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# Can high-inequality developing countries escape absolute poverty?

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## Abstract

At any positive rate of growth, the higher the initial inequality, the lower the rate at which income-poverty falls. It is possible for inequality to be sufficiently high to result in rising poverty, despite good underlying growth prospects at low inequality. © 1997 Elsevier Science S.A.

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## 1. Introduction

Do the poor face the same prospects of escaping poverty in high inequality developing countries as in low inequality countries? Is it possible that inequality could sometimes be so high as to stifle prospects of reducing absolute poverty, even when other initial conditions and policies are favorable to growth?

There are two arguments as to why initial distribution matters to subsequent rates of poverty reduction. The first is that higher inequality may entail a lower subsequent rate of growth in average income, and hence (it is argued) lower rate of progress in reducing absolute poverty. I shall call this the “induced-growth argument”. There are two links in this argument, one from initial distribution to growth, and one from growth to poverty reduction. On the first, an adverse effect of inequality on growth has been explained in various ways, including political-economy models in which more unequal distributions foster distortionary interventions which (it is assumed) impede growth, and models of risk-market failure in which more unequal distribution entails a higher density of credit-constrained people who are unable to take up productive investment options.<sup>2</sup> This link has

<sup>1</sup>The findings, interpretations, and conclusions of this paper are those of the author, and should not be attributed to the World Bank, its Executive Directors, or the countries they represent.

<sup>2</sup>See Persson, Tabellini (1994), Alesina, Rodrik (1994), and Bénabou (1996). For a review of the theory and evidence as to how inequality can impede growth see Bruno et al. (1995).

received attention in recent literature and there is supportive evidence from cross-country comparisons.<sup>3</sup> Argument and evidence on the second link from growth to poverty reduction—has had a longer history.<sup>4</sup> A number of recent studies suggest that growth in average incomes typically reduces absolute income poverty.<sup>5</sup>

There is a second argument linking initial distribution to the rate of poverty reduction. This argument has received less attention. Even if initial distribution is irrelevant to the rate of growth, it may matter greatly to how much the poor share in that growth. Assume a growth process in which all levels of income grow at roughly the same rate. (Amongst developing countries, recent changes in inequality have had virtually zero correlation with rates of growth, so this assumption is defensible; see Ravallion, Chen, 1997.) Higher inequality will then entail that the poor gain less in absolute terms from growth; the poor will have a lower share of both total income and its increment through growth; thus the rate of poverty reduction (for a wide range of measures) must be lower. At maximum inequality—when the richest person has everything—absolute poverty will be unresponsive to growth. By the same token, lower inequality will mean that the poor bear a larger share of the adverse impact of aggregate economic contraction. Low inequality will then be a mixed blessing for the poor; it helps them share in the benefits of growth, but it also exposes them to the costs of contraction. I call this the “growth-elasticity argument”.<sup>6</sup>

This paper is mainly concerned with testing the growth-elasticity argument, though it will throw some new light on the induced-growth argument, and it will explore implications of both. The following section outlines the testable hypothesis implied by the “growth-elasticity argument” and provides a test. Section 3 then brings the two arguments together to examine how initial distribution influences progress in reducing poverty. Section 4 concludes.

## **2. The hypothesis and test**

It is impossible to predict in the abstract how differences between countries in a measure of overall inequality, such as the Gini index, will influence the growth elasticity of poverty reduction for any specific measure of poverty, such as the proportion of the population living below a poverty line. The outcome will depend on precisely how distribution varies between countries and over time, as well as the specific properties of the poverty measure. Consideration of some special cases can be

<sup>3</sup>On the effect of initial inequality on the rate of growth see Persson, Tabellini (1994); Alesina, Rodrik (1994); Clarke (1995), and Deininger, Squire (1996).

<sup>4</sup>For recent reviews of this literature see Lipton, Ravallion (1995) and Bruno et al. (1995).

<sup>5</sup>On the extent to which growth reduces absolute poverty see World Bank (1990); Fields (1989); Squire (1993); Ravallion (1995) and Ravallion, Chen (1997).

<sup>6</sup>There is a small literature on the decomposition of changes in poverty into “growth” and “distributional” effects (Kakwani, 1993; Datt, Ravallion, 1992). In this context one can identify and measure a “growth elasticity” of standard poverty measures with respect to changes in the mean of the distribution on which they are based. However, this literature has not examined the dependence of these elasticities on initial distribution.

illuminating.<sup>7</sup> However, robust theoretical generalizations would seem well out of reach. What I am after here is a data-consistent empirical generalization of the relationship.

The hypothesis to be tested is that, as inequality increases, the rate of poverty reduction becomes less responsive to growth in average income, and reaches zero at sufficiently high inequality. Assuming that the elasticity of poverty reduction to growth falls linearly as inequality increases, and reaches zero when the richest person has all of the income, the rate of reduction in poverty can be written:

$$r = \beta(1 - I)g \quad (\beta > 0), \quad (1)$$

where  $I$  is a measure of initial inequality and  $g$  is the rate of growth in mean income. Thus the rate of poverty reduction is directly proportional to the “distribution-corrected” rate of growth  $(1 - I)g$ .

To test the hypothesis against a more general (ad hoc) nonlinear alternative, I estimated the following encompassing model, including an error term:

$$r = \beta(1 - I)g + \gamma_0 + \gamma_1 g + \gamma_2 g^2 + \gamma_3 I + \gamma_4 I^2 + \gamma_5 gI^2 + \gamma_6 g^2 I + \gamma_7 g^2 I^2 + \epsilon, \quad (2)$$

where  $\epsilon$  is an innovation error. Eq. (1) implies the testable restrictions on (2) that  $\gamma_i = 0$  for all  $i$ . However, (2) is flexible enough to allow a wide range of alternatives, including that initial inequality is irrelevant, and only growth matters ( $\gamma_i = 0$  for all  $i \neq 1$  and  $\beta = 0$ ). It also allows nonlinearity in the way inequality affects the growth elasticity.

To test the hypothesis in (1) I will be using data for 41 spells constructed from two household surveys over time, for 23 developing countries.<sup>8</sup> The two surveys use the same welfare indicator (so one does not compare a consumption-based measure of inequality at one date with an income-based measure at another). All distributions are based on consumption or income per person, and are household-size weighted (so all fractiles are of persons not households). All rates of change are compound annual rates (annualized differences in logs gave similar results.) The poverty measure is the proportion of the population living below \$1.50/day at 1993 international prices.<sup>9</sup> All currency conversions used the consumption PPP rate from Penn World Tables 5.6. The poverty measure is intended to be “absolute” in that the poverty line has constant real value both across countries (based on the PPP exchange rates) and over time (based on country-specific CPIs). (It does not reflect, for example, any effect of rising average levels of living on the perception of what constitutes “poverty”

<sup>7</sup>For example, Kakwani (1993) derives formulae for the elasticities of various poverty measures with respect to growth in the mean, holding the Lorenz curve constant. He also considers one special case in which the Lorenz curves shift by a constant proportion of the difference between the line of equality and the Lorenz curve. Suppose that distribution does not change over time, but differs between countries in the way Kakwani assumes. Then, from Kakwani’s formulae for the “growth elasticities” it can then be shown that the (absolute) elasticity of certain poverty measures (including, for example, the Foster et al., 1984, index) with respect to the mean of the distribution will be decreasing in the Gini index when the poverty line is less than the mean of the distribution.

<sup>8</sup>Further details on the data can be found in Ravallion, Chen (1997), who use these data to describe how poverty and distribution have been changing in the developing world, and what the empirical relationship is amongst these variables (though they do not examine the issue of this paper).

<sup>9</sup>This is equivalent to \$1/day at 1985 prices; this is the average level of poverty lines found in low-income countries; see (World Bank (1990), Chapter 2) and Ravallion et al. (1991), for further discussion.

in a given country.) The inequality measure is the Gini index. The growth rate is the annualized rate of change in the survey mean.<sup>10</sup> Though care has gone into setting up this data set from the primary sources, it is undeniably “noisy” data; there are underlying differences in survey methodology between countries and over time that one cannot possibly eliminate (though by focusing on rates of change, noncomparabilities which take the form of proportionate country-level fixed effects will be eliminated.)

A joint  $F$ -test on the OLS estimate of (2) could not reject the null hypothesis that  $\gamma_i = 0$  for all  $i$ .<sup>11</sup> The restricted form is:<sup>12</sup>

$$r = 4.435(1 - I)g + \text{residual (4.695)}, \quad (3)$$

with an  $R^2$  of 0.355. Fig. 1 plots Eq. (3) and the data. There is a large unexplained variance, though at least some of this is measurement error.

However, there were other null hypotheses which could not be rejected as restricted forms, including  $\gamma_i = 0$  for all  $i \neq 1$  and  $\beta = 0$ .<sup>13</sup> Under this null, it is only the growth rate that matters. If one lets the distribution-corrected growth rate and the ordinary growth rate fight it out in one regression one obtains:

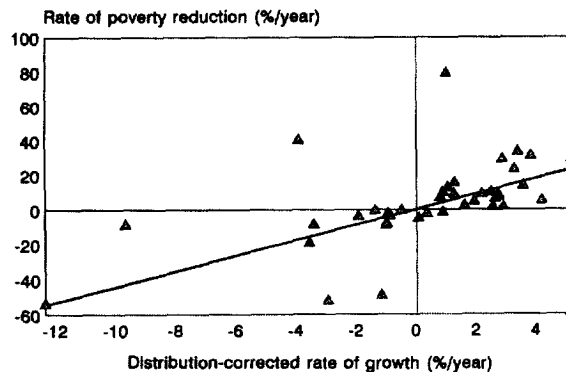


Fig. 1. Rate of poverty reduction against distribution-corrected rate of growth.

<sup>10</sup>This is almost certainly a better measure for this purpose than (say) the private consumption component of the national accounts; both sources entail measurement errors but for the survey mean the attenuation bias will be offset by a bias in the opposite direction due to the use of a common survey to estimate both the poverty measure and the growth rate; indeed, under certain conditions the two sources of bias will be exactly offsetting (Ravallion, Chen, 1997). Using the national accounts, however, will give the attenuation bias only, which could be large given the imperfect matching between survey dates and the accounting periods for the national accounts.

<sup>11</sup>The value of  $F(8, 32) = 1.467$ , which is significant at only the 21% level; similarly the LM tests gave  $\text{Chi-square}(8) = 11.003$ , significant at the same level.

<sup>12</sup>The  $t$ -ratio is based on the OLS standard error. If one interprets the following equation as the first difference of an equation for the log of the poverty measure which has a white noise error term then there will be non-zero off diagonal elements in the error covariance matrix. If one allows for this in estimating the standard error, the  $t$ -ratio rises slightly (to 4.76). If one also allows for any general type of heteroscedasticity, the robust  $t$ -ratio falls to 4.26. So such corrections make little difference here.

<sup>13</sup>The  $F$ -test was  $F(8, 32) = 1.761$  and the LM test gave  $\text{Chi-square}(8) = 12.532$ ; both would only reject the null at the 12% level.

$$r = 16.096(1 - I)g - 6.663g + \text{residual } (2.189) \ (-1.596). \quad (4)$$

Though there is clearly a strong correlation between these two variables, this regression still suggests that it is the distribution-corrected mean which matters more to poverty reduction than the ordinary mean. Eq. (3) is a statistically acceptable restricted form of (4).

I repeated the analysis replacing the proportion of people living below \$1.50/day by a distribution-sensitive poverty measure (for the same poverty line), namely the Foster et al. (1984) index based on squared poverty gaps. The same qualitative results were obtained, though the estimated value of  $\beta$  rose to 8.098 (with a  $t$ -ratio of 3.905<sup>14</sup>).

### 3. Combining the “induced-growth” and “growth-elasticity” arguments

The above results indicate that higher inequality tends to entail a lower rate of poverty reduction at any given positive rate of growth. Eq. (3) suggests that the growth elasticity declines sharply as inequality increases. At the lowest Gini index in the sample (0.25) the growth elasticity is 3.33, while at the highest Gini index (0.59) it is 1.82. At the mean Gini index (0.41), the growth elasticity of the poverty reduction is 2.62.

As noted in the Introduction, there is also evidence that higher inequality results in a lower rate of growth. To bring these two sources of evidence together, let us follow past specifications used in the growth literature and write the rate of growth as:

$$g = g_0 + \delta I + \nu \quad (\delta < 0), \quad (5)$$

where  $g_0$  is the expected rate of growth at zero inequality and  $\nu$  is an innovation error. The expected rate of poverty reduction (conditional on  $g_0$  and  $I$ ) is then:

$$\bar{r} = \beta g_0 + \beta(\delta - g_0)I - \beta\delta I^2. \quad (6)$$

This is strictly decreasing (increasing) in  $I$  as long as the rate of growth at zero inequality is above (below)  $\delta$  ( $1 - 2I$ ). And  $\bar{r}$  is strictly convex in  $I$  (for  $\delta < 0$  and  $\beta > 0$ ). Fig. 2 depicts the relationship implied by (6).

If  $g_0 > 0$  and  $I \leq 0.5$  then poverty will fall, and at a faster rate the lower the inequality. The same difference in inequality will matter more to the rate of poverty reduction amongst low inequality countries than amongst high-inequality countries. For  $g_0 > 0$  but  $I > 0.5$ , it is possible for inequality to be sufficiently high that the rate of growth becomes negative and poverty rises, as indicated by the upper dashed line in Fig. 2; this requires that  $\delta < -g_0$  (implying that the left derivative of the RHS of (6) w.r.t.  $I$  is positive at  $I = 1$ ), and poverty will be rising (in expectation) for  $I$  in the interval  $(-g_0/\delta, 1)$ . For  $g_0 < 0$  and  $I \geq 0.5$ ,  $\bar{r}$  must be strictly increasing in  $I$ ; however, if  $\delta < g_0$  then  $\bar{r}$  will be decreasing in  $I$  at sufficiently low inequality (Fig. 2).

So the value of  $\delta$  is crucial. What is the evidence on this? There are clearly many other factors

<sup>14</sup>In this case, the correction for heteroscedasticity and non-zero off diagonal elements in the covariance matrix (using the method described in footnote 12) made more difference to the standard error; the reported  $t$ -ratio here is based on the corrected standard error; without corrections, the  $t$ -ratio was 2.45.

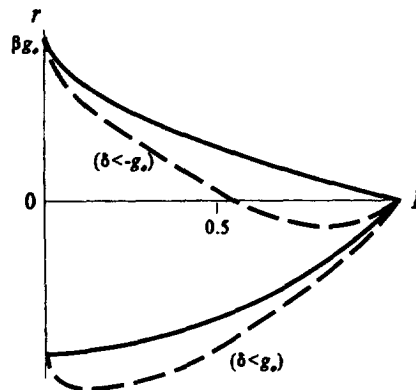


Fig. 2. Rate of poverty reduction ( $r$ ) as a function of initial inequality ( $I$ ).

determining the rate of growth, including the initial income level, initial human capital, and the policies pursued. Controlling for these factors, Clarke (1995) estimates that  $\delta = -0.07$  (i.e., a one percentage point increase in the Gini index results in about a 0.07 percentage point decrease in the annual rate of economic growth). The growth regressions in Deininger, Squire (1996) suggest a similar value of  $\delta = -0.05$ , on a data set different to Clarke's in many respects. Both estimates are significantly different from zero at the 5% level or better.

These estimates of  $-\delta$  are sufficiently high to suggest that, once the impact of inequality on growth is factored in, even countries with relatively good growth prospects (at low inequality) will see contraction and rising poverty at sufficiently high levels of inequality. Returning to the data used in the previous section, and using the Deininger–Squire estimate of  $\delta$ , I found that  $g_0 > 0$  (in expectation) for 33 of the 41 spells.<sup>15</sup> In 24 of those 33 spells, poverty was falling (the growth rate was positive in 26 cases); so in nine cases the data are in the region with  $g_0 > 0$  but rising poverty. Using the Clarke estimate of  $\delta$  instead the result is unchanged;<sup>16</sup> again  $g_0 > 0$  in 33 cases, and these were the same 33, so again nine had rising poverty.

However, there is (of course) statistical imprecision in the estimate of  $-\delta$  and (hence)  $g_0$ . If instead one sets  $\delta = -0.03$  (one standard error above the Deininger–Squire point estimate), then the number of spells for which  $g_0 > 0$  and yet poverty was rising drops from nine to three.

#### 4. Conclusion

Household survey data for developing countries suggest that initial distribution does matter to how much the poor share in rising average incomes; higher initial inequality tends to reduce the impact of growth on absolute poverty. By the same token, higher inequality diminishes the adverse impact on the poor of overall contraction.

Further interpretation is possible when one combines this evidence with that from recent

<sup>15</sup>This is the expected value of  $g_0$ , given by  $g - \delta I$ . The mean value of  $g_0$  is 2.8% per annum though the variance is high, with a standard deviation of 6.2%.

<sup>16</sup>Though the mean  $g_0$  is of course higher, at 3.6%.

investigations of the impacts of inequality on growth. One then finds that, if inequality is sufficiently high, countries which would have very good growth prospects at low levels of inequality may well see little or no overall growth, and little progress in reducing poverty, and even a worsening on both counts. (And, by the same token, factoring in the growth effects magnifies the estimated handicap that the poor face in contracting low-inequality countries.) The data used here suggest that such cases do occur. The precision with which key parameters have been estimated makes it difficult to say with confidence how common such cases are, although they do appear to be in the minority. What would appear to be the best available estimates suggest that about one fifth of the spells between surveys analyzed here were cases in which poverty was rising, yet positive growth in the mean (and hence falling poverty) is predicted at zero inequality. Inequality can be sufficiently high to result in rising poverty despite good underlying growth prospects.

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