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Inequality, Income and Poverty

Comparative Global Evidence

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Abstract

Analysing a large sample of 1980–2004 unbalanced panel data, the current study presents comparative global evidence on the role of (income) inequality in poverty reduction. The evidence involves both an indirect channel via the tendency of high inequality to decrease the rate at which income is transformed to poverty reduction and the tendency of rising inequality to increase poverty. Based on the basic needs approach, an analysis-of-covariance model is estimated, with the headcount measure of poverty as the dependent variable and the Gini coefficient and PPP-adjusted mean income as explanatory variables. The study finds that the responsiveness of poverty to income growth is a decreasing function of inequality and that the income elasticity of poverty is actually smaller than the inequality elasticity. Thus, income distribution can play a more important role than might be traditionally acknowledged. Found also is a large variation across regions (and countries) in the poverty effects of inequality.

Keywords: inequality, income, poverty, comparative global evidence

JEL classification: D31, I32, O49

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Tables and figures appear at the end of the paper.

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1 Introduction

As Goal 1 of the Millennium Development Goals (MDGs) of halving poverty by 2015 enjoys a major emphasis in the international discourse, poverty has now become a subject of global interest. Since the 1980s, the poverty rate has been trending considerably downward globally (World Bank 2006a). Attention on the importance of income distribution in poverty reduction has also been growing (e.g. Bruno et al. 1998; World Bank 2006b). At the country level, a number of studies have decomposed the effects of inequality and income on poverty (e.g. Datt and Ravallion 1992; Kakwani 1993). Both Datt and Ravallion (1992) and Kakwani (1993) estimate substantial contributions by distributional factors as well as by growth. Regionally, based on cross-country African data, Ali and Thorbecke (2000) find that poverty is more sensitive to income inequality than it is to income.

Several papers, furthermore, emphasize the importance of inequality in determining the responsiveness of poverty to income growth (e.g. Adams 2004; Easterly 2000; Ravallion 1997). Based on the specification that growth elasticity of poverty decreases with inequality, Ravallion (1997) econometrically tested the 'growth-elasticity argument' that while low inequality helps the poor share in the benefits of growth it also exposes them to the costs of contraction. Similarly, Easterly (2000) evaluated the impact of the Bretton Woods Institutions' programmes by specifying growth interactively with the level of inequality in the poverty–growth equation and found that the effect of the programmes was enhanced by lower inequality. Moreover, emphasizing the importance of the definition of growth, Adams (2004) nonetheless provides elasticity estimates showing that the growth elasticity of poverty is larger for the group with the smaller Gini coefficient (less inequality).[1] Most recently, Fosu (2008, 2009, 2010) make similar observations for the Africa region.

Despite the above and other related studies, there appears to be limited recent comprehensive comparative global evidence on the effect of inequality on poverty that sufficiently delineates the role of inequality in poverty reduction presented in the present study.[2] Based on the headcount ratio, the paper, first, presents comparative global evidence on trends in the poverty rate for the major regions of the world: East Asia and Pacific (EAP), Europe and Central Asia (ECA), Latin America and the Caribbean (LAC), Middle East and North Africa (MENA), South Asia (SAS) and sub-Saharan Africa (SSA). The focus is on the US$1 standard, which has arguably emerged as the most important yardstick for measuring poverty, as apparent in the case of the MDGs and other related global debates on improving the lives of the poorest countries of the world. The paper then estimates an analysis-of-covariance model of the poverty–income relationship, where the level of inequality enters both independently and

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1 We adopt the convention of an *absolute-valued* elasticity.

2 The few recent exceptions include Kalwij and Verschoor (2007). However, that study is based on a smaller and earlier sample that ends in 1998. Besides, the Kalwij and Verschoor article is on the US$2-per-day headcount ratio, which is arguably a less desirable poverty measure than the US$1 standard for policy purposes currently. Nor does that study explore possible country-specific differences implied in the present paper by providing interval estimates per region for the elasticity measures. Fosu (2009) attempts to fill this gap, but it is only for sub-Saharan Africa.

interactively with income. Using unbalanced panels over 1980–2004,[3] the fully specified and constrained versions of this model are estimated for the global sample as well as for the regional samples, in order to appropriately assess the impact of inequality on poverty, with both regional and country-specific implications.

2 Trends in poverty

Based on the most recent World Bank data,[4] Table 1 and Figure 1 shed light on the global and regional trends in the headcount-ratio measure of poverty for the US$1-per-day (US$32-per-month) standard. These data show that the global poverty rate has trended downward steadily since the 1980s, falling from 43.8 per cent in 1981 to 17.9 per cent in 2005. There are regional differences, however. The greatest decline is exhibited by EAP, whose poverty rate has fallen from 69.5 per cent in 1981 to only 10.8 per cent in 2005. Similarly, though less dramatically, SAS's poverty has also declined from 45.8 per cent in 1981 to 27.3 per cent in 2005. In contrast, SSA's poverty rate has hardly budged, falling only marginally from 44.7 per cent in 1981 to 42.1 per cent in 2005. Meanwhile, poverty in ECA, LAC and MENA has been historically quite low (less than 10 per cent), with MENA's and LAC's poverty rates trending downward and ECA's slightly upward.

There also appear to be regional differences in the intertemporal behaviour of the trends in the poverty rate. For example, most of SAS's poverty reduction had occurred by the early 1990s, with little progress in the 1990s; the rate fell only marginally from 33.1 per cent in 1993 to 30.2 per cent in 2002, before declining to 27.3 per cent in 2005 (see Table 1 and Figure 1). In contrast, EAP's poverty rate fell steadily, while SSA's progress on poverty did not begin until the mid-1990s. The poverty rate increased for SSA from the early 1980s, reaching a peak of about 50.0 per cent in the late 1990s, before falling to 42.1 per cent in 2005. Since 1996, however, SSA's poverty rate has fallen by 8.2 percentage points compared with SAS's of 5.8 percentage points, translating to 16.3 per cent and 17.5 per cent, respectively. Hence, beginning in the mid-1990s, SSA has performed as well as SAS in reducing poverty, as measured by the US$1 headcount ratio, for instance.[5]

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3 Details of the data used in the estimation will be presented in the data and estimation section.

4 See World Bank (2009). This is a revised database and is a sequel to World Bank (2007). It uses a different purchasing power parity (PPP) adjustment and extends the sample size by about 20 per cent. We employ these new data for the descriptive analysis, but the older version for the actual estimation in order to more appropriately compare our results with those of existing studies. See Fosu (2009) for a review of such studies.

5 Based on similar data (World Bank 2007), Fosu (2009: table 1) actually reports higher poverty rates (headcount ratio) at the US$2 level for SAS than for SSA throughout 1981–2004. Though SAS decreased the gap substantially, the catch-up rate since the 1990s has been relatively minimal. In 1993, for instance, SAS's poverty rate exceeded SSA's by 6 percentage points. By 2004, about a decade later, this difference had been cut by only 1 percentage point, with the SAS and SSA's poverty rates standing at 77.1 per cent and 72.0 per cent, respectively (ibid.).

3 The estimating model

To arrive at the estimating model we follow, for instance, Fosu (2008). An individual is said to be 'poor' if his/her income falls short of 'basic needs' in a given locality.[6] Moreover, the lower the level of income is the more likely that it will fall below basic needs and put the individual into poverty. Thus the 'poverty function' can be expressed as decreasing in income. Furthermore, inequality can play a role in the poverty function, in that a more equitable distribution of income would generally imply lower poverty. Thus, poverty would be a function of both income and inequality. A rudimentary specification of the poverty function might then entail the following equation:

$$p = b_1 + b_2y + b_3g \qquad (1)$$

where p is the poverty rate, y is mean income, g is the Gini coefficient as a measure of inequality, and all variables are expressed in logarithm. As the respective income and inequality elasticities of poverty b_2 and b_3 are expected to be negative and positive, respectively, growth is anticipated to decrease poverty and an increase in inequality should raise it.

Equation (1) corresponds to the Dollar and Kraay (2002) proposition that all income groups benefit proportionately from growth, which implies a uniform distribution of the effectiveness of growth, with no special role for inequality in the growth impact. Indeed, this equation has been estimated by others as well (see, for example, Ali and Thorbecke 2000).

As argued in several studies (e.g. Adams 2004; Easterly 2000; Fosu 2008; Ravallion 1997), however, the rate by which income growth is transformed to poverty reduction would also depend on the level of inequality, in that less poverty reduction would result from a given rate of growth if inequality was higher. Thus, as in Fosu (2008), for example, we postulate the following equation as the main model of interest: [7]

$$p = c_1 + c_2y + c_3gy + c_4g \qquad (2)$$

where, as already defined, p is the poverty rate, y is mean income, g is the Gini coefficient as a measure of inequality, with all variables expressed in logarithm. Here, the coefficients of interest are c_2, c_3 and c_4. The sign of c_2, which is the independent

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6 For proponents of the basic needs approach see, for example, Hicks and Streeten (1979), Streeten (1977) and Adelman (1975), however, Goldstein (1985) and Ram (1985) suggest a 'trickle-down' approach to growth. Being qualitatively below basic needs (the poverty line) would be measured here by the headcount ratio P_0. However, other related measures include the 'poverty gap' P_1 which indicates how far below, as well as the 'squared gap' P_2 which measures how severely below income on average is below basic needs (see Foster, Greer and Thorbecke 1984).

7 See Fosu (2008) for details of the actual derivation of equation (2) based on the Cobb-Douglas function. Alternatively, one could estimate a poverty equation given the assumption that the income distribution is log-normal, as in Bourguignon (2003), Epaulard (2003), Fosu (2009), and Kalwij and Verschoor (2007), for instance. However, such a specification may be too constraining, given a specific nature of the income distribution. Actually, even though the present specification is simpler, the fit of a similar model (in growth rates) does not seem to differ appreciably from the more complicated model based on the log-normal distribution (see Fosu 2009). The use of the present model in levels (rather than growth rates), however, increases the usable sample size and is, therefore, capable of yielding relatively efficient estimates.

impact of y (with g=0), is anticipated to be negative, since growth reduces poverty when there is a near perfectly equal income distribution. However, c_3 is expected to be positive. This is because c_3 represents the effect of g on the impact of y, as g rises and income distribution becomes less equal, the (negatively signed) effect of income on poverty is reduced. Finally, the sign of c_4 is anticipated to be negative, that is, an increase in inequality would decrease poverty when y is zero. This anticipated result may seem counter-intuitive, but the rationale is that in the case where nearly everyone is poor (near-zero y), redistribution from the non-poor to the poor is likely to render more people poor (Fosu 2008).[8] As the estimated results will show, however, the income level is sufficiently large for all regions, so that increasing inequality practically raises poverty.

From equation (2), the income impact on poverty, which is the income elasticity of poverty, is obtained as:

$$E_y = c_2 + c_3 g \qquad (3)$$

Similarly, the partial effect of inequality on poverty, the inequality elasticity of poverty, is expressed as:

$$E_g = c_4 + c_3 y \qquad (4)$$

We discuss first equation (3). Since c_2 is anticipated to be negative, the sign of E_y should be negative as well (provided g is not too large), so that an increase in y should reduce poverty, however, the rate of poverty reduction is attenuated by increases in g at the rate of c_3 (the sign of c_3 is expected to be positive). As will become apparent, E_y is negative for all regions, as expected, though its value differs substantially across regions.

Similarly, according to equation (4), while initially negative at very low levels of y (the anticipated sign of c_4 is negative), E_g is expected to be positive at reasonably large levels of y. As the subsequent results from the estimation will show, E_g is positive for all regions, suggesting that rising inequality would increase poverty, as one would expect. Furthermore, the inequality impact increases with income and is found to differ considerably across regions.

4 Data, estimation and results

4.1 The data

As already indicated above, the data used in the estimation are derived from a global sample (World Bank 2007), which provides 456 usable unbalanced panel observations over 1980–2004 generally.[9, 10] Country representation in the sample differs substantially,

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8 Note that the measure of poverty in the current instance is the headcount ratio. Thus it is easy to see that where the mean income is low the distribution will be concentrated close to the poverty line, so that redistribution from the non-poor to the poor is likely to put the former below the line.

9 The summary statistics are shown in Appendix table 1. Note that two observations, both for India (rural and urban), are for 1977–8. We prefer to use the World Bank (2007) database for the actual estimation in order to be able to compare our results with those of existing studies (for a review of

depending on the availability of survey data, with China and India having the greatest representation. To provide comparability across countries, the same poverty line, US$32.74 per month (translating roughly to the international standard of US$1 per day in real 1993 PPP-adjusted dollars), is applied to all countries and over time. The headcount ratio is analysed using the above equations.

The Appendix table 1 presents the summary statistics for the global and regional samples employed in the regression analysis. The results, though representing non-weighted statistics based on World Bank (2007), are roughly similar to those shown in Table 1, which are population-weighted and based on World Bank (2009).[11] The only aberration appears to be MENA where the summary statistics show a much higher value for poverty than in Table 1. This discrepancy is explained primarily by the relatively large level of poverty in Djibouti, a tiny country, whose value apparently pulls the non-weighted mean upward for MENA.

4.2 Estimation and results

Equations (1) and (2) are estimated using both random effects (RE) and fixed effects (FE). While RE results are more (statistically) efficient than those of FE, they are prone to biases if unobservable country-specific factors are present and are correlated with the explanatory variables. Hence, the FE results are preferable unless efficiency is a problem, which seems unlikely in the present case due to the large sample size. Nonetheless, both the RE and FE results are presented in Table 2 and the Hausman test statistic is also provided in each case to indicate if the RE estimates are statistically different from those of the FE. The results are presented for the global sample and for each of the six regions.

From Table 2, we observe that the signs of the coefficients are as anticipated. In the simpler specification (A.1 and B.1 models), for example, the y and g coefficients are significantly negative and positive, respectively, in all equations estimated. Thus, income growth would decrease poverty, while a higher level of inequality would increase it. Furthermore, the interactive model generally displays the expected signs of the coefficients.[12] The coefficient of y is negative, implying that income growth would reduce poverty. However, the g coefficient is also negative, suggesting that an increase

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related studies see, for instance, Fosu 2009). In contrast, to the best of our knowledge, no comprehensive published studies based on this more recent World Bank (2009) database currently exist for comparison purposes.

10 Solt (2009) reports an impressive database of income inequality designed to be inter-country comparable. However, for the current analysis we prefer to use the World Bank inequality data, for two reasons. First, the Bank's inequality data are based on PPP-adjusted income data in a similar fashion as the mean income and poverty line designed to make them inter-country and inter-temporally comparable for poverty analysis. Second, the Bank's data contain a significant number of rural and urban observations, especially for China and India, which are not available in the Solt database.

11 This observation suggests that World Bank (2007) and World Bank (2009) may not be that far apart in terms of descriptive statistics, lending some further credence to the reliability of the current estimates based on the former.

12 The only exceptions appear to be EAP and MENA, where the results seem perverse and the coefficients are imprecisely estimated.

in inequality would *reduce* poverty when y is small. As argued above, this is what one would expect, given that in a very low income country, redistributing from haves to have-nots might actually put more people into poverty, thus raising the poverty rate.[13] Given the magnitude of the positive sign of the interactive term, though, a larger income would ensure that the overall impact of g would be positive, as one would ordinarily expect. The positive sign of the interactive term further suggests that an increase in g would reduce the (negative) effect of y on poverty, thus counteracting the ability of income growth to reduce poverty.

According to the Hausman test statistics reported in Table 2, the FE results are statistically superior to those of RE generally.[14] Hence, using equations (3) and (4), we select the respective FE models A.1 and A.2 as the basis for computing the respective income and inequality elasticities of poverty. These estimates are reported in Table 3.

It is observable from Table 3 that both the income and inequality elasticities differ substantially across regions. Based on the selected (starred) values, which are based on the model with the better fit, according to AR^2, the standard error of estimate (SEE) and/or the precision of the coeffcients, the income elasticity ranges as low as 1.3 (in absolute value) in SSA to as much as 5.8 (in absolute value) in MENA, with the global estimate of 2.6. Similarly, the inequality elasticity of poverty ranges from 1.6 in SAS to 8.4 in ECA and MENA, with a global estimate of 5.1.[15] Thus, income growth or inequality changes would have different implications for poverty reduction in these regions. For example, the effectiveness of growth in poverty reduction would be lowest in SSA and highest in MENA, while increasing inequality would appear to be least deleterious in SAS.

These regional differences in estimates of the income and inequality elasticities are summarized in Figures 2 and 3. Consistent with the prescriptions of Brambor et al. (2006), the graphs allow us to more fully explore the relationship between the (absolute-valued) income elasticity E_y and inequality, on the one hand, and between the inequality elasticity E_g and income, on the other hand. Figure 2 shows that E_y is monotonic with respect to inequality in the global sample and that the poverty-reduction effect of growth decreases steadily with the level of inequality, approaching zero as the Gini coefficient approaches 100 per cent. Based on this figure, we could predict E_y for a country given the value of its Gini coefficient.

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13 As previously observed above, this result is mainly because at a low mean income, the distribution would be concentrated close to the poverty line, so that redistribution would likely result in the non-poor becoming poor and thus raising the headcount ratio.

14 The only sets of results where the Hausman test fails to reject the null hypothesis of the statistical superiority of RE over FE are the cases of EAP (equation 1), SAS and SSA (both equations in each). However, the FE estimates are highly significant, suggesting that possible efficiency is not a problem for the FE model, as conjectured above.

15 It is noteworthy that the present estimates are in line with those obtained from the more complicated model based on the assumption of a log-linear income distribution. For example, using that model, Fosu (2009) obtains for non-SSA the income and inequality elasticity estimates of -2.9 and 5.4, respectively, compared with the present respective estimates of -2.6 and 5.1 for the global sample, which includes SSA. In addition, Fosu (2009) reviews similar global estimates, as in particularly Bourguignon (2003), and finds them to be generally in line.

Similarly the graph of E_g based on the global sample shown in Figure 3 indicates that the inequality elasticity increases with the level of income. Both positive and negative values are, however, admissible. Below a monthly income of US$22, E_g is negative,[16] implying that *reductions* in inequality would *increase* poverty. This finding then supports the theoretical result discussed earlier that at a sufficiently low level of income decreasing inequality would rather increase poverty. Nonetheless, the average income levels are large enough for the global and regional samples so that E_g is positive for all regions.

Note that the regional estimates do not necessarily fit the 'global' curves, suggesting that there are idiosyncratic regional differences. For example, as Figure 2 shows, while LAC and EAP are quite close to the global curve, SAS, ECA, SSA and MENA are not. SSA and SAS are overpredicted by the global norm, in contrast, ECA and especially MENA are underpredicted. Hence, income growth would decrease poverty less in SSA, for instance, than the global prediction would imply, the reverse would be the case for MENA and ECA. In terms of ranking, the income elasticity (absolute-valued) is highest for MENA, followed by ECA, LAC, EAP, SAS and SSA, in that order. Thus, one would expect the effectiveness of growth in reducing poverty to be highest in MENA and least in SSA. Alternatively put, relatively high growth would be required to achieve the MDGs in Africa, for instance, unless lower inequality levels were to prevail.

According to Figure 3, SAS, SSA, EAP and LAC are all below the global inequality elasticity curve, though they are very close, suggesting that the inequality elasticity would be (slightly) overestimated by the global curve for these regions. In contrast, EAP and MENA are underestimated. For these two regions, therefore, increasing inequality would raise poverty faster than the global model would imply. With respect to ranking, the highest inequality elasticity is enjoyed by ECA and MENA (about equally), followed by LAC, EAP and SSA and SAS (about equally). For poverty reduction purposes, therefore, increasing inequality should not be as much of a concern in SAS and SSA as in ECA and MENA.[17]

Moreover, for particularly LAC, SAS and SSA, the estimated intervals of responsiveness of poverty to both income and inequality are significant (see Tables 2 and 3). Hence, a country-specific approach, based on the relative emphasis of income vis-à-vis inequality, would be required in order to most effectively reduce poverty. While growth is crucial if meaningful poverty reduction is to be achieved, for certain countries, especially those with high levels of inequality, reductions in inequality along with modest growth may be a relatively efficient strategy.

5 Conclusion

Analysing a global sample of 1980–2004 unbalanced panel data, the current study has presented comparative global evidence on the role of income inequality in poverty reduction. The evidence involves both an indirect channel via the tendency of high

16 From equation (4) in the text and model (A.2) of Table 2, $E_g = 0 = -8.31 + 2.68y$ implies $y = 3.1$, so that $Y = e^{3.1} = 22.2$.

17 Of course, like a double-edged sword, rising inequality could, on the other hand, attenuate the effectiveness of income growth in reducing poverty as observed above.

inequality to decrease the rate at which income is transformed to poverty reduction, and the tendency of rising inequality to increase poverty. Based on the basic needs approach, an analysis-of-covariance model is estimated, with the headcount measure of poverty as the dependent variable, and the Gini coefficient and PPP-adjusted income as explanatory variables.

The study finds that inequality affects poverty in two ways: (1) a higher level of inequality tends to limit the ability of income growth to reduce poverty and (2) rising inequality generally increases poverty, at a rate that tends to rise with the level of mean income. The income and inequality elasticities differ considerably across regions and countries, suggesting that the responsiveness of poverty to inequality or income is region- and country-specific. Furthermore, the elasticity of poverty with respect to inequality tends to be larger than the income elasticity of poverty. Thus, to the extent that it does not adversely affect growth, reducing inequality may have a more effective favourable impact on poverty reduction than traditionally believed. Most importantly, though, the findings in the present study strongly suggest that optimal poverty-reduction strategies would require regional and indeed country-specific approaches that exert different emphases on income growth relative to inequality changes.

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Table 1: Global trends in poverty (%; headcount ratio; US$1 standard)

Region/year	1981	1990	1996	2005
East Asia and Pacific (EAP)	69.47	42.69	26.05	10.84
Europe and Central Asia (ECA)	0.86	1.03	2.85	2.45
Latin America and the Caribbean (LAC)	9.53	8.46	8.05	5.72
Middle East and North Africa (MENA)	4.04	2.09	1.99	1.89
South Asia (SAS)	45.84	37.96	33.06	27.28
Sub-Saharan Africa (SSA)	44.73	49.49	50.28	42.06
World	43.83	32.3	25.56	17.91

Notes: For comparability, the data reported in this table are for US$32 per month 2005-PPP adjusted income and are selected to correspond to the US$1 poverty rates from World Bank (2007). Hence, the rates reported here are similar to those used in the subsequent regression analysis but are smaller than the rates at the World Bank's US$1.25 new standard.

Source: World Bank (2009).

Table 2: Inequality, income and poverty – regression results, global and by region

	Y	*g*	*y*g*	*const*	AR^2	*SEE*	*H*
I. Global (n=456)							
A. Fixed effects							
(A.1)	-2.477	3.502	---	---	0.931	0.432	---
	(-12.96)	(7.98)					
(A.2)	-12.62	-8.321	2.681	---	0.946	0.382	---
	(-6.60)	(-3.90)	(5.33)				
B. Random effects							
(B.1)	-2.283	3.474	---	-0.196	0.801	0.732	5.12
	(-22.69)	(12.32)		(-0.20)			[0.08]
(B.2)	-12.307	-8.639	2.667	45.254	0.891	0.543	10.62
	(-9.45)	(-6.00)	(7.89)	(8.19)			[0.01]
II. East Asia and Pacific, EAP (n=66)							
A. Fixed effects							
(A.1)	-2.950	3.042	---	---	0.980	0.228	---
	(-12.05)	(7.98)					
(A.2)	-1.868	4.306	-0.305	---	0.980	0.229	---
	(-0.96)	(1.82)	(-0.56)				
B. Random effects							
(B.1)	-2.827	2.85	---	4.506	0.941	0.393	0.90
	(-13.00)	(6.82)		(4.83)			[0.64]
(B.2)	-3.409	2.132	0.167	6.995	0.943	0.385	7.53
	(-1.86)	(0.97)	(0.33)	(0.91)			[0.06]
III. Europe and Central Asia, ECA (n=95)							
A. Fixed effects							
(A.1)	-3.974	8.371	---	---	0.950	0.545	---
	(-7.39)	(9.42)					
(A.2)	-15.833	-8.902	3.366	---	0.857	0.531	---
	(-2.33)	(-0.89)	(1.70)				
B. Random effects							
(B.1)	-3.157	6.702	---	-7.505	0.759	0.841	18.81
	(-8.89)	(7.80)		(-2.58)			[0.00]
(B.2)	-9.115	-1.981	1.677	23.328	0.758	0.691	55.38
	(-0.18)	(-0.18)	(0.72)	(0.57)			[0.00]
IV. Latin America and the Caribbean, LAC (n=147)							
A. Fixed effects							
(A.1)	-2.345	3.647	---	---	0.910	0.327	---
	(-12.77)	(6.18)					
(A.2)	-21.247	-20.583	4.795	---	0.930	0.288	---
	(-6.23)	(-4.66)	(5.56)				
(B.1)	-2.183	3.779	---	-1.498	0.759	0.532	7.03
	(-15.41)	(7.45)		(-0.77)			[0.03]
(B.2)	-18.918	-17.748	4.249	83.251	0.799	0.489	12.36
	(-5.13)	(-3.75)	(4.59)	(4.42)			[0.00]

V. Middle East and North Africa, MENA (n=25)							
A. Fixed effects							
(A.1)	-5.811	8.337	---	---	0.948	0.376	---
	(-6.50)	(4.28)					
(A.2)	2.778	20.235	-2.417	---	0.933	0.425	---
	(0.38)	(1.93)	(-1.15)				
B. Random effects							
(B.1)	-3.963	5.975	---	-1.553	0.900	0.519	12.62
	(-10.14)	(4.32)		(-0.43)			[0.01]
(B.2)	-10.336	-2.454	1.781	23.507	0.818	0.700	20.33
	(-2.15)	(-0.40)	(1.34)	(1.30)			[0.00]
VI. South Asia, SAS (n=42)							
A. Fixed effects							
(A.1)	-2.479	1.619	---	---	0.976	0.111	---
	(-14.71)	(4.18)					
(A.2)	-11.060	-8.271	2.417	---	0.983	0.095	---
	(-3.17)	(-2.10)	(2.45)				
B. Random effects							
(B.1)	-2.545	1.617	---	7.735	0.940	0.176	1.48
	(-16.01)	(4.67)		(8.79)			[0.48]
(B.2)	-10.995	-8.173	2.396	42.211	0.935	0.184	0.14
	(-2.98)	(-1.97)	(2.29)	(2.90)			[0.99]
VII. Sub-Saharan Africa, SSA (n=81)							
A. Fixed effects							
(A.1)	-1.297	1.331	---	---	0.944	0.182	---
	(-8.18)	(5.96)					
(A.2)	-9.640	-7.414	2.174	---	0.963	0.147	---
	(-4.89)	(-3.66)	(4.37)				
B. Random effects							
(B.1)	-1.311	1.379	---	3.645	0.827	0.319	0.24
	(-8.34)	(7.80)		(3.96)			[0.89]
(B.2)	-8.571	-6.223	1.862	33.211	0.865	0.282	3.1
	(-5.85)	(-4.21)	(5.16)	(5.55)			[0.38]

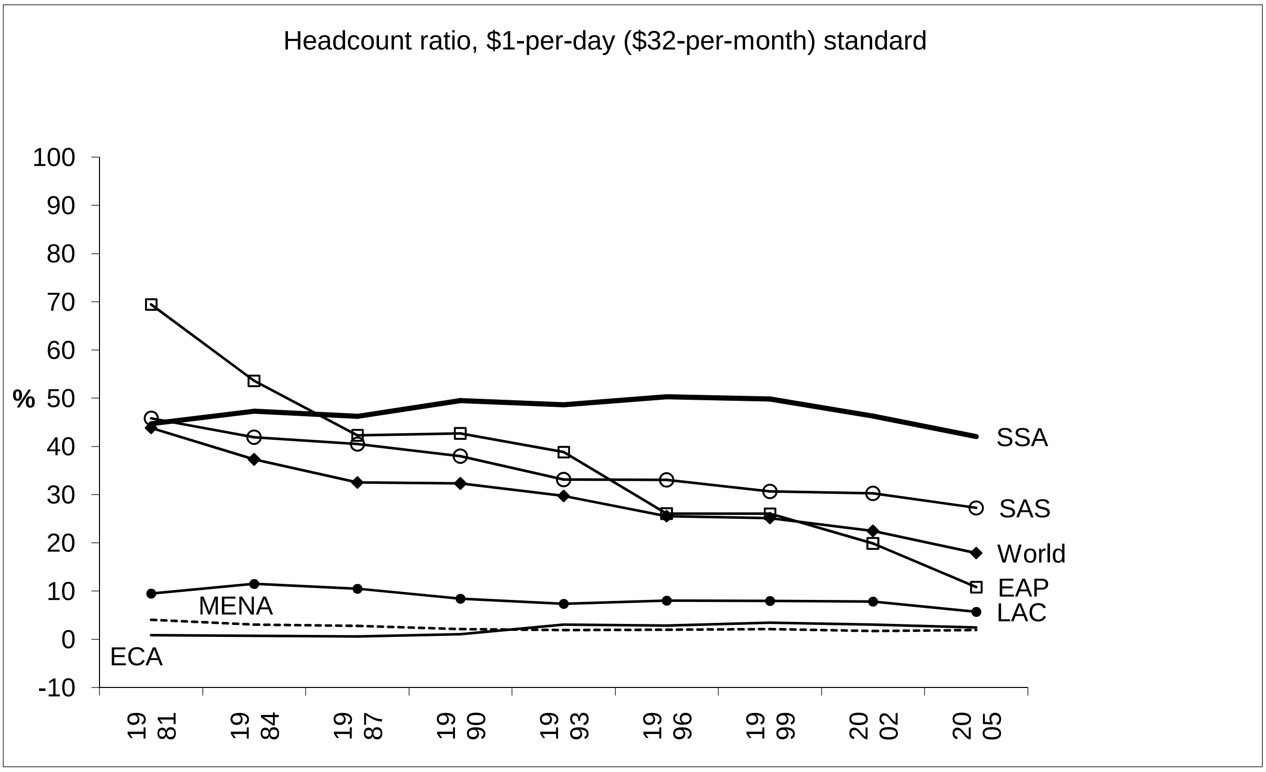
Notes: The dependent variable is the log of the headcount ratio (US$1-per day-standard), *y* is the log of mean income and *g* is the log of the Gini coefficient. Heteroscedastic-consistent robust t-statistics are in parentheses. The data source for all variables is World Bank (2007). AR^2 is the adjusted coefficient of determination and SEE is the standard error of estimate. *H* is the Hausman specification test statistic with the p-value in square brackets.

Table 3: Inequality, income and poverty - income and inequality elasticities of poverty, global and by region

	Income elasticity	
Region	**(A.1)**	**(A.2)**
Global	-2.477	-2.579* [-5.012, -1.069]
East Asia and Pacific (EAP)	-2.950*	-2.949 [-3.053, -2.734]
Europe and Central Asia (ECA)	-3.974*	-3.836 [-4.904, -2.425]
Latin America and The Caribbean (LAC)	-2.345	-2.315* [-4.271, -1.349]
Middle East and North Africa (MENA)	-5.811*	-6.083 [-6.549, -5.323]
South Asia (SAS)	-2.479	-2.668* [-3.196, -2.133]
Sub-Saharan Africa (SSA)	-1.297	-1.325* [-2.327, -0.273]
	Inequality elasticity	
Region	**(A.1)**	**(A.2)**
Global	3.502	5.027* [-0.503, 7.998]
East Asia and Pacific (EAP)	3.042*	2.917 [2.612, 3.317]
Europe and Central Asia (ECA)	8.371*	8.204 [5.359, 10.511]
Latin America and The Caribbean (LAC)	3.647	5.337* [-2.039, 8.603]
Middle East and North Africa (MENA)	8.337*	7.899 [6.567, 11.198]
South Asia (SAS)	1.619	1.425* [0.227, 2.987]
Sub-Saharan Africa (SSA)	1.331	1.760* [-1.074, 4.357]

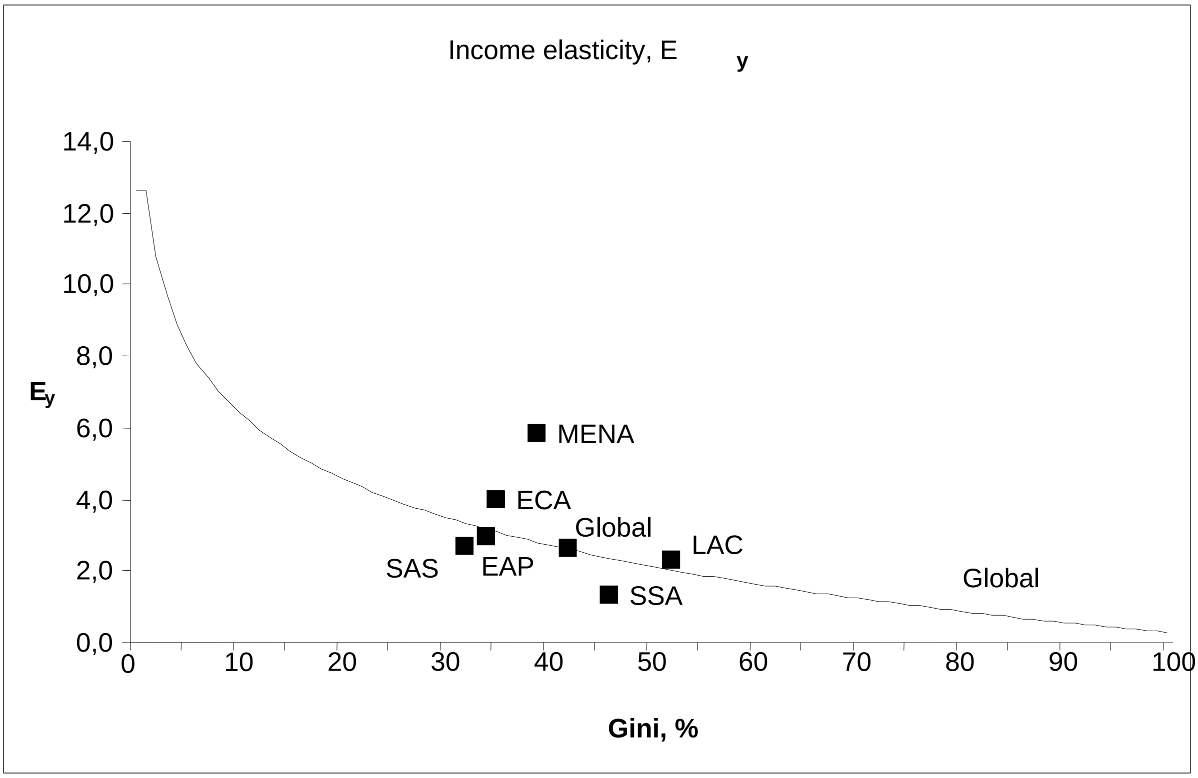
Notes: Estimates of the income and inequality elasticities are based on equations (3) and (4) of the text, respectively, using corresponding estimates from Table 2 (columns A.1 and A.2 refer to the fixed-effects results for equations (1) and (2) of the text, respectively) and the summary statistics from Appendix table 1. The values in brackets indicate the lower and upper limits of the elasticity using the respective regional minimum and maximum values of the Gini or the mean income. A starred (*) value refers to the model with the better fit in each case, based on AR^2, SEE and/or precision of the coefficients. Furthermore, where model A.2 is selected (LAC, SAS and SSA as well as Global), the interactive term is significant, thus implying inter-country differences in the elasticity.

Figure 1: Poverty trends, globally and by region, 1981–2005



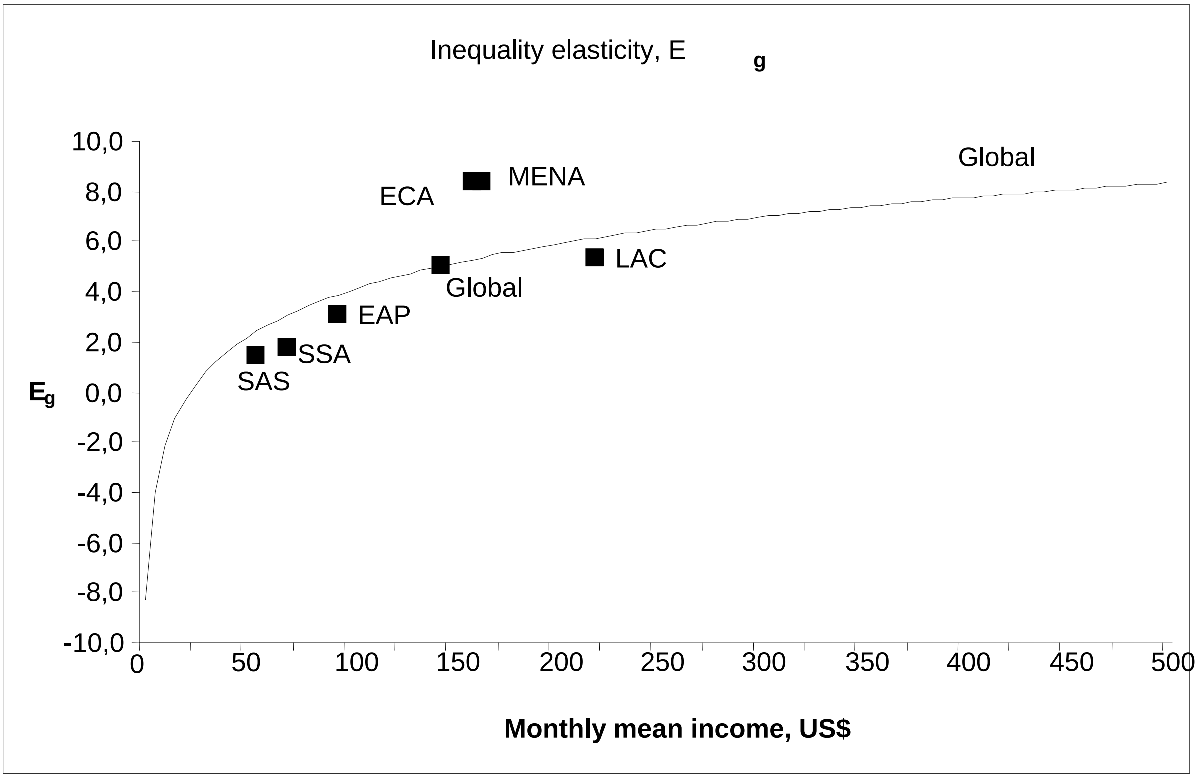
Source: World Bank (2009).

Figure 2: Income elasticity (E_y), globally and by region



Notes: The absolute value of the income elasticity is plotted here. The continuous line is the estimated elasticity function for the global sample based on the FE model (A.2) of Table 2. The regional elasticity estimates are also based on the FE models (A.1 or A.2 of Table 2). Points plotted here are the starred values representing estimates from the 'best' performing models from Table 2, evaluated at the respective regional mean values of the Gini coefficient, as reported in Table 3.

Figure 3: Inequality elasticity (E_g), globally and by region



Notes: The continuous line is the estimated elasticity function for the global sample based on the FE model (A.2) of Table 2. The regional elasticity estimates are also based on the FE models (A.1 or A.2 of Table 2). Points plotted here are the starred values representing estimates from the 'best' performing models from Table 2, evaluated at the respective regional mean values of the mean income, as reported in Table 3.

Appendix table 1. Inequality, income and poverty: summary statistics (1980–2004)

Region	Mean	SD	Min	Max
1.1 Poverty rate (Headcount ratio, US$1 per day, US$32.78 monthly 1993-PPP)				
Global	17.68	20.17	0.03	90.26
East Asia and Pacific (EAP)	18.27	18.53	0.27	82.03
Europe and Central Asia (ECA)	3.15	4.08	0.03	20.65
Latin America and The Caribbean (LAC)	10.81	10.47	0.20	52.90
Middle East and North Africa (MENA)	6.39	11.44	0.14	42.66
South Asia (SAS)	31.96	17.28	3.82	66.09
Sub-Saharan Africa (SSA)	42.80	22.35	1.91	90.26
1.2 Inequality (Gini, %)				
Global	42.33	10.02	17.08	74.33
East Asia and Pacific	34.62	7.28	17.08	48.63
Europe and Central Asia	35.31	5.23	25.71	53.70
Latin America and The Caribbean	51.84	5.81	34.48	63.42
Middle East and North Africa	39.10	4.73	28.55	47.42
South Asia	32.20	3.26	25.88	40.18
Sub-Saharan Africa	45.82	8.84	28.90	74.33
1.3 Mean monthly income (1993-PPPadjusted US$)				
Global	145.27	92.31	18.47	440.02
East Asia and Pacific	94.90	55.35	25.60	258.10
Europe and Central Asia (	161.10	54.17	69.18	319.67
Latin America and The Caribbean	222.64	90.60	47.82	440.02
Middle East and North Africa	164.66	71.36	42.06	285.65
South Asia	55.23	16.72	33.65	105.40
Sub-Saharan Africa	68.01	45.49	18.47	224.59

Notes: All statistics are non-weighted and are computed from data for 1980–2004, except for India with additional data for 1977–8.

Source: World Bank (2007).