
Growth and Poverty Reduction: An Empirical Analysis

Nanak Kakwani

Abstract. *This paper develops an inequality-growth trade off index, which shows how much growth is needed to offset the adverse impact of an increase in inequality on poverty. The empirical analysis based on this index shows that pro-poor policies will have a greater payoff for poverty reduction in Thailand, while growth-maximizing policies may be more adequate for Korea and Lao PDR. For the Philippines, a mixture of growth and pro-poor policies may be deemed as adequate. Further, the paper shows that countries with low initial inequality will have a greater poverty reduction payoff from growth, whereas countries with high initial inequality will have a greater poverty reduction payoff from pro-poor policies. Finally, the paper suggests that if our focus is on ultra poverty, then pro-poor policies would be of greater benefit.*

Introduction

How sensitive is the incidence of poverty to economic growth? This issue has been the subject of extensive research in recent years. A large amount of cross-country evidence suggests that growth and poverty reduction are strongly positively correlated. This result is consistent with the “trickle down” theory that some benefits of growth will always trickle down to the poor. Thus, the incidence of poverty can diminish with growth even if the poor receive only a small fraction of total benefits.

A recent World Bank study by Dollar and Kraay (2000) has come out with a much stronger result that the income of the poor rises one-for-one with overall growth. It means that the proportional benefits of growth enjoyed by the poor are the same as those by the nonpoor. An important implication of this research is that growth is good for the poor irrespective of the nature of growth. Thus, governments

Nanak Kakwani is a professor in the University of New South Wales. The author wishes to acknowledge the expert assistance provided by Hyun Son.

need not follow pro-poor policies with a focus on poverty reduction. To achieve a rapid reduction in poverty, they should focus on maximizing economic growth while maintaining macroeconomic stability.

The World Bank study, although highly influential, is based on cross-country regressions, which can indicate only the average trends. Individual country experiences can be quite different. We cannot have the same policy prescriptions for all countries. For some countries, the growth-maximizing policies may be adequate but for other countries, there may be a need to have pro-poor growth policies with a focus on reducing inequality (for a detailed discussion of pro-poor growth see Kakwani and Pernia 2000).

The degree of poverty depends upon two factors: average income and income inequality. The increase in average income reduces poverty and the increase in inequality increases it. Thus, the change in poverty can be decomposed into two components: one is the growth component relating to change in mean income, and the other is the inequality component relating to change in inequality. The magnitudes of two components provide the relative sensitivity of poverty reduction to growth and inequality. It is obvious that if the growth component dominates over the inequality component, then growth-maximizing policies may be adequate in achieving a rapid reduction in poverty. If the inequality component dominates, then the policies that are pro-poor and thus reduce inequality should be adopted.

The main objective of the present paper is to measure the tradeoff between inequality and growth, which shows how much growth is needed in order to offset the adverse impact of an increase in inequality on poverty. The magnitude of this tradeoff is estimated for four countries, namely, Republic of Korea (Korea), Thailand, Lao PDR, and Philippines. These four countries are at different stages of development and will require different policies to achieve a rapid reduction in poverty. The magnitude of the inequality–growth tradeoff gives an indication of the policies that individual countries should follow.

Economic Growth and Poverty Reduction

Suppose income x of an individual is a random variable with distribution function given by $F(x)$. Let z denote the poverty line, then $H = F(z)$ is the proportion of individuals whose income falls below the poverty line or H is the proportion of poor in the society. H is the most popularly used poverty measure and is called the headcount ratio.

The headcount ratio is a crude measure of poverty. The percentage of the population that is poor does not reflect the intensity of poverty suffered by the poor. A suitable measure of poverty should take into account the following three indicators of poverty:

- (i) percentage of poor
- (ii) aggregate poverty gap
- (iii) distribution of income among the poor

A general class of a poverty measure, which combines these three characteristics of poverty can be written as

$$\theta = \int_0^z P(z, x) f(x) dx \quad (1)$$

where $f(x)$ is the density function of x and

$$\frac{\partial P}{\partial x} < 0, \frac{\partial^2 P}{\partial x^2} > 0, P(z, z) = 0$$

and $P(z, x)$ is a homogenous function of degree zero in z and x .

Foster, Greer, and Thorbecke (1984) proposed a class of poverty measures that is obtained by substituting

$$P(z, x) = \left(\frac{z - x}{z} \right)^\alpha \quad (2)$$

in (1), where α is the parameter of inequality aversion. For $\alpha = 0$, $\theta = H$, that is, the headcount ratio. This measure gives equal weight to all poor irrespective of the intensity of their poverty. For $\alpha = 1$, each poor is weighed by his or her distance from the poverty line, relative to z . This measure is called the poverty gap ratio. For $\alpha = 2$, the weight given to each poor is proportional to the square of his or her income shortfall from the poverty line. This measure is called the severity of poverty ratio. This measure satisfies all the three indicators of poverty stated above.

The degree of poverty depends on two factors: the average level of income and the extent of inequality in income distribution. Thus a poverty measure can always be written as

$$\theta = \theta(\mu, L(p)) \quad (3)$$

where μ is the mean income of the society and $L(p)$ is the Lorenz function measuring the relative income distribution. $L(p)$ is the percentage of income that is enjoyed by the bottom p percent of the population.

The growth effect measures the effect of a change in μ on θ when $L(p)$ remains constant. On the other hand, the redistribution (or inequality) effect measures the effect of a change in $L(p)$ on θ when μ remains constant. The total effect of economic growth on poverty can be decomposed into two factors: (i) the impact of growth when the inequality does not change, and (ii) the impact of change in inequality when the mean income of the society is kept constant. The measures of these two effects are presented in the next two sections.

Growth Effect

To measure the growth effect, Kakwani (1993) derived the elasticity of θ with respect to μ , keeping $L(p)$ fixed. This elasticity is given by

$$\eta_{\theta} = \frac{1}{\theta} \int_0^{\epsilon} x \frac{\partial P}{\partial x} f(x) dx \tag{4}$$

which is always negative in view of $\frac{\partial P}{\partial x} < 0$. For the headcount measure $P(z,x) = 1$, the elasticity is derived as

$$\eta_H = -\frac{zf(z)}{H} < 0 \tag{5}$$

which is the percentage of poor who will cross the poverty line as a result of a 1 percent growth in the mean income of the society.

Substituting (2) into (4) gives the elasticity of the Foster, Greer, and Thorbecke class of poverty measures denoted by θ_{α} with respect to μ as

$$\eta_{\alpha} = \frac{\partial \theta_{\alpha}}{\partial \mu} \cdot \frac{\mu}{\theta_{\alpha}} = -\frac{\alpha(\theta_{\alpha-1} - \theta_{\alpha})}{\theta_{\alpha}} \tag{6}$$

for $\alpha \neq 0$, which will always be negative because θ_{α} is a monotonically decreasing function of α . This elasticity for the poverty gap ratio is obtained by substituting $\alpha = 1$ in (6), which gives

$$\eta_1 = -\frac{\mu^*}{(z - \mu^*)} \tag{7}$$

where μ^* is the mean income of the poor.

The magnitude of η_1 depends on $\frac{\mu^*}{z}$, which measures the depth of poverty.

The smaller is $\frac{\mu^*}{z}$, the greater is the depth of poverty. It can be noted that the

absolute magnitude of elasticity in (7) is an increasing function of $\frac{\mu^*}{z}$, from which we may conclude that the impact of economic growth on poverty reduction (when inequality does not change) is smaller (larger) when the depth of poverty is larger (smaller).

Inequality Effect

η_α is the pure growth elasticity, measuring the impact of economic growth on poverty reduction when the inequality of income (measured by the Lorenz curve) does not change with growth. However, economic growth may increase or decrease inequality. Growth may be called pro-poor if it reduces inequality so that the poor benefit proportionally more than the rich.

The measurement of the effect of inequality on poverty is a difficult task because inequality can change in infinite ways. Here we follow Kakwani (1993) and make a simple assumption that the entire Lorenz curve shifts. Using this assumption, the elasticity of poverty with respect to the Gini index can be written as

$$\epsilon_\theta = \frac{1}{\theta} \int_0^z \frac{\partial P}{\partial x} (x - \mu) f(x) dx, \quad (8)$$

which shows that if the economic growth leads to an increase in the Gini index by 1 percent, the incidence of poverty will increase by ϵ_θ percent, provided the poverty line is less than the mean income μ .

For the Foster, Greer, and Thorbecke poverty measures, the inequality elasticity is given by

$$\epsilon_\alpha = \mu + \frac{\alpha \theta_{\alpha-1}}{\theta_\alpha} \times \frac{(\mu - z)}{z} \quad (9)$$

For $\alpha \neq 0$. This elasticity for the poverty gap ratio is obtained by substituting $\alpha = 1$ in (9), which gives

$$\varepsilon_1 = \frac{(\mu - \mu^*)}{(z - \mu^*)} \tag{10}$$

which will always be positive.

It can be seen that ε_1 increases monotonically with $\left(\frac{\mu^*}{z}\right)$, which implies that the adverse impact of increase in inequality on poverty will be larger (smaller) when the depth of poverty is smaller (larger).

Tradeoff between Inequality and Poverty

Economic growth increases mean income, which has an impact of reducing poverty. If economic growth also increases inequality, then poverty increases. What is the tradeoff between inequality and growth? If the Gini index increases by 1 percent, how much should be the growth rate in order that poverty does not increase? The total proportional change in poverty may be written as

$$\frac{d\theta}{\theta} = \eta_\theta \frac{d\mu}{\mu} + \varepsilon_\theta \frac{dG}{G} \tag{11}$$

where the first term in the right-hand side measures the impact of growth on poverty (affecting the mean income) and the second component measures the impact of change in the Gini index on poverty. Equating the total proportionate change in poverty to zero, we obtain the inequality–growth tradeoff index (IGTI) as

$$\text{IGTI} = \phi_\theta = \frac{\partial\mu}{\partial G} \times \frac{G}{\mu} = -\frac{\varepsilon_\theta}{\eta_\theta} \tag{12}$$

If, for example, IGTI is equal to 3.0, it means that a 1 percent increase in the Gini index will require a growth rate of 3 percent in order to offset the adverse impact of increase in inequality. It also means that by following pro-poor policies, if we can reduce the Gini index by 1 percent, then this policy is equivalent to having an additional 3 percent growth rate. This suggests that the larger the IGTI, the greater will be the benefits of following pro-poor policies that would reduce inequality.

The IGTI for the Foster, Greer, and Thorbecke class of poverty measures is given by

$$\phi_\alpha = \frac{z\theta_\alpha + (\mu - z)\theta_{\alpha-1}}{z(\theta_{\alpha-1} - \theta_\alpha)} \quad (13)$$

Substituting $\alpha=1$ in (13) gives the IGTI for the poverty gap ratio as

$$\theta_1 = \frac{(\mu - \mu^*)}{\mu^*}$$

which is clearly a decreasing function of μ^* . This means that the greater the poverty depth, the larger the IGTI. Thus, in the countries, where poverty depth is higher, then pro-poor policies will be more effective in reducing poverty.

Empirical Analysis

The methodology developed herein is applied to four countries, namely, Korea, Thailand, Lao PDR, and Philippines. These countries are at different levels of development with different levels of poverty and inequality. Korea and Thailand are cited as tiger economies in the Asian and Pacific region. Their per capita GDP growth has been on average over 6 percent for a long period of time until the economic crisis in mid-1997 brought a halt to their impressive growth performance. Although both countries have experienced a rapid reduction in poverty, Korea's performance in poverty reduction has been much superior (Kakwani and Son 2000). Korea achieved high growth while maintaining low inequality whereas Thailand achieved high growth but at the cost of acquiring high inequality. The Philippines's performance in both growth and poverty reduction has not been so good compared with Korea and Thailand. While its growth rate has been much lower, it has maintained a high level of inequality and also high incidence of poverty. Lao PDR is the poorest of the three countries. Almost 45 percent of the population were identified as poor in 1992-1993; fortunately the percentage of poor declined to about 38.7 percent in 1997-1998 (Kakwani 2000b). The rapid poverty reduction was achieved due to an average annual growth rate of 4.6 in the per capita real GDP during the past five years.

Poverty elasticity was computed using the unit record data for the four countries. To compute the elasticity we need to know the poverty threshold for each country. We utilized the threshold for each of the four countries (Kakwani and Prescott 1999 for Korea, Kakwani and Krongkaew 2000 for Thailand, Kakwani 2000a for the Philippines and Kakwani 2000b for Lao PDR). The values of growth and inequality elasticity along with the IGTI index are presented in Table 1.

Table 1: **Growth and Inequality Elasticity and their Tradeoff**

Countries	Poverty Gap Ratio			Severity of Poverty Ratio		
	Growth Elasticity	Inequality Elasticity	IGTI	Growth Elasticity	Inequality Elasticity	IGTI
Thailand, 1998	-2.94	11.96	4.07	-3.27	16.65	5.10
Philippines, 1998	-1.83	4.25	2.32	-2.15	6.77	3.14
Korea, 1998	-3.52	4.32	1.23	-3.76	6.24	1.66
Lao PDR, 1997-1998	-2.41	2.27	0.94	-2.90	3.83	1.32

IGTI means inequality–growth tradeoff index.

The value of IGTI for Thailand is computed to be 4.04 (for the poverty gap ratio), which means that an increase of 1 percent in the Gini index will require a growth rate of about 4 percent in order that the incidence of poverty does not change. It also means that a reduction of inequality by 1 percent is equivalent to having a growth rate of 4 percent. This result suggests that a strategy of inequality reduction will have greater payoff for poverty reduction than the strategy of promoting economic growth. This cannot be said for Korea and Lao PDR. The values of the IGTI for Korea and Lao PDR are 1.23 and 0.94, respectively. These results suggest that the payoff for the strategy of inequality reduction in these countries is much lower and therefore the growth maximization may be adequate for them to achieve a rapid reduction in poverty. For the Philippines, the value of IGTI is 2.32, which is much lower than that of Thailand but much higher than that of Korea and Lao PDR. Thus for the Philippines, a mixture of growth and pro-poor policies may be deemed as appropriate.

How does the initial level of inequality affect the choice of policies? To see this effect, we generated a new income distribution by uniformly shifting the Lorenz curve of the original income distribution downward by 5 percent so that the new distribution had the same mean income as the original distribution but a 5 percent higher value for the Gini index. This new distribution is referred to as the distribution with high inequality. Similarly, we generated a low inequality distribution by uniformly shifting the Lorenz curve upward by 5 percent, which will have a 5 percent lower value for the Gini index. The original income distribution is referred to as the distribution with medium inequality. We computed the IGTI for the three income distributions. The empirical results given in Table 2 show that the value of IGTI increases monotonically with inequality; the higher the inequality, the greater the value of IGTI. This result holds for all the four countries. From these results, we may conclude that the countries with a higher initial level of inequality may be able to reduce poverty more rapidly by following inequality-reducing policies. The countries with low initial inequality can afford to follow growth-maximizing policies.

Table 2: **Growth and Inequality Elasticity and their Tradeoff for Different Levels of Initial Inequality**

Countries	Poverty Gap Ratio			Severity of Poverty Ratio		
	Growth Elasticity	Inequality Elasticity	IGTI	Growth Elasticity	Inequality Elasticity	IGTI
Thailand, 1998						
Low Inequality	-4.22	15.52	3.68	-4.84	21.03	4.34
Medium Inequality	-2.94	11.96	4.07	-3.27	16.65	5.10
High Inequality	-2.08	9.56	4.60	-2.23	13.78	6.17
Korea, 1998						
Low Inequality	-4.02	4.69	1.17	-4.37	6.68	1.53
Medium Inequality	-3.52	4.32	1.23	-3.76	6.24	1.66
High Inequality	-3.06	3.98	1.30	-3.25	5.86	1.80
Lao PDR, 1997-1998						
Low Inequality	-2.73	2.39	0.88	-3.31	3.97	1.20
Medium Inequality	-2.41	2.27	0.94	-2.90	3.83	1.32
High Inequality	-2.13	2.17	1.02	-2.55	3.70	1.45
Philippines, 1998						
Low Inequality	-2.27	4.75	2.10	-2.75	7.45	2.71
Medium Inequality	-1.83	4.25	2.32	-2.15	6.77	3.14
High Inequality	-1.49	3.86	2.59	-1.69	6.23	3.69

IGTI means inequality-growth tradeoff index.

Do we need to follow different policies when our focus is on reducing ultra poverty? To investigate this question, we computed the IGTI for the ultrapoor, who are defined as those having a lower poverty line. The poverty line was uniformly reduced by 20 percent. The calculated values of the IGTI for the poor and ultrapoor are presented in Table 3.

It is noted that the value of IGTI is uniformly higher for the ultrapoor compared to those for the poor. This suggests that inequality-reducing policies will be more beneficial for the ultrapoor than for the poor. Thus, if our focus is on reducing ultra poverty, then we should be more inclined to adopt pro-poor policies.

Table 3: Growth and Inequality Elasticity and their Tradeoff for Poor and Ultrapoor

Countries	Poverty Gap Ratio			Severity of Poverty Ratio		
	Growth Elasticity	Inequality Elasticity	IGTI	Growth Elasticity	Inequality Elasticity	IGTI
Thailand, 1998						
Poor	-2.94	11.96	4.07	-3.27	16.65	5.10
Ultrapoor	-3.35	17.21	5.14	-3.67	23.13	6.30
Korea, 1998						
Poor	-3.52	4.32	1.23	-3.76	6.24	1.66
Ultrapoor	-3.82	6.63	1.74	-4.09	9.12	2.23
Lao PDR, 1997-1998						
Poor	-2.41	2.27	0.94	-2.90	3.83	1.32
Ultrapoor	-3.05	3.90	1.28	-3.38	5.86	1.73
Philippines, 1998						
Poor	-1.83	4.25	2.32	-2.15	6.77	3.14
Ultrapoor	-2.17	6.35	2.92	-2.45	9.50	3.87

IGTI means inequality–growth tradeoff index.

Conclusion

A simple message of this paper is that we cannot have the same policies for all countries. For some countries, growth-maximizing policies may be adequate and for others, there may be a need to have pro-poor policies focusing on reducing inequality. The choice of policies may be made based on the inequality–growth tradeoff index, which has been developed in the paper. The empirical analysis shows that pro-poor policies will have a greater payoff for poverty reduction in Thailand, while growth-maximizing policies may be more adequate for Korea and Lao, PDR. For the Philippines, a mixture of growth and pro-poor policies may be deemed as adequate.

Further, the paper indicates that the initial level of inequality is important in determining the appropriate policies for a country. Countries with low initial inequality will have a greater poverty-reduction payoff from growth, whereas countries with high initial inequality will have a greater poverty-reduction payoff from pro-poor growth.

Finally, the paper suggests that the poverty-reduction payoff from growth is lower for the ultrapoor than for the poor. Thus, if our focus is on reducing ultra poverty, then pro-poor policies would be of greater benefit.

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