East Asia	1.29	1.68	33.01	20.06	28.44	518.25	364.51	516.78
(excluding China)	1.92	3.02	45.06	26.66	45.00	214.86	157.09	256.30
Eastern Europe and Central Asia	2.71	2.49	7.54	24.63	15.23	34.35	116.89	72.28
Latin America and Caribbean	3.31	3.67	50.20	47.05	48.91	208.43	236.05	245.38
Middle East and North Africa	1.78	1.68	18.93	15.19	11.66	41.03	43.40	33.31
South Asia	1.08	1.13	45.20	40.23	40.59	477.21	524.84	529.54
Sub-Saharan Africa	1.33	1.36	51.09	51.17	51.79	238.10	320.89	324.78
Total	1.59	1.81	36.31	31.91	34.25	1517.37	1606.58	1722.07
(excluding China)	1.79	2.03	39.34	36.83	38.69	1213.98	1393.15	1461.59

the world distribution of consumption in 1985 was such that it would not take much of an increase in overall inequality to wipe out the benefits to the world's poor of modest growth in consumption per capita.[24] And there is some evidence of rising inter-personal income inequality in the world (developing plus developed countries) around the late 1980s and early 1990s; Milanovic (2001) estimates that the world Gini index of inter-personal income inequality increased sharply from 0.63 to 0.66 between 1988 and 1993.

To see if worsening distribution was putting a brake on the aggregate rate of poverty reduction, imagine if all household consumptions in all countries grew at the growth rate in the population-weighted survey mean across our entire data set, namely 0.90 percent per capita per year between 1987 and 1998. Also imagine that the population weights stayed at their 1987 values. By construction then, the aggregate inter-personal Lorenz curve for our data set would also stay unchanged. The measured reduction in poverty can then be attributed solely to the growth in the overall survey mean.

Table 5 gives the results of this calculation. We find that the percentage of the population falling below the \$1/day line without any change in the overall Lorenz curve would have been 24.4 percent instead of the actual rate we estimate of 23.4 percent. Since poverty would have fallen less if the growth in mean household consumption per person had been distribution-neutral, we can conclude that the changes in inter-personal distribution were actually pro-poor over this period. Table 5 also gives the results by region. Of course, with distribution-neutral growth, poverty would fall less than it actually did in East Asia, and more than it actually did in Sub-Saharan Africa.

We can also see from Table 5 that the improvement in distribution is attributable almost entirely to growth in China. If we exclude China from the calculation, then we find that the poverty rate would have fallen to 25.2 percent without any change in distribution, compared to 25.6 percent under the actual changes.

These calculations hold the 1987 Lorenz curve constant over the whole data set; relative positions do not change either between or within countries. The last column of Table 5 gives the simulations implied by distribution-neutral growth *within* countries only—allowing the between-country distribution to change consistently with the data. Now we find a markedly lower poverty rate of 21.6 percent in 1998.

The results suggest that the between-country changes in distribution were poverty reducing in the aggregate; comparing the 1998 simulation in which the aggregate Lorenz curve is fixed with that in which it is only fixed within countries we see that the implied poverty rate is lower in the latter case. However, we can see some notable regional differences. In East Asia, the within-country distribution-neutral case implies lower poverty in 1998 than actually observed; in East Asia, the changes in distribution within countries had an offsetting effect on the impact of

[24]The simulations in Ravallion *et al.* (1991) indicated that about a 4 percent increase in the world's Gini index, spread over fifteen years from 1985, would be sufficient to wipe out the gains to the poor from a sustained 1 percent per annum rate of growth in consumption per capita. These simulations assumed that the world Lorenz curve shifts out by an equal proportion at all points (following the assumption made by Kakwani, 1993).

TABLE 5

SIMULATIONS OF DISTRIBUTION-NEUTRAL GROWTH

Region	1987	1998 Actual	1998 Simulations with no Change in the Aggregate Lorenz Curve	1998 Simulations with no Change in the Lorenz Curve Within Countries
		Headcount index (% under $1/day)		
East Asia	26.6	14.7	21.1	11.5
(excluding China)	23.9	9.4	18.9	11.4
Eastern Europe and Central Asia	0.2	3.7	0.2	0.6
Latin America and Caribbean	15.3	12.1	11.3	16.7
Middle East and North Africa	4.3	2.1	2.7	2.9
South Asia	44.9	40.0	39.4	38.8
Sub-Saharan Africa	46.6	48.1	44.0	43.2
Total	28.3	23.4	24.4	21.6
(excluding China)	28.5	25.6	25.2	24.9

growth in the survey means; the same is true in Sub-Saharan Africa. By contrast, the within-country distribution-neutral case shows markedly higher poverty in Latin America; in that region, the distributional changes were pro-poor.

These results do not support the view that rising inter-personal inequality in the developing world (either within or between countries) has been putting a brake on the aggregate rate of poverty reduction. In short, the proximate cause of slow progress in reducing poverty in the aggregate was not worsening distribution but too little growth.

Nonetheless, even when it is not rising, high inequality within countries is known to be an important constraint on prospects for pro-poor growth. There is evidence that the same rate of growth can have very different impacts on absolute consumption poverty, depending on the initial level of inequality (Ravallion, 1997). Indeed, inequality is too high in some countries to assure poverty-reducing growth, even when the fundamentals are conducive to growth.[25]

While Sub-Saharan Africa is certainly not the only region where high initial inequality impedes pro-poor growth, the depth of poverty (even relative to its high incidence) in that region carries a warning for the future. Africa will probably need a higher growth rate than South Asia (where the incidence of poverty is currently only slightly lower than Africa) to achieve the same rate of poverty reduction in the coming years. Yet Sub-Saharan Africa has experienced lower growth than other regions in the 1990s (World Bank, 2000a, 2000b).

8. CONCLUSIONS

We have provided new estimates of the extent and depth of absolute consumption poverty in the developing world, and the incidence of relative

[25]See Ravallion (1997), using cross-country panel data. On the role of inequalities in both non-income dimensions in inhibiting pro-poor growth, see also Ravallion and Datt (1999), using data for India.

consumption poverty, for 1987 and 1998. In measuring absolute consumption poverty we have followed past practice in using an international poverty line that accords with poverty lines typical of the poorest countries. This gives a poverty line of about $1 per day, though we have also considered a line arbitrarily set at twice this value. In estimating the incidence of relative consumption poverty, we also count as poor people who consumed more than $1 per day but less than one third of mean consumption in their country of residence. We have drawn on new household survey and price data, and all past estimates have been revised in the light of the new data.

We find that the percentage of the population of the developing world living below $1 per day in 1987 was 28 percent, and that it fell to 23 percent by 1998. Factoring in our allowance for low relative consumption brings the incidence of poverty in 1987 up to 36 percent, falling to 32-34 percent in 1998 (depending on whether one makes the poverty line relative over time as well as between countries). These aggregates hide diverse experiences over time and across regions. While the total number of people living below $1 per day stayed roughly constant, the number fell in three regions (East Asia, the Middle East–North Africa, and Latin America) and rose in the other three (Eastern Europe and Central Asia, South Asia and Sub-Saharan Africa).

Our results do not suggest that rising inequality between or within countries was putting a brake on overall progress in reducing the absolute number of poor in the 1990s. The more important factor appears to have been too little growth in average household living standards, given the persistence of the initial inequalities (in both income and non-income dimensions) that prevented the poor from participating fully in the growth that did occur.

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