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Economic Growth, Inequality and Poverty: Estimating the Growth Elasticity of Poverty

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Summary. — This paper uses a new data set of 126 intervals from 60 developing countries to analyze the growth elasticity of poverty, that is, how much does poverty decline in percentage terms with a given percentage rise in economic growth. The data set is both broader in coverage and more selective in terms of quality controls than those used in the past. The study finds that while economic growth does reduce poverty in developing countries, the rate of poverty reduction depends very much on how economic growth is defined. Controlling for changes in income inequality, when economic growth is measured by changes in survey mean income (consumption), the growth elasticity of poverty (excluding Eastern Europe and Central Asia) is −2.79; that is, a 10% increase in the survey mean will reduce poverty ($1.00/person/day) by 27.9%. But, when growth is measured by changes in GDP per capita, the growth elasticity of poverty is a statistically insignificant −2.27, which is lower than has previously been estimated.
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Key words — poverty, inequality, economic growth, growth elasticity of poverty

1. INTRODUCTION

Most economists and policy makers would now agree that economic growth—in the sense of rising per capita incomes or expenditures—reduces poverty in the developing world. The key policy question then becomes: to what extent does economic growth reduce poverty, that is, how much does a given rate of economic growth reduce poverty? Expressed in more technical terms, the question is: what is the "growth elasticity of poverty," that is, how much will poverty decline in percentage terms with a given percentage rise in economic growth?

During the 1990s the growth elasticity of poverty was usually estimated to be between −2.0 and −3.0 (Adams, 2003; Bruno, Ravallion, & Squire, 1998; Ravallion & Chen, 1997). This means that a 10% increase in economic growth (however measured) will lead to a 20–30% decrease in poverty (however measured). In other words, in a large enough selection of developing countries in which exactly half of the population lives in poverty, a 10% increase in economic growth will reduce the proportion of the poor population to between 35% and 40%.

New estimates made by Bhalla (2002) suggest, however, that these growth elasticities of poverty are too low, and that the "correct" growth elasticity of poverty should be about −5.0 (Table 10.2). In other words, in a large selection of developing countries, the same 10% increase in economic growth will reduce the percentage of the poor to about 25%, rather than to between 35% and 40%.

The difference between these "traditional" and "new" estimates of the growth elasticity of poverty is neither trivial nor academic. Many international agencies—such as the World Bank—and governmental organizations—such as the United States Agency for International Development (USAID)—spend much time and energy trying to calculate the number of poor people in the developing world. When projected into the future, all of these calculations hinge on the central question: how much does the number of poor people decline with a given rate of economic growth? Thus, using the lower, "traditional" growth elasticities of poverty, the World Bank (1999) recently estimated that there were 1.15 billion people living

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under the international poverty standard of \$1.00 per person per day, while Bhalla (2002, p. 202), using the "new," higher growth elasticities of poverty found that less than one-third that number of people—450 million—were living under that poverty standard.

The purpose of this study is neither to analyze the number of poor people living in the developing world nor to pinpoint the various technical ways in which the "traditional" and "new" estimates of the growth elasticity of poverty differ. Rather the goal of this study is more straightforward, namely, to show how estimates of the growth elasticity of poverty are sensitive to the measure of economic growth being used. In the past, most traditional estimates of the growth elasticity of poverty have used changes in mean income (consumption) as calculated from household budget surveys as their yardstick of economic growth. There are, however, other (more popular) measures of economic growth—such as changes in GDP per capita—which can be used to calculate economic growth. Most policymakers certainly think of economic growth in terms of GDP per capita, and studies in the economic growth literature invariably use GDP per capita as the standard measure of growth. In this context, one of the basic challenges of Bhalla's work (2002) is that it questions the validity of using changes in survey mean income (consumption) to calculate economic growth. Bhalla's work instead emphasizes the need to use national accounts data (the source of GDP per capita figures) to calculate economic growth. The core of Bhalla's argument is that using the survey mean as the measure of growth has the effect of seriously underestimating the growth elasticity of poverty in the developing world.

The contribution of this study is twofold. First, it constructs a new data set based on the latest household survey data to pinpoint the effect of economic growth on poverty in the developing world. This data set is new because it is both broader and more selective than those used in the past: it is broader in the sense of including more countries and time spans than used by Ravallion and Chen (1997) and others, and it is more selective in the sense of applying quality filters to the heterogeneous mix of primary and secondary data sources used by Bhalla (2002).[1] Second, the paper uses two different measures of economic growth—growth as measured by the changes in the survey mean and growth as measured by changes in GDP per capita—in analyzing the effect of growth on poverty. Since these two measures differ with respect to both the levels and rates of recorded economic growth, they also generate different estimates of the growth elasticity of poverty.

There are several possible ways for this study to proceed in using this new data set and these two measures of economic growth. On the one hand, it is possible to proceed directly to an explanation of the data set and the calculation of the relevant growth elasticities of poverty. But, this approach seems a bit too simplistic, both because of the large amount that has already been written on the growth-poverty relationship as well as the fact that the impact of economic growth on poverty depends to a large extent on how income distribution changes over time. In other words, the growth elasticity of poverty in any particular country depends greatly on the level of initial income inequality in that country. This makes it important to take a broader approach and explore the links between economic growth, poverty and income inequality.

Mindful of these issues, this paper adopts a more general approach to investigating the growth elasticity of poverty. It proceeds as follows. To set the stage, Section 2 reviews recent analytical arguments regarding the relationship between economic growth, poverty and income distribution. Section 3 then presents the new household data set, which contains detailed growth, poverty and inequality data for 60 low- and middle-income countries of the developing world. Section 4 discusses econometric methods for estimating the growth elasticity of poverty, and Section 5 describes the main findings of the new data set. The next two sections of the paper use the new data to analyze the relationship between growth and income distribution (Section 6) and to estimate the growth elasticity of poverty (Section 7) in the developing countries of the world. The final section, Section 8, summarizes.

2. THE DEBATE ABOUT ECONOMIC GROWTH, POVERTY AND INCOME DISTRIBUTION

In the past, some observers have argued that economic growth tends to increase—rather than reduce—poverty in the developing world. For instance, in 1974 Chenery, Ahluwalia, Bell, Duloy, and Jolly published an influential book in which they declared: "It is now clear that more than a decade of rapid growth in underdeveloped countries has been of little or no benefit to perhaps a third of their population" (1974, p. iii). Similarly, Adelman and Morris (1973) argued that: "Development is accompanied by an absolute as well as a relative decline in the average income of the very poor.... The frightening implication (of this) is that hundreds of millions of desperately poor people ... have been hurt rather than helped by economic development" (1973, pp. 189–193).

These early arguments on the relationship between growth and poverty were heavily influenced by the Kuznets hypothesis (1955, 1963). This hypothesis claims that growth and inequality are related in an inverted U-shaped curve: in the early stages of economic development, income distribution tends to worsen and does not improve until countries reach middle-income status. The implications of this hypothesis are obvious: if, in the early stages, economic growth leads to more inequality, then poverty might take many years to decline in the developing world.

The Kuznets hypothesis was based on data derived from cross-sectional data, that is, data from different countries observed at various stages of development at about the same point in time. If, however, the goal is to understand how growth affects inequality, what is really needed is time-series data which show how inequality changes within countries as they grow over time. In the last decade such time-series data have become available and have been analyzed by a number of studies, including Ravallion (1995), Deininger and Squire (1996, 1998), and Bruno *et al*., 1998. [2] The empirical findings of all of these more recent studies tend to reject the Kuznets hypothesis. In the words of Ravallion: "The rejection of the inverted U hypothesis (of the Kuznets curve) could not be more convincing... The data do *not* suggest that growth tends to either increase or decrease inequality" (1995, p. 415).

The most current thinking is that economic growth does not have much of an impact on inequality, because income distributions generally do not change much over time. According to Deininger and Squire (1996, p. 587), GDP per capita increased by 26% in the developing world during 1985–95, while Gini coefficients in the world changed by only 0.28 percentage points per year over the same period. [3]

Since income inequality tends to remain stable over time, economic growth can be expected to reduce poverty, at least to some extent. Exactly how much growth actually reduces poverty depends on at least two factors. The first is the rate of economic growth itself. Using an international poverty line of $1 per person per day, an econometric study by Bruno *et al*., 1998 for 20 developing countries over 1984–93 found that the growth elasticity of poverty was -2.12. This means that a 10% increase in economic growth (as measured by changes in survey mean income) can be expected to produce a 21.2% decrease in the proportion of the poor. The second factor affecting how much economic growth reduces poverty is the extent of inequality. In a straightforward statistical sense, economic growth can be expected to reduce poverty more if inequality falls, than if it does not. This expectation is confirmed by the previously cited study of Bruno *et al*., 1998. For the same 20 developing countries, these authors regressed the rate of change in poverty on both the change in growth (change in the survey mean) and the change in inequality (as measured by change in the Gini coefficient). They obtained statistically significant coefficients of -2.28 for the growth variable and 3.86 for the inequality variable. In other words, even small changes in the overall distribution of inequality can lead to sizeable changes in the incidence of poverty.

3. NEW DATA SET ON GROWTH, POVERTY AND INCOME DISTRIBUTION

To test these relationships, and to pinpoint more accurately the impact of economic growth on poverty and inequality, it is necessary to construct a new empirical data set. This data set should do three things: first, it should focus on the developing countries of the world; second, it should utilize the results of household budget surveys, since these surveys represent the best source of poverty information in most developing countries, and third, it should include *complete* growth, poverty and inequality for as many countries and time periods as possible.

Other observers have built such data sets to examine the impact of growth on poverty. Deininger and Squire (1996), for example, constructed a comprehensive data base on income distribution for 58 countries. But, this data base included only 26 developing countries, and did not contain any specific poverty data.

Ravallion and Chen (1997) and Chen and Ravallion (2000) also constructed useful data sets that had growth, poverty and income distribution data. For example, the 1997 data set used by Ravallion and Chen (1997) included 42 developing countries.

The purpose of this study is to expand the coverage of previous work by including the results of those country-level household surveys which have become available since 1997. Initially, the goal was to include all 157 developing countries which were classified as either "low-income" or "middle-income" countries by the World Bank in the *World Development Report, 2000/01*. [4] It proved impossible, however, to find poverty and inequality data for all of these countries since many of them have not conducted the type of nationally-representative household surveys that are needed to estimate poverty. For example, of the 157 countries only 81 countries (52%) have published the results of any national household survey.

This paper thus uses data from 60 "low-income" and "middle-income" countries; [5] all of these countries had at least two nationally-representative household surveys since 1980. The year 1980 was used as a cutoff point, because many of the pre-1980 household surveys were of suspect quality.

Table 1 gives the countries, geographical regions, dates and welfare indicators included in the new data set. The data set is notable in that it includes 13 countries from sub-Saharan Africa, a region for which household survey data are relatively rare. It also includes countries from all other regions of the developing world.

Since the goal is to examine how economic growth affects poverty and inequality, we need at least two surveys for each country. In the data set two surveys for one country define what is called an "interval." The data set includes a total of 126 intervals, which is considerably more than previous studies (Table 1). For example, the Ravallion and Chen (1997) study used only 64 intervals.

Not only is the new data set broader than previous studies, but it is also more selective in the sense of including a number of quality filters. Restrictive criteria are used in constructing the intervals: intervals must be two or more years in length, they must come from nationally-representative household surveys and intervals must use the same "welfare indicator"—either expenditure per person or income per person—over time. [6] This approach is much more "data selective" than the one used by Bhalla (2002), who generated poverty and inequality measures from a wide variety of secondary sources that were often not linked to nationally-representative surveys or that failed to use the same welfare indicator over time. For example, in reporting poverty data from 921 income distributions since 1950, Bhalla reported poverty data for countries which had not conducted households surveys before the 1980s (China) or the 1990s (Vietnam). Bhalla also used income distributions in which the poverty variable (expenditure or income) and/or the ranking variable (household or per person) was not clearly indicated. The result for Bhalla (2002) was a data set (600 distributions since 1980) that was very broad in coverage, but also one that failed to meet the type of more restrictive quality controls employed in this study.

Table 2 summarizes the information for the 126 intervals from the 60 countries in the data set. The poverty and inequality data in the table come from the World Bank, *Global Poverty Monitoring* database and the data on GDP growth come from the World Bank, 2001 World Development Indicators database.

Despite the various quality filters that were used, the data in Table 2 are not without their problems. Many of these problems have to do with the underlying differences between countries and over time concerning how the income and expenditure data in the various underlying household surveys were collected, tabulated and recorded. For example, some of the household surveys do not include valuations for consumption or income from own production, and most of the surveys exclude the imputed value of the benefits of public services (e.g., education, health) received by households. At present, it is not known how excluding these values affects poverty and inequality measures in individual countries. There are also concerns about how best to convert nominal values into real terms; the available consumer price indices do not always accurately reflect either urban and rural differences in the cost of living or the spending behavior of the poor. In addition to these problems, there is likely to be underestimation of income and expenditures in the data, particularly at the top, because the rich either are difficult to reach or are not anxious to participate in household surveys. While little can be done to fix these and other problems, it is possible to take partial account of such data problems

Table 1. *Coverage of the data set*

Country	Region	Income group[a]	Survey years	Welfare indicator
Algeria	Middle East, North Africa	Middle	1988, 1995	Expenditure
Bangladesh	South Asia	Low	1983/84, 1985/86, 1988/89, 1991/92, 1995/96	Expenditure
Belarus	Europe, Central Asia	Middle	1988, 1993, 1995	Income
Brazil	Latin America	Middle	1985, 1988, 1993, 1995, 1997	Income
Bulgaria	Europe, Central Asia	Middle	1989, 1992, 1995	Expenditure
Chile	Latin America	Middle	1987, 1990, 1992, 1994	Income
China (Rural)	East Asia	Middle	1990, 1992, 1994, 1996, 1998	Income
China (Urban)	East Asia	Middle	1990, 1992, 1994, 1996, 1998	Income
Colombia	Latin America	Middle	1988, 1991, 1995, 1996	Income
Costa Rica	Latin America	Middle	1986, 1990, 1993, 1996	Income
Côte d'Ivoire	Sub-Saharan Africa	Low	1985, 1987, 1993, 1995	Expenditure
Czech Republic	Europe, Central Asia	Middle	1988, 1993	Income
Dominican Republic	Latin America	Middle	1989, 1996	Income
Ecuador	Latin America	Middle	1988, 1995	Expenditure
Egypt (Rural)	Middle East, North Africa	Middle	1991, 1995	Expenditure
Egypt (Urban)	Middle East, North Africa	Middle	1991, 1995	Expenditure
El Salvador	Latin America	Middle	1989, 1996	Income
Estonia	Europe, Central Europe	Middle	1988, 1993, 1995	Income
Ethiopia	Sub-Saharan Africa	Low	1981, 1995	Expenditure
Ghana	Sub-Saharan Africa	Low	1987, 1989, 1992, 1997	Expenditure
Guatemala	Latin America	Middle	1987, 1989	Income
Honduras	Latin America	Middle	1989, 1992, 1994, 1996	Income
Hungary	Europe, Central Asia	Middle	1989, 1993	Income
India	South Asia	Low	1983, 1986, 1988, 1990, 1995, 1997	Expenditure
Indonesia	East Asia	Low	1987, 1993, 1996, 1998	Expenditure
Jamaica	Latin America	Middle	1988, 1990, 1993, 1996	Income
Jordan	Middle East, North Africa	Middle	1986/87, 1992, 1997	Expenditure
Kazakhstan	Europe, Central Asia	Middle	1988, 1993, 1996	Income/Expenditure
Kenya	Sub-Saharan Africa	Low	1992, 1994	Expenditure
Kyrgyz Republic	Europe, Central Asia	Low	1988, 1993, 1997	Income
Latvia	Europe, Central Asia	Middle	1988, 1993, 1995, 1998	Income
Lesotho	Sub-Saharan Africa	Low	1986/87, 1993	Expenditure
Lithuania	Europe, Central Asia	Middle	1988, 1993, 1996	Income/Expenditure
Madagascar	Sub-Saharan Africa	Low	1980, 1993/94	Expenditure
Mali	Sub-Saharan Africa	Low	1989, 1994	Expenditure
Mauritania	Sub-Saharan Africa	Low	1988, 1993, 1995	Expenditure

Table 1—*continued*

Country	Region	Income group[a]	Survey years	Welfare indicator
Mexico	Latin America	Middle	1984, 1989, 1992, 1995	Income
Moldova	Europe, Central Asia	Low	1988, 1992	Income
Morocco	Middle East, North Africa	Middle	1984/85, 1990	Expenditure
Nepal	South Asia	Low	1985, 1995	Expenditure
Niger	Sub-Saharan Africa	Low	1992/93, 1995	Expenditure
Pakistan	South Asia	Low	1987/88, 1990/91, 1993, 1996/1997	Expenditure
Panama	Latin America	Middle	1989, 1991, 1995, 1997	Income/Expenditure
Paraguay	Latin America	Middle	1990, 1995	Income
Peru	Latin America	Middle	1985, 1994, 1997	Expenditure/Income
Philippines	East Asia	Middle	1985, 1988, 1991, 1994, 1997	Expenditure
Poland	Europe, Central Asia	Middle	1985, 1987, 1990, 1993	Income/Expenditure
Romania	Europe, Central Asia	Middle	1989, 1992, 1994	Income
Russian Federation	Europe, Central Asia	Middle	1994, 1996, 1998	Expenditure
Senegal	Sub-Saharan Africa	Low	1991, 1994	Expenditure
Slovak Republic	Europe, Central Asia	Middle	1988, 1993	Income
Sri Lanka	South Asia	Middle	1985, 1990, 1995	Expenditure
Tanzania	Sub-Saharan Africa	Low	1991, 1993	Expenditure
Thailand	East Asia	Middle	1988, 1992, 1996, 1998	Expenditure
Tunisia	Middle East, North Africa	Middle	1985, 1990	Expenditure
Turkey	Europe, Central Asia	Middle	1987, 1994	Expenditure
Turkmenistan	Europe, Central Asia	Low	1988, 1993	Income
Uganda	Sub-Saharan Africa	Low	1989, 1992/93	Expenditure
Ukraine	Europe, Central Asia	Low	1989, 1992, 1996	Income/Expenditure
Uzbekistan	Europe, Central Asia	Low	1988, 1993	Income
Venezuela	Latin America	Middle	1981, 1987, 1989, 1993, 1996	Income
Zambia	Sub-Saharan Africa	Low	1991, 1993, 1996	Expenditure

Sources. World Bank, Global Poverty Monitoring database.

[a] Income group classifications come from World Bank, *World Development Report*, 2000–01. Low-income includes countries with 1999 GNP per capita $756 or less; middle-income includes countries with 1999 GNP per capita of $756 to $9,265. In 2000–01, there was a total of 157 low-income and middle-income countries.

Table 2. *Summary of survey data on poverty, income distribution and growth*

Country	Survey year	Poverty headcount ($1/person/day)	Poverty gap (%)	Squared poverty gap	Gini coefficient	Survey mean ($/person/month)	Percent change in survey mean	Percent change in GDP per capita, PPP (1993$)
Algeria	1988	1.75	0.64	0.48	40.14	168.79		
Algeria	1995	1.16	0.23	0.09	35.33	157.93	−6.44	2.24
Bangladesh	1983/84	26.16	5.98	1.96	25.88	48.16		
Bangladesh	1985/86	21.96	3.92	1.08	26.92	52.74	9.51	14.25
Bangladesh	1988/89	33.75	7.72	2.45	28.85	46.68	−7.7	22.87
Bangladesh	1991/92	35.86	8.77	2.98	28.27	44.88	−7.81	9.99
Bangladesh	1995/96	29.07	5.88	1.60	33.63	55.20	22.99	21.85
Belarus	1988	0	0	0.00	22.76	203.17		
Belarus	1993	1.06	0.13	0.03	21.6	82.49	−59.4	−5.54
Belarus	1995	2.27	0.71	0.46	28.76	114.18	38.42	−18.1
Brazil	1985	15.8	4.69	1.82	59.5	196.46		
Brazil	1988	18.62	6.78	3.22	62.4	202.7	3.17	29.83
Brazil	1993	18.79	8.38	5.01	61.5	189.89	−6.32	1.83
Brazil	1995	13.94	3.94	1.46	60	215.61	13.54	18.2
Brazil	1997	5.1	1.32	0.5	51.7	270.86	25.62	4.32
Bulgaria	1989	0	0	0.00	23.33	315.08		
Bulgaria	1992	0	0	0.00	30.8	300.95	−4.49	−15.52
Bulgaria	1995	0	0	0.00	28.25	163.91	−45.54	13.49
Chile	1987	10.2	2.25	0.66	56.4	197.47		
Chile	1990	8.26	2.03	0.73	56.1	206.9	4.77	20.34
Chile	1992	3.91	0.74	0.23	55.7	244.34	18.13	23.06
Chile	1994	4.18	0.65	0.15	54.8	251.84	3.03	13.91
China (Rural)	1990	50.27	16.38	7.26	33.5	38.47		
China (Rural)	1992	40.62	12.33	5.20	38.98	44.00	14.37	29.13
China (Rural)	1994	34.64	11.35	5.29	43.34	48.40	10	29.81
China (Rural)	1996	24.11	6.71	2.84	39.8	59.02	21.94	25.25
China (Rural)	1998	24.14	6.88	3.02	40.3	58.84	−0.31	13.65
China (Urban)	1990	0.95	0.04	0.01	33.5	99.54		
China (Urban)	1992	0.83	0.29	0.24	38.98	114.02	14.55	29.13
China (Urban)	1994	0.86	0.23	0.13	43.34	133.96	17.49	29.81
China (Urban)	1996	0.46	0.13	0.08	39.8	144.90	8.17	25.25
China (Urban)	1998	0.98	0.39	0.33	40.3	156.26	7.84	13.65
Colombia	1988	4.47	1.31	0.57	53.11	322.41		
Colombia	1991	2.82	0.75	0.33	51.32	349.96	8.54	6.89

Table 2—*continued*

Country	Survey year	Poverty headcount ($1/person/day)	Poverty gap (%)	Squared poverty gap	Gini coefficient	Survey mean ($/person/ month)	Percent change in survey mean	Percent change in GDP per capita, PPP (1993$)
Colombia	1995	8.87	2.05	0.63	57.4	218.51	−37.57	23.17
Colombia	1996	10.99	3.16	1.21	57.14	207.59	−5	2.34
Costa Rica	1986	12.52	5.44	3.27	34.42	101.52		
Costa Rica	1990	11.08	4.19	2.37	45.66	149.45	47.21	28.04
Costa Rica	1993	10.3	3.53	1.80	46.28	155.92	4.33	11.97
Costa Rica	1996	9.57	3.18	1.55	47.08	169.40	8.64	14.4
Côte d'Ivoire	1985	4.71	0.59	0.11	41.21	146.89		
Côte d'Ivoire	1987	3.28	0.41	0.09	40.01	131.23	−10.67	10.62
Côte d'Ivoire	1993	9.88	1.86	0.55	36.91	91.52	−30.26	1.03
Côte d'Ivoire	1995	12.29	2.4	0.71	36.68	85.29	−6.81	3.23
Czech Republic	1988	0	0	0	19.4	235.17		
Czech Republic	1993	0	0	0	26.6	206.28	−12.29	NA
Dominican Republic	1989	7.73	1.51	0.42	50.46	172.90		
Dominican Republic	1996	3.19	0.71	0.26	48.71	242.85	40.45	25.65
Ecuador	1988	24.85	10.21	5.82	43.91	74.79		
Ecuador	1995	20.21	5.77	2.27	43.73	88.97	18.96	16.58
Egypt (Rural)	1991	3.97	0.53	0.13	36	88.63		
Egypt (Rural)	1995	1.06	0.06	0.01	23.5	69.56	−21.52	17.32
Egypt (Urban)	1991	3.97	0.53	0.13	34	88.63		
Egypt (Urban)	1995	5.55	0.66	0.14	33.1	85.48	−3.56	17.32
El Salvador	1989	25.49	13.72	10.06	48.96	91.09		
El Salvador	1996	25.26	10.35	5.79	52.25	101.21	11.11	41.23
Estonia	1988	0	0	0	22.9	225.12		
Estonia	1993	3.15	0.91	0.51	39.5	142.05	−36.91	−28.72
Estonia	1995	4.85	1.18	0.39	35.3	149.6	5.31	9.45
Ethiopia	1981	32.73	7.69	2.71	32.42	50.26		
Ethiopia	1995	31.25	7.95	2.99	39.96	59.20	17.79	36.77
Ghana	1987	47.68	16.60	7.82	35.35	76.90		
Ghana	1989	50.44	17.71	8.36	35.99	79.85	3.83	9.8
Ghana	1992	45.31	13.74	5.62	33.91	122.03	52.82	9.71
Ghana	1997	44.81	17.28	8.70	32.72	25.69	−78.95	16.58
Guatemala	1987	47.04	22.47	13.63	58.26	66.38		
Guatemala	1989	39.81	19.79	12.59	59.6	84.50	27.3	8.58
Honduras	1989	44.67	20.65	12.08	59.49	74.40		

Honduras	1992	38.98	17.74	10.41	54.51	74.93	0.71	6.93
Honduras	1994	37.93	16.6	9.38	55.22	78.04	4.15	2.88
Honduras	1996	40.49	17.47	9.72	53.72	70.37	−9.83	6.94
Hungary	1989	0	0	0	23.3	211.8		
Hungary	1993	0	0	0	27.9	157.22	−25.77	−11.43
India	1983	52.55	16.27	NA	32.06	43.67		
India	1986	47.46	13.92	NA	33.68	47.14	7.95	26.23
India	1988	47.99	13.51	NA	32.93	46.86	−0.6	27.99
India	1990	45.95	12.63	NA	31.21	46.24	−1.33	4.41
India	1995	46.75	12.72	NA	36.32	47.61	2.96	38
India	1997	44.03	11.96	NA	37.83	49.92	4.85	8.51
Indonesia	1987	28.08	6.08	1.78	33.09	55.67		
Indonesia	1993	14.82	2.08	0.39	31.69	68.54	23.11	55.87
Indonesia	1996	7.81	0.95	0.18	36.45	86.62	26.37	24.96
Indonesia	1998	26.33	5.43	1.70	31.51	61.19	−29.36	−7.83
Jamaica	1988	5.02	1.38	0.67	43.16	151.91		
Jamaica	1990	0.62	0.03	0.01	41.79	168.85	11.15	11.79
Jamaica	1993	4.52	0.86	0.29	37.92	118.43	−29.87	2.59
Jamaica	1996	3.15	0.73	0.33	36.43	124.94	5.49	3.39
Jordan	1986/87	0	0	0.00	36.06	268.80		
Jordan	1992	0.55	0.12	0.05	43.36	211.30	−21.4	−3.61
Jordan	1997	0.36	0.1	0.06	36.42	183.89	−12.98	5.34
Kazakhstan	1988	0.05	0.02	0.01	25.74	195.62		
Kazakhstan	1993	1.06	0.04	0.01	32.67	132.69	−32.17	−24.7
Kazakhstan	1996	1.49	0.27	0.10	35.4	162.70	22.76	−11.35
Kenya	1992	33.54	12.82	6.62	57.46	89.71		
Kenya	1994	26.54	9.03	4.50	44.54	73.74	−17.81	1.82
Kyrgyz Republic	1988	0	0	0.00	26.01	180.65		
Kyrgyz Republic	1993	22.99	10.87	6.82	53.7	121.54	−32.73	−25.97
Kyrgyz Republic	1997	1.57	0.28	0.10	40.5	166.01	36.59	−6.67
Latvia	1988	0	0	0.00	22.49	407.89		
Latvia	1993	0	0	0.00	26.98	153.33	−62.41	−41.89
Latvia	1995	0	0	0.00	28.47	181.60	18.44	7.15
Latvia	1998	0.19	0.01	0.00	32.37	181.42	−0.1	19.02
Lesotho	1986/87	30.34	12.66	6.85	56.02	101.93		
Lesotho	1993	43.14	20.26	11.84	57.94	80.16	−21.36	82.19
Lithuania	1988	0	0	0.00	22.48	381.87		
Lithuania	1993	16.47	3.37	0.95	33.64	67.86	−82.23	−35.75
Lithuania	1996	0	0	0.00	32.36	171.25	152.36	5.39

Table 2—*continued*

Country	Survey year	Poverty headcount ($1/person/day)	Poverty gap (%)	Squared poverty gap	Gini coefficient	Survey mean ($/person/ month)	Percent change in survey mean	Percent change in GDP per capita, PPP (1993$)
Madagascar	1980	49.18	19.74	10.21	46.85	50.14		
Madagascar	1993/94	60.17	24.46	12.83	43.44	39.07	−22.08	17.15
Mali	1989	16.46	3.92	1.39	36.51	76.75		
Mali	1994	72.29	37.38	23.09	50.5	32.47	−57.7	3.48
Mauritania	1988	40.64	19.07	12.75	42.53	48.10		
Mauritania	1993	49.37	17.83	8.58	50.05	54.53	13.37	20.17
Mauritania	1995	30.98	9.99	4.60	38.94	59.50	9.11	5.46
Mexico	1984	12.05	2.65	0.78	54	120.97		
Mexico	1989	16.20	5.63	2.75	55.1	149.21	23.34	21.13
Mexico	1992	13.31	3.23	1.04	54.3	128.39	−14.96	13.56
Mexico	1995	17.9	6.15	2.92	53.7	133.42	3.92	3.36
Moldova	1988	0	0	0	24.14	324.88		
Moldova	1992	7.31	1.32	0.32	34.43	106.24	−67.3	−45.68
Morocco	1984/85	2.04	0.7	0.50	39.19	153.80		
Morocco	1990	0.14	0.02	0.01	39.2	211.72	37.66	44.14
Nepal	1985	35.76	8.68	3.02	33.44	56.30		
Nepal	1995	37.68	9.74	3.71	38.78	52.60	−6.58	74.23
Niger	1992/93	41.73	12.46	5.29	36.1	47.07		
Niger	1995	61.42	33.93	23.66	50.61	36.17	−23.16	5.39
Pakistan	1987/88	49.63	14.85	6.03	33.35	41.05		
Pakistan	1990/91	47.76	14.57	6.04	33.23	41.66	1.48	14.93
Pakistan	1993	33.9	8.44	3.01	34.22	51.56	23.76	15.28
Pakistan	1996/97	30.96	6.16	1.87	31.24	50.22	−2.6	11.63
Panama	1989	16.57	7.84	4.9	56.5	198.37		
Panama	1991	18.9	8.87	5.48	56.8	175.91	−11.33	18.73
Panama	1995	14.73	6.15	3.39	57	209	18.81	20.55
Panama	1997	10.31	3.15	3.67	48.5	188.59	−9.77	7.71
Paraguay	1990	11.05	2.47	0.80	39.74	106.77		
Paraguay	1995	19.36	8.27	4.65	59.13	170.69	59.86	16.73
Peru	1985	1.14	0.29	0.14	45.72	264.48		
Peru	1994	9.13	2.37	0.92	44.58	137.48	−48.02	22.16
Peru	1997	15.49	5.38	2.81	46.24	112.09	−18.47	15.72
Philippines	1985	22.78	5.32	1.66	41.04	74.98		
Philippines	1988	18.28	3.59	0.94	40.68	82.79	10.42	31.62
Philippines	1991	15.7	2.79	0.66	43.82	87.75	5.99	2.94

Philippines	1994	18.36	3.85	1.07	42.89	89.10	1.54	4.9
Philippines	1997	14.4	2.85	0.75	46.16	110.19	23.67	11.87
Poland	1985	0	0	0	25.3	211.26		
Poland	1987	0	0	0	25.5	215.84	2.16	NA
Poland	1990	0.08	0.03	0.02	28.3	201.78	−6.52	1.52
Poland	1993	5.4	4.3	4.84	23.1	161.29	−20.07	1.07
Romania	1989	0	0	0.00	23.31	191.03		
Romania	1992	0.8	0.34	0.31	25.46	144.27	−24.48	−18.32
Romania	1994	2.81	0.76	0.43	28.2	99.92	−30.75	9.4
Russian Federation	1994	6.23	1.6	0.55	43.59	184.06		
Russian Federation	1996	7.24	1.6	0.47	48.05	175.45	−4.68	−2.77
Russian Federation	1998	7.05	1.45	0.39	48.72	173.33	−1.21	−2.34
Senegal	1991	45.38	19.95	11.18	54.12	63.70		
Senegal	1994	26.26	7.04	2.73	41.28	67.87	6.54	2.66
Slovak Republic	1988	0	0	0	19.5	179.6		
Slovak Republic	1993	0	0	0	19.5	251.2	39.8	−19.5
Sri Lanka	1985	9.39	1.69	0.50	32.47	78.77		
Sri Lanka	1990	3.82	0.67	0.23	30.1	86.84	10.24	39.43
Sri Lanka	1995	6.56	1	0.26	34.36	88.33	1.71	36.62
Tanzania	1991	48.54	24.42	15.41	59.01	66.22		
Tanzania	1993	19.89	4.77	1.66	38.1	73.26	10.63	1.51
Thailand	1988	25.91	7.36	2.55	43.84	90.46		
Thailand	1992	6.02	0.48	0.05	46.22	129.80	43.49	47.27
Thailand	1996	2.2	0.14	0.01	43.39	143.87	10.84	42.38
Thailand	1998	0	0	0.00	41.36	138.88	−3.47	−12.92
Tunisia	1985	1.67	0.34	0.13	43.43	189.63		
Tunisia	1990	1.26	0.33	0.17	40.24	204.00	7.58	27.12
Turkey	1987	1.49	0.36	0.17	43.57	180.59		
Turkey	1994	2.35	0.55	0.24	41.53	170.34	−5.68	25.39
Turkmenistan	1988	0	0	0.00	26.39	111.69		
Turkmenistan	1993	20.92	5.69	2.10	35.76	69.91	−37.41	−15.36
Uganda	1989	39.17	14.99	7.57	44.36	57.57		
Uganda	1992/93	36.7	11.44	5.00	39.16	53.86	−6.45	17.1
Ukraine	1989	0	0	0.00	23.31	309.85		
Ukraine	1992	0.04	0.01	0.01	25.71	191.70	−38.14	−17.42
Ukraine	1996	0	0	0.00	32.53	120.14	−37.32	−43.02
Uzbekistan	1988	0	0	0.00	24.95	204.40		
Uzbekistan	1993	3.29	0.46	0.11	33.27	116.28	−43.12	−27.33

Table 2—*continued*

Country	Survey year	Poverty headcount ($1/person/day)	Poverty gap (%)	Squared poverty gap	Gini coefficient	Survey mean ($/person/ month)	Percent change in survey mean	Percent change in GDP per capita, PPP (1993$)
Venezuela	1981	6.3	1.08	0.25	55.6	258.09		
Venezuela	1987	6.6	1.04	0.22	53.4	229.06	−11.25	18.87
Venezuela	1989	8.49	1.77	0.49	55.7	219.49	−4.18	0.75
Venezuela	1993	2.66	0.57	0.22	41.6	178.14	−18.84	17.99
Venezuela	1996	14.69	5.62	3.17	48.7	132.92	−25.39	0.3
Zambia	1991	58.59	31.04	20.18	48.29	39.09		
Zambia	1993	69.16	38.49	25.71	46.18	28.70	−26.58	0.76
Zambia	1996	72.63	37.75	23.88	49.79	31.11	8.39	−8.83

Sources: All data from household budget surveys conducted in individual countries, and reported in World Bank, *Global Poverty Monitoring* database. Data on changes in GDP per capita are measured in purchasing power parity (PPP) exchange rates, whereby local currencies are converted into international dollars. Data on changes in GDP measured in PPP units are from World Bank, 2001c *World Development Indicators* database.

by using methods of analysis that are not too sensitive to the errors in the data.

In measuring changes in poverty, Table 2 uses three different poverty measures. The first, the headcount index, set at $1 per person per day, measures the percent of the population living beneath that poverty line in various survey years. However, the headcount index ignores the amounts by which the expenditures (income) of the poor fall short of the poverty line. For this reason, Table 2 also reports the poverty gap index, which measures in percentage terms how far the average expenditures (income) of the poor fall short of the poverty line. For instance, a poverty gap of 10% means that the average expenditure (income) of the poor is 90% of the poverty line. The third poverty measure—the squared poverty gap index—indicates the severity of poverty. The squared poverty gap index possesses useful analytical properties, because it is sensitive to changes in distribution among the poor. In other words, while a transfer of expenditures from a poor person to a poorer person will not change the headcount index or the poverty gap index, it will decrease the squared poverty gap index.

To ensure comparability across countries, all of the poverty lines in Table 2 are international poverty lines, set at estimates of $1.08 per person per day in 1993 purchasing power parity (PPP) exchange rates. [7] The PPP exchange rates are used so that $1.08 is worth roughly the same in all countries. PPP values are calculated by pricing a representative bundle of goods in each country and comparing the local cost of that bundle with the US dollar cost of the same bundle. In calculating PPP values, the comparison of local costs with US costs is done using conversion estimates produced by the World Bank. [8]

To measure changes in inequality, Table 2 uses the Gini coefficient. In the table this measure is normalized by household size and the distributions are weighted by household size so that a given quintile (such as the lowest quintile) has the same share of population as other quintiles across the sample.

Table 2 presents two measures of economic growth: (a) changes in the level of mean expenditure (income) per person, as calculated from the household surveys; and (b) changes in GDP per capita, in PPP units, as measured from national accounts data. Unfortunately, these two measures of economic growth do not often agree. For instance, in Table 2 the two growth measures move in opposite directions about one-third of the time (47 of 126 intervals). This is not surprising, given their differences in definitions and coverage. Growth as measured by the survey mean comes from the household survey itself, so it is usually closely correlated with observed changes in household expenditures (income). But, growth as measured by GDP data comes from the national accounts, which measure household expenditure as a residual item, so that errors and omission elsewhere in the accounts automatically affect the calculation of household expenditures. A major problem here is business expenditure, which has to be estimated and subtracted from expenditure totals in order to arrive at the expenditure of households. Since the national accounts data also include many items (such as the expenditures of nonprofit organizations and the imputed rent of owner-occupied dwellings) which are not included in the household surveys, it is little wonder that the two measures of growth do not correspond.

Which of these measures of economic growth is more accurate? According to Deaton, who has spent many years trying to reconcile household survey and national accounts measures of growth in India, [9] the best answer is:

> We don't know, although it seems safe to say that there are almost certainly errors in both the (national accounts and the household survey figures). There is a longstanding prejudice by many economists against using surveys and in favor of (using) national accounts (to measure growth), (however) this is probably without basis (2001, p. 133).

In this study we will use the unique approach of using both measures of economic growth to estimate the growth elasticity of poverty. Most other growth and poverty studies typically only report growth as defined by changes in the survey mean to estimate growth and poverty relationships.

4. ECONOMETRIC METHODS FOR ESTIMATING GROWTH, POVERTY AND INEQUALITY REGRESSIONS

Our goal is to use the new data to analyze how economic growth affects poverty and income distribution in the developing world. The new data are, however, riddled with measurement error and noncomparabilities. The household survey data are plagued by problems in the accuracy of household response, and the national accounts data measure household expenditure as a residual item. When the data are used in crosscountry regressions, these errors in measurement behave like country-level fixed effects, although they also cause artificial variation over time. This means that there is latent heterogeneity in distribution. Combining these various features, the type of relationship that we want to estimate can be expressed following an expanded version of the model suggested by Ravallion and Chen (1997) [10]:

$$\mathrm{Log} P_{it} = \alpha_i + \beta \log \mu_{it} + \gamma \log g_{it} + \delta t + \epsilon_{it} \quad (i = 1, \ldots, N;\ t = 1, \ldots, T_i), \tag{1}$$

where P is the measure of poverty in country i at time t, α_i is a fixed-effect reflecting time differences between countries in distribution, β is the "growth elasticity of poverty" with respect to mean expenditure (or mean GDP) given by μ_{it}, γ is the elasticity of poverty with respect to income inequality given by the Gini coefficient, g, δ is a trend rate of change over time t, and ϵ_{it} is a white-noise error term that includes errors in the poverty measure.

Taking first differences in Eqn. (1), α_i, the fixed effect term, can be eliminated in order to obtain:

$$\Delta \log P_{it} = \delta + \beta \Delta \log \mu_{it} + \gamma \Delta \log g_{it} + \Delta \varepsilon_{it} - \beta \Delta v_{it} - \gamma \Delta \mu_{it} \tag{2}$$

In Eqn. (2) the rate of poverty reduction (P) is regressed on the rate of growth in mean consumption (or GDP per capita) and the rate of change in income inequality (Gini coefficient). This is the basic equation that will be estimated here.

As Ravallion and Chen (1997) note, however, the difference transformation that is used to obtain Eqn. (2) introduces a first difference in the original error term (ε_{it}). If the latter is white noise, then the new error process in Eqn. (2) is correlated within countries and over time. This means that successive intervals for a given country are not statistically independent, because they have one household survey (or one national accounts) in common. Conventional methods of calculating standard errors then have to be modified to take account of the variance–covariance matrix of the error process $\Delta\varepsilon_{it}$. In this study we correct all standard errors and t-ratios to take account of the error covariance of this specification.

5. MAIN FINDINGS OF NEW DATA SET

Table 2 shows that definite changes took place in the poverty and income distribution measures over 1980–99. Poverty, when measured by the headcount index of $1.00 per person per day, declined in slightly less than half (60 of 126) of the intervals in the data set. The poverty gap index also declined in about half (64 of 126) of the intervals. But, income inequality, as measured by the Gini coefficient, increased in more than half (66 of 126) of the intervals.

At the country level, some of the changes in poverty and inequality in Table 2 are quite large. For example, in Mali the headcount index of poverty increased from 16.5% to 72.3% during 1989–94. This is, however, clearly an exception. In Table 2 the headcount index of poverty changed by 10 or more percentage points in only 15% (19 of 126) of the intervals. Moreover, many of these large, over 10-percentage point changes in the headcount index of poverty were caused by easily-identifiable external factors, such as the collapse of the Soviet Union (which led to large increases in poverty in the Kyrgyz Republic, Lithuania and Turkmenistan), the collapse of South Asian currencies in the late 1990s (which prompted a sharp rise in poverty in Indonesia) and the re-introduction of capitalism in China (which led to a large decline in poverty in rural China). On the other hand, most of the unexplainable, over 10-percentage point changes in the headcount index of poverty index in Table 2 occurred in sub-Saharan Africa. Some of these large changes in poverty in sub-Saharan Africa are likely to due to measurement error in the underlying household surveys, particularly as it relates to measuring and valuing in-kind consumption, especially consumption from own-household production. It is likely that household surveys in sub-Saharan Africa are still not as consistent at including in-kind consumption in the total expenditure aggregate as surveys in other regions of the world.

Table 3. *Regional summary of changes in growth and income distribution*[a]

Designation	Number of intervals	Real survey mean per capita household income or consumption: Number of intervals for which it Fell	Real survey mean: Number of intervals for which it Rose	Real survey mean: Mean rate of change (percent per year)	GDP per capita, 1993 PPP values: Number of intervals for which it Fell	GDP per capita: Number of intervals for which it Rose	GDP per capita: Mean rate of change (percent per year)	Inequality[b]: Number of intervals for which it Fell	Inequality: Number of intervals for which it Rose	Inequality: Mean rate of change (percent per year)
East Asia	18	3	15	3.58 (5.95)	2	16	7.33 (6.15)	8	10	1.62 (4.48)
Eastern Europe and Central Asia	37	26	11	−3.87 (11.81)	22	15	−1.76 (5.72)	9	28	2.92 (5.45)
Latin America and the Caribbean	30	11	19	0.87 (6.48)	0	30	3.80 (2.65)	18	12	0.07 (3.22)
Middle East and North Africa	7	5	2	−1.04 (3.92)	1	6	2.95 (2.75)	5	2	−2.02 (4.14)
South Asia	15	6	9	1.36 (3.15)	0	15	5.95 (2.58)	6	9	0.82 (2.13)
Sub-Saharan Africa	19	11	8	−3.32 (9.27)	1	18	2.36 (2.63)	12	7	−1.67 (7.53)
Low-income countries	42	24	18	−2.82 (8.79)	9	33	1.95 (5.49)	20	22	0.38 (6.44)
Middle-income countries	84	38	46	0.19 (8.61)	15	69	3.13 (5.24)	37	47	1.07 (4.32)
Total	126	62	64	−0.81 (8.75)	24	102	2.73 (5.34)	57	69	0.83 (5.11)
Total (excluding Eastern Europe and Central Asia)	89	36	53	0.46 (6.81)	2	87	4.50 (3.99)	48	41	−0.03 (4.73)

[a] Numbers in parentheses are standard deviations.
[b] Inequality is measured by the Gini coefficient.

6. ECONOMIC GROWTH AND INCOME DISTRIBUTION

Table 3 provides a regional summary of how economic growth affects inequality. As might be expected, the two measures of economic growth suggest different rates of change. Economic growth, as measured by the survey mean, rose in 64 of the 126 intervals, but the average rate of change was slightly negative: −0.81% per year. But, economic growth as measured by GDP per capita was much stronger: GDP per capita rose in 102 of the 126 intervals and increased at an average rate of 2.73% per annum. [11]

Whatever the correct rate of economic growth was, inequality rose in slightly more than half (69) of the intervals in the data set. But, the average annual rate of increase in the Gini coefficient was small: only 0.83% per year.

Table 3 shows that economic growth was much more rapid in the middle-income countries than in the low-income countries. This was a reflection of slow (and sometimes negative) growth in two regions of the world: Eastern Europe and Central Asia, and sub-Saharan Africa. About half of the Eastern Europe and Central Asian countries are classified as "low income," and all of the sub-Saharan countries fall into this category. The disappointing rates of economic growth in these two regions pulled down the averages for low-income countries as a whole.

Among the various regions of the world, Eastern Europe and Central Asia was clearly the worst performer in terms of both growth and inequality. According to Table 3, economic growth declined between 1.76% and 3.87% per year in Eastern Europe and Central Asia and inequality increased at a high average rate of 2.92 per annum. [12] As noted above, this disappointing performance was caused by the collapse of the Soviet Union. After the Soviet Union folded, wage and income opportunities for millions of workers in the region declined dramatically, while returns to risk and entrepreneurship increased substantially for a select few. Because of these large changes in growth and inequality in Eastern Europe and Central Asia, the rest of this analysis will distinguish changes in Eastern Europe and Central Asia from those in other regions of the world.

The focus in Table 3 is on average rates of change in growth and inequality, but there is obviously considerable variation between regions and countries over time. On a regional basis, Eastern Europe and Central Asia usually has the highest rates of standard deviation for economic growth and inequality, followed by sub-Saharan Africa. The reasons for the high variation in the figures for Eastern Europe and Central Asia have already been discussed, but those for sub-Saharan Africa are less clear. In the case of sub-Saharan Africa, the large variation in inequality (SD = 7.53) may reflect measurement problems in household surveys relating to counting the imputed value of consumption (income) from ownproduction activities.

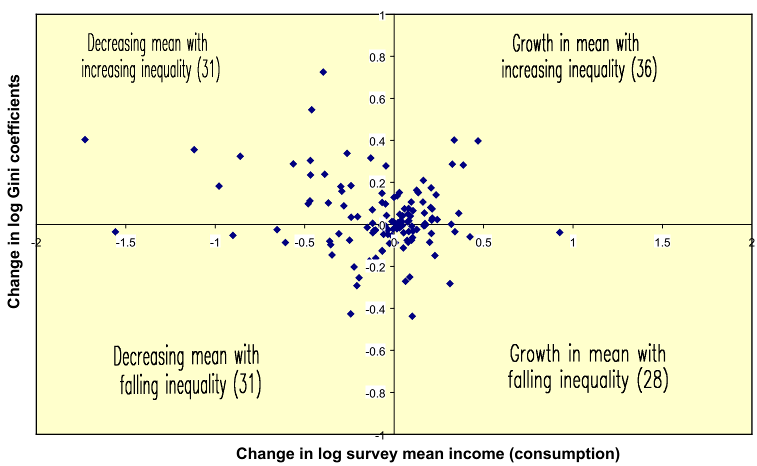

Figure 1. *Growth and inequality, plotted using survey mean income (consumption).*

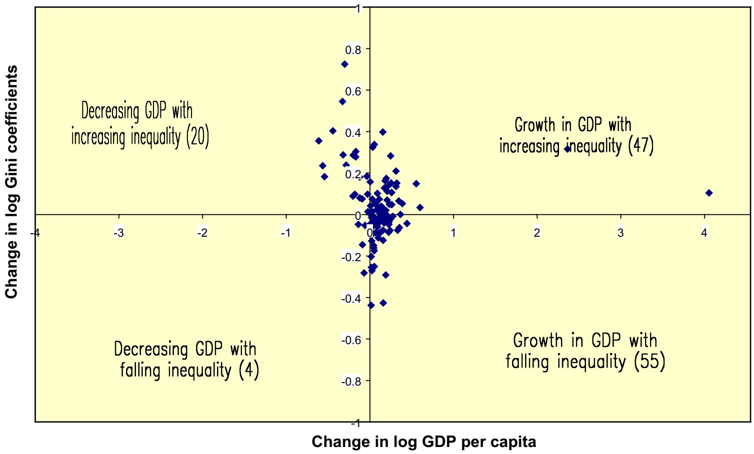

Figure 2. *Growth and inequality, plotted using GDP per capita, 1993 PPP values.*

Figures 1 and 2 broaden the examination of growth and inequality by plotting changes in the (log) Gini coefficient against changes in the two measures of economic growth—(log) real survey mean income (consumption) (Figure 1) and (log) GDP per capita (Figure 2)—for all 126 intervals in the data set. [13] Two results emerge. First, the relationship between inequality and growth varies for different measures of growth. When growth is measured by the survey mean, inequality and growth have a highly variable and negative correlation of −0.217 across all 126 intervals; when growth is measured by GDP per capita, inequality and growth have a tighter, and much less negative correlation of −0.055. Second, there appears to be no particular relationship between economic growth and inequality. If there was a strong tendency for economic growth to increase inequality, then most of the observations would lie in the upper right quadrants of Figures 1 and 2 (labeled "growth in mean (or GDP) with increasing inequality"). In reality, however, in both figures the observations for positive economic growth ("growth in mean (or GDP)") are distributed fairly equally between the upper *and* lower right quadrants. When growth is measured by the survey mean, in about 40% of the cases (28 of 64 intervals) where there is positive growth in the mean, inequality actually declines and the observations lie in the lower right quadrant. When growth is measured by GDP per capita, in about 50% of the cases (55 of 102 intervals) where there is positive GDP growth, inequality declines and the observations lie in the lower right quadrant. These results for both measures of economic growth suggest that there is no strong tendency for growth to increase income inequality.

It is possible to further analyze the relationship between economic growth and inequality by using the Anand and Kanbur test equation (1993) appropriate to the Gini coefficient. Using first differences to estimate this equation, the change in the (log) of the Gini coefficient can be regressed on change in the (log) of income and on change in the (log) of income-squared. If Kuznets hypothesis is true and economic growth does increase income inequality, then the results from this equation should be positive for the income term and negative for the income-squared term. However, Table 4a shows that when using changes in survey mean as the measure of income (growth), none of the regression coefficients on the income or income squared terms are statistically significant. When changes in GDP per capita are used as the measure of income (growth), the regression coefficients are statistically significant but in a way that suggests that income inequality *falls*—rather than increases—with growth. When intervals from Eastern Europe and Central Asia are removed from the sample (Table 4b), none of the coefficients for the income or income squared terms are statistically significant for either measure of growth. On this basis we conclude that there is no systematic tendency for economic growth (as measured by

Table 4. *Economic growth and inequality: regression analysis*[a]

Variable	Regression coefficient	Variable	Regression coefficient
(a) Full sample			
Survey mean income (consumption)	−0.045	GDP per capita, 1993 PPP values	−0.239
	(−0.77)		(−3.46)**
Survey mean income (consumption)^2	0.078	GDP per capita^2	0.073
	(1.42)		(3.59)**
Constant	0.023	Constant	0.052
	(1.48)		(3.31)**
Adjusted R^2	0.047	Adjusted R^2	0.083
F-statistic	4.10	*F*-statistic	6.63
(b) Sample excluding Eastern Europe and Central Asia			
Survey mean income (consumption)	0.143	GDP per capita, 1993 PPP values	0.297
	(1.91)		(1.25)
Survey mean income (consumption)^2	0.140	GDP per capita^2	−0.129
	(1.86)		(−0.25)
Constant	−0.008	Constant	−0.038
	(−0.51)		(−1.58)
Adjusted R^2	0.024	Adjusted R^2	0.033
F-statistic	2.09	*F*-statistic	2.50

[a] Estimates were obtained using ordinary least squares, with the dependent variable being difference in log of Gini coefficient between household surveys. Independent variables measured as the difference in log of survey mean income (consumption) between surveys OR the difference in log of GDP per capita between surveys. *T*-ratios are shown in parentheses. Sample sizes are 126 intervals for full sample and 89 intervals for sample excluding Eastern Europe and Central Asia. See Table 1 for countries and survey dates.
** Significant at the 0.01 level.

Table 5. *Regional summary of changes in poverty*

Region	Total	Number of intervals			Mean rate of change (percent per year)
		Poverty fell[a]	Poverty increased[a]	No change	
East Asia	18	13	5	–	−7.01 (34.45)
Eastern Europe and Central Asia	37	7	22	8	88.27 (139.13)
Latin America and the Caribbean	30	17	13	–	2.52 (29.64)
Middle East and North Africa	7	5	2	–	4.28 (48.04)
South Asia	15	9	6	–	−1.65 (8.00)
Sub-Saharan Africa	19	8	11	–	0.29 (15.91)
Low-income countries	42	20	22	–	33.01 (106.54)
Lower middle-income countries	84	39	37	8	21.84 (77.62)
Total	126	59	59	8	25.56 (88.04)
Total (excluding Eastern Europe and Central Asia)	89	52	37	–	−0.50 (27.42)

[a] Poverty is measured by headcount index of \$1.08/person/day.

either the survey mean or GDP per capita) to increase income inequality.

7. ECONOMIC GROWTH AND POVERTY

Table 5 summarizes changes in poverty in the data set, when poverty is measured by the proportion of people living on less than \$1.00 per person per day. For the data set as a whole, poverty fell in slightly less than half of the intervals: 59 of 126 intervals. In both low- and middle-income countries, poverty fell in just about as many cases as it increased.

These summary data, however, mask important differences between the various regions. Europe and Central Asia, in particular, had a *very* poor poverty record. In Europe and Central Asia poverty increased in 22 of 37 intervals and rose by a whopping average rate of 88.27% per year! This performance, clearly the worst of any region of the world, reflects the effects of the previously noted economic "meltdown" that occurred in the region after 1990. With the collapse of Soviet Union, many state-owned firms and enterprises in Europe and Central Asia went bankrupt, throwing many people out of work and into poverty. As a result, poverty headcount ratios ($1.00 per person per day) went from zero to as high as 20% in a number of the former Soviet bloc countries, including Kyrgyz Republic, Lithuania and Turkmenistan. [14] Since the late 1990s some of these large increases in poverty in Eastern Europe and Central Asia have moderated, but poverty still remains much higher in this region than it was before the breakup of the Soviet Union.

By contrast, East Asia had an impressive record of poverty reduction. Table 5 shows that poverty fell in East Asia in about 70% of the cases (13 of 18 intervals) and that the poverty headcount ratio in East Asia declined by a large 7.01% per year. This impressive achievement was largely caused by two factors: first, China's decision to re-introduce capitalism into its economy, which had a dramatic effect on reducing levels of rural poverty in that country; and second, Thailand's continuing economic "miracle," which reduced to zero the number of people living on less than $1.00 per day.

The focus in Table 5 is on average rates of change in poverty but the figures show that there is much variation between regions and countries over time. As might be expected, on a regional basis Eastern Europe and Central Asia has the highest rate of standard deviation for changes in the poverty headcount ratio, and this standard deviation rate is almost three times that of the next region. Because of the wide swings in poverty in Eastern Europe and Central Asia, when this region is excluded from the sample the mean annual rate of change in the headcount index of poverty in Table 5 is almost flat: –0.50% per year. In other words, excluding Eastern Europe and Central Asia, there was relatively little change in poverty over time in this data set.

Figures 3 and 4 extend the examination of growth and poverty by plotting changes in the (log) poverty headcount ($1.00/person/day) against changes in the two measures of economic growth—(log) real survey mean income (consumption) (Figure 3) and (log) GDP per capita (Figure 3)—for all intervals in the data set. [15] As was the case with inequality and growth, the relationship between poverty and growth varies for different measures of growth. When growth is measured by the survey mean, poverty and growth have a highly variable and very negative correlation of –0.605 across all

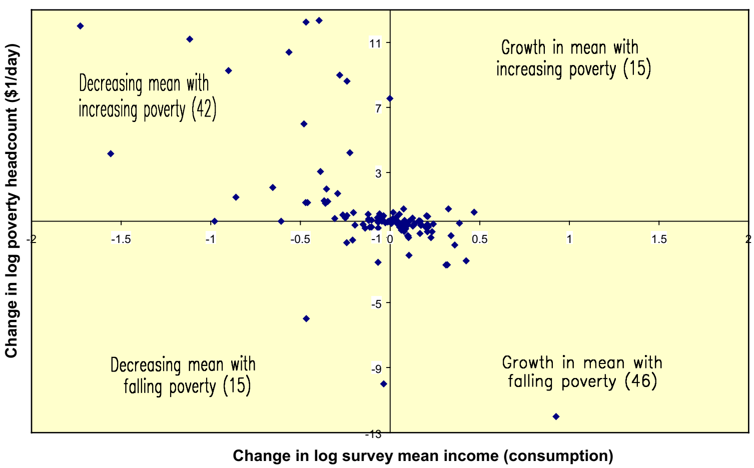

Figure 3. *Growth and poverty, plotted using survey mean income (consumption).*

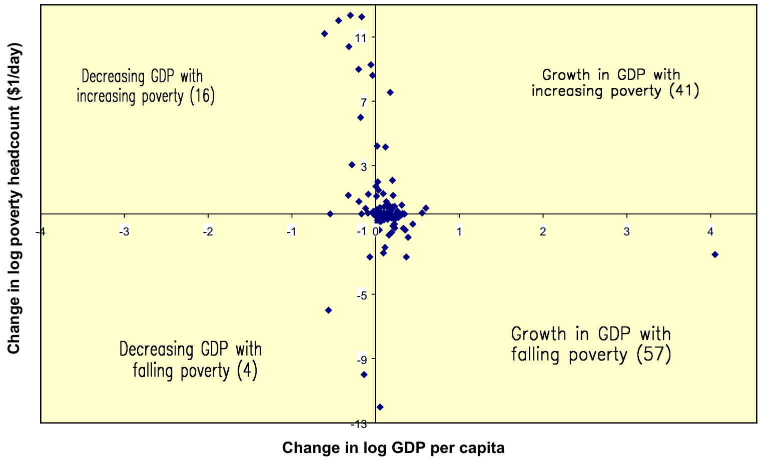

Figure 4. *Growth and poverty, plotted using GDP per capita, 1993 PPP values.*

the intervals; when growth is measured by GDP per capita, inequality and growth have a much closer, and not so negative correlation of −0.252. This means that holding everything else constant, a given positive rate of change in growth as measured by the survey mean will have a more negative impact on poverty than the same positive rate of change in growth as measured by GDP per capita.

At first glance many of the observations in Figure 3 and 4 appear to lie on the horizontal axis line. In reality, however, in both figures the largest number of observations lie in the lower right quadrant (labeled "growth in mean (or GDP) with falling poverty"). When growth is measured by the survey mean (Figure 3), about 40% of the observations (46 out of 118) lie in the lower right quadrant; when growth is measured by GDP per capita (Figure 4), 48% of the observations (57 out of 118) lie in this quadrant. All of this suggests that increasing growth in either survey mean income (consumption) or GDP per capita *may* be associated with falling poverty. As economic growth takes place, poverty appears to fall.

This relationship between growth and poverty can be tested by using Eqn. (2) to estimate elasticities of poverty with respect to growth for the two measures of economic growth. The results are shown in Table 6. All of the results in this table control for changes in income inequality. While increases in the Gini coefficient are always positively associated with increases in poverty, the regression coefficients for the Gini coefficient variable are not always statistically significant.

Four findings stand out in Table 6. First, when economic growth is measured by changes in the survey mean, most of the regression coefficients for the growth elasticity of poverty variable are negative and significant at the 1% level for the three poverty measures. But, when economic growth is measured by changes in GDP per capita, although all of the regression coefficients for the growth elasticity of poverty variable are negative, only about half of them (6 of 12 coefficients) are significant at the 1% level. These results suggest that while economic growth *does* reduce poverty, the actual impact of economic growth upon poverty depends on how growth is being measured. The second finding is closely related to the first. When growth is measured by the survey mean, the point estimate for the growth elasticity of poverty for the headcount ratio for the full sample (−5.021) is almost three times as large as that recorded when growth is measured by GDP per capita (−1.729). Increases in the survey mean have a much larger, poverty-reducing impact on poverty because the survey mean and poverty are far more negatively correlated than GDP per capita and poverty. Again, the actual impact of economic growth upon poverty depends very much on how growth is being measured or defined. Third, the high point estimates (−5.021 and −1.729) for the growth elasticity of poverty for the headcount ratio for the full sample are probably caused by the inclusion of so many intervals in the data set from the

Table 6. *Growth elasticities of poverty (full sample)*[a]

	Using survey mean income (consumption)			Using GDP per capita, 1993 PPP values		
	Difference in Gini coefficient	Growth Elasticity of poverty	Adjusted R^2	Difference in Gini coefficient	Growth Elasticity of poverty	Adjusted R^2
Poverty headcount $1.08/person/day						
Low-income countries	8.188 (3.51)**	−4.329 (−3.43)**	0.453	8.507 (3.38)**	−5.532 (−2.49)**	0.384
Middle-income countries	4.532 (2.41)*	−5.280 (−6.48)**	0.408	5.909 (2.59)*	−1.184 (−1.72)	0.116
Full sample	6.091 (4.30)**	−5.021 (−7.52)**	0.440	7.827 (4.75)**	−1.729 (−2.59)*	0.217
Full sample (excluding Eastern Europe and Central Asia)	3.309 (2.93)**	−2.789 (−4.88)**	0.253	3.034 (2.39)*	−2.267 (−1.56)	0.070
Poverty gap index						
Low-income countries	1.729 (1.51)	−2.321 (−3.81)**	0.338	2.952 (2.16)*	−0.575 (−0.48)	0.090
Middle-income countries	0.972 (0.81)	−0.996 (−1.85)	0.025	1.104 (0.97)	−1.051 (−3.09)**	0.098
Full sample	1.637 (2.00)*	−1.528 (−3.83)**	0.147	2.048 (2.47)*	−1.011 (−3.02)**	0.109
Full sample (excluding Eastern Europe and Central Asia)	3.283 (4.72)**	−3.218 (−9.13)**	0.516	3.029 (3.20)**	−3.014 (−2.79)**	0.122
Squared poverty gap index						
Low-income countries	1.284 (0.14)	−2.437 (−3.14)**	0.246	3.037 (1.79)	0.361 (0.23)	0.022
Middle-income countries	1.043 (0.74)	−0.338 (−0.53)	0.001	0.971 (0.74)	−1.119 (−2.86)**	0.098
Full sample	1.641 (1.63)	−1.107 (−2.28)*	0.061	1.877 (1.91)	−0.953 (−2.40)*	0.065
Full sample (excluding Eastern Europe and Central Asia)	3.884 (4.06)**	−3.615 (−7.51)**	0.435	3.681 (3.08)**	−4.110 (−2.97)**	0.133

[a] Estimates were obtained using ordinary least squares, regressing the difference between household surveys in the log of the poverty measure on three variables: (1) the time elapsed between surveys; (2) the difference in the log of the Gini coefficient; and (3) the difference in the log of the real value of survey mean income (consumption) OR the difference in the log of the real value of GDP per capita, 1993 PPP values. Results for time elapsed variable (which are never significant) not shown. *T*-ratios are shown in parenthesis, corrected for heteroscedasticity. Sample sizes are 42 intervals for low-income countries, 84 intervals for middle-income countries, 126 intervals for full sample, excluding Eastern Europe and Central Asia. See Table 1 for countries and survey dates.

* Significant at the 0.05 level.

** Significant at the 0.01 level.

Table 7. *Growth elasticities of poverty (full sample, excluding Eastern Europe and Central Asia)*[a]

	Using survey mean income (consumption)			Using GDP per capita, 1993 PPP values		
	Difference in Gini coefficient	Growth elasticity of poverty	Adjusted R^2	Difference in Gini coefficient	Growth elasticity of poverty	Adjusted R^2
Poverty headcount $1.08/person/day						
Low-income countries	0.757 (1.76)	−2.509 (−13.17)[b]	0.842	1.303 (1.19)	−1.749 (−1.38)	0.015
Middle-income countries.	6.954 (3.46)[b]	−4.051 (−3.27)[b]	0.248	5.157 (2.45)[c]	−2.156 (−0.96)	0.102
Full sample (excluding Eastern Europe and Central Asia)	3.309 (2.93)[b]	−2.789 (−4.88)[b]	0.253	3.034 (2.39)[c]	−2.267 (−1.56)	0.070
Poverty gap index						
Low-income countries	1.969 (3.30)[b]	−3.210 (−12.13)[b]	0.825	2.654 (1.87)	−2.160 (−1.31)	0.048
Middle-income countries	4.524 (3.73)[b]	−3.606 (−4.82)[b]	0.334	3.150 (2.38)[c]	−3.780 (−2.55)[c]	0.137
Full sample (excluding Eastern Europe and Central Asia)	3.283 (4.72)[b]	−3.218 (−9.13)[b]	0.516	3.029 (3.20)[b]	−3.014 (−2.79)[b]	0.122
Squared poverty gap index						
Low-income countries	2.646 (3.53)[b]	−3.719 (−11.35)[b]	0.834	3.597 (2.01)	−2.884 (−1.33)	0.074
Middle-income countries	4.685 (2.83)[b]	−3.809 (−3.74)[b]	0.231	3.379 (2.02)[c]	−5.201 (−2.79)[b]	0.148
Full sample (excluding Eastern Europe and Central Asia)	3.884 (4.06)[b]	−3.615 (−7.51)[b]	0.435	3.681 (3.08)[b]	−4.110 (2.97)[b]	0.133

[a] Estimates were obtained using ordinary least squares, regressing the difference between household surveys in the log of the poverty measure on three variables: (1) the time elapsed between surveys; (2) the difference in the log of the Gini coefficient; and (3) the difference in the log of the real value of survey mean income (consumption) OR the difference in the log of the real value of GDP per capita, 1993 PPP values. Results for time elapsed variable (which are never significant) not shown. *T*-ratios are shown in parenthesis, corrected for heteroscedasticity. Sample sizes are 42 intervals for low-income countries, 84 intervals for middle-income countries, 126 intervals for full sample, excluding Eastern Europe and Central Asia. See Table 1 for countries and survey dates.
[b] Significant at the 0.01 level.
[c] Significant at the 0.05 level.

countries of Europe and Central Asia. [16] In fact, when the intervals from Europe and Central Asia are excluded, the point estimates for the headcount ratio drops to −2.789 (measured by the survey mean) and −2.267 (measured by GDP per capita). [17] In other words, when the countries of Eastern Europe and Central Asia are excluded, a 10% increase in growth (measured by the survey mean) can be expected to produce a 27.9% decrease in the proportion of people living in poverty ($1 per person per day). This means that in a sufficiently large enough sample of developing countries in which exactly half of the population lives below $1.00/person/day, a 10% increase in the survey mean will reduce the proportion of the poor to about 0.37. Fourth, the data show that economic growth has a greater impact on the more sensitive measures of poverty. Excluding the intervals from Europe and Central Asia, the results for both measures of economic growth show that the growth elasticities for the poverty gap and the squared poverty gap are higher than that for the simple headcount ratio. For example, while a 10% increase in the survey mean can be expected to lead to a 27.9% decline in the headcount index, it will lead to a 32.2% fall in the poverty gap and a 36.1% decrease in the squared poverty gap. The results are quite similar for a 10% increase in GDP per capita.

Since Eastern Europe and Central Asia had such a poor poverty record, it is useful to see if the preceding results are robust when data from this region are excluded. Table 7 thus re-estimates the growth elasticities of poverty for low- and middle-income countries when data from Eastern Europe and Central Asia are excluded. The results mirror those of the previous table. When economic growth is measured by changes in the survey mean, all of the regression coefficients for the growth elasticity of poverty variable are negative and highly significant. But, when economic growth is measured by changes in GDP per capita, only three of the nine regression coefficients for the growth elasticity of poverty variable are significant at the 1% level. As in the preceding table, for both measures of economic growth, the growth elasticities for the poverty gap and the squared poverty gap measure are higher than that for the simple headcount ratio. The data clearly show that economic growth—however measured—reduces poverty faster for more sensitive poverty measures.

It should be emphasized that all of these estimated growth elasticities of poverty are averages. In other words, there is considerable variation between countries and over time in the extent to which poverty responds to economic growth. As noted by Ravallion (1997), one of the more important factors affecting how poverty responds to growth is the level of initial inequality in a country. The impact of this variable on poverty can be examined by dividing the full sample into two groups of countries—low-income inequality countries (initial Gini below 40.0) and high-income inequality countries (initial Gini above 40.0)—and re-estimating the regressions in Table 6 using both measures of economic growth. [18] When growth is measured by changes in the survey mean, the results for the poverty headcount measure show that countries with a low initial Gini have a growth elasticity of poverty of −5.866 (t-ratio of −5.95), while those with a high initial Gini have a much lower growth elasticity of poverty, −2.461 ($t = -2.56$). When growth is measured by changes in GDP per capita, the relevant elasticities are −2.282 ($t = -2.40$) for low inequality countries, and −1.958 ($t = -1.20$) for high inequality countries. In other words, with a given rate of economic growth as defined by either measure of growth, low inequality countries will be much more effective in reducing the proportion of people living in poverty ($1 per person per day) than high inequality countries.

8. CONCLUSION

This paper has used a new data set of 126 intervals from 60 developing countries to analyze the growth elasticity of poverty, that is, how much does poverty decline in percentage terms with a given rate of increase in economic growth. This data set is both broader in terms of including more countries and time spans and more selective in terms of quality controls than those used in the past.

While the study finds that economic growth does indeed reduce poverty (as measured by the international standard of $1.00/person/day), the actual extent of poverty reduction depends very much on how economic growth is defined. When economic growth is measured by changes in survey mean income (consumption), there is a strong, negative, statistical link between growth and poverty; however, when economic growth is measured by changes in GDP per capita, the statistical relationship between growth and poverty reduction is much weaker.

However measured, economic growth reduces poverty in this study because growth has little impact on income inequality. Income distributions do not generally change much over time. Analysis of the 126 intervals included in the data set shows that income inequality rises on average less than 1.0% per year. Moreover, econometric analysis shows that economic growth—as measured by changes in the survey mean or GDP per capita—has no statistical effect on income distribution.

Since income distributions are relatively stable over time, economic growth has the general effect of raising incomes for all members of society, including the poor. In many developing countries poverty, as measured by the $1 per person per day standard, tends to be "shallow" in the sense that many people are clustered right below (and above) the poverty line. Thus, even a modest rate of economic growth has the effect of "lifting" people out of poverty. Poor people are capable of using economic growth—especially labor-intensive economic growth which provides more jobs—to "work" themselves out of poverty.

As noted above, however, the number of poor people who are able to use economic growth to "work" themselves out of poverty depends very much on how economic growth is defined. Controlling for changes in income inequality, when economic growth is measured by changes in survey mean income (consumption), the growth elasticity of poverty (excluding Eastern Europe and Central Asia) in this study is −2.79. This growth elasticity of poverty is well within the range of "traditional" estimates of −2.0 and −3.0 suggested by previous researchers (Ravallion & Chen, 1997; Bruno *et al.*, 1998 and Adams, 2003). But, when economic growth is measured by changes in GDP per capita, the growth elasticity of poverty (excluding Eastern Europe and Central Asia) is a statistically insignificant −2.27, which is much lower than has previously been estimated.

In other words, this study finds little support for Bhalla's "new" suggestion (2002, Table 10.2) that the "correct" growth elasticity of poverty should be about −5.0. In this study the growth elasticity of poverty is only −5.0 when the full sample of intervals (including those from Eastern Europe and Central Asia) is used and growth is defined by changes in the survey mean. But, the recent, large-scale changes in growth and poverty in Eastern Europe and Central Asia suggest that it is best to exclude these countries from any estimates of the growth elasticity of poverty. Moreover, Bhalla's assertion (2002, p. 163) that using the survey mean as the measure of economic growth has the effect of underestimating the "correct" growth elasticity of poverty finds no support in this analysis. This study actually finds that the growth elasticity of poverty is higher—not lower—when growth is defined using survey mean figures as opposed to those coming from national accounts (the source of GDP per capita data).

NOTES

1. Bhalla (2002) presents growth, inequality and poverty data for about 900 intervals from 150 countries. Many of these data, however, are drawn from secondary sources which are not directly linked to primary household budget surveys. Moreover, in many of these secondary sources either the poverty variable—income or consumption—or the ranking variable—household or per capita—is unclear. The result is a very broad but quite heterogeneous data set that lacks consistently applied quality filters.

2. For a useful review of these studies, see Fields (2001, pp. 40–48).

3. The Gini coefficient is a standard measure of inequality which is scaled to lie between zero (perfect equality) and 100 (perfect inequality).

4. The full list of these 157 countries appears in World Bank (2001b, p. 334).

5. Of the 60 countries included in the data set, 23 are classified by the World Bank as low-income and 37 are classified as middle-income.

6. Table 1 shows that most countries (30) use expend-

iture per person as the welfare indicator; only six counties use both expenditure and income. When countries use both welfare indicators (i.e., they switch between expenditure and income), we either make sure that the same indicator is used in computing an interval or else we drop the interval.

7. The poverty line used in this paper is set at $1.08 per person per day, measured in 1993 PPP rates. This line is equivalent to the $1.00 per person per day poverty line, measured in 1985 PPP rates, used by Squire (1993) and Ravallion and Chen (1997). For the purposes of simplicity, this $1.08 person/day poverty line will be called the $1.00 person/day poverty line.

8. For a useful review, and critique, of purchasing power parity (PPP) numbers, see Deaton (2001).

9. In India, the difference between growth as measured by the survey mean and growth as measured by the national accounts is widening; the difference in per capita growth rates between these two growth measures in India is now about 2% per year. See Deaton, 2001, p. 133.

10. The Ravallion and Chen model (1997) is expanded here by adding a variable measuring income inequality.

11. Economic growth, as measured by GDP data from the national accounts, is usually found to be higher than economic growth, as measured by changes in survey mean income (consumption). For example, Ravallion (2000) finds that GDP growth in China and Latin America is 30–50% higher than growth in survey mean income (consumption).

12. For more on the increase in inequality (and poverty) in Eastern Europe and Central Asia, see World Bank (2000).

13. In this paper, the terms "consumption" and "expenditure" are used interchangeably.

14. For example, during 1988–93, the poverty headcount ($1.00 per person per day) increased from zero to 22.9 in the Kyrgyz Republic, and from zero to 20.9% in Turkmenistan. See Table 2.

15. As shown in Table 5, eight of the 126 intervals recorded no change in the poverty headcount index over time. The calculations in Figure 2 are therefore based on 118 intervals.

16. About 29% of the intervals (37 of 126 intervals) in the data set are from Eastern Europe and Central Asia.

17. One of the reviewers observed that these results may be affected by using time intervals of "two years or more" as the basic unit of analysis. According to this reviewer, it is necessary to use longer time periods—such as 10 years—to pinpoint the "true" relationship between economic growth and poverty. Unfortunately, in this data set it is not possible to use 10-year time intervals because this would reduce the total number of intervals from 126 to 18. It is possible, however, to re-estimate the equations in Table 6 using time intervals of "more than five years." When this is done, the total number of intervals falls to 54 (or 45 when intervals from Europe and Central Asia are excluded). Using this smaller data set, and excluding the intervals from Europe and Central Asia, the point estimates for the poverty headcount ratio are −3.262 (*t*-ratio of −2.73) when measured by the survey mean, and −3.101 (*t*-ratio of −1.70) when measured by GDP per capita. In other words, results from the smaller data set using time intervals of "more than five years" are quite similar to those reported in Table 6 using the full data set.

18. These regressions are estimated by revising Eqn. (2) to drop the independent variable measuring the difference in the log of the Gini coefficient.

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