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Pro-Poor Growth: The Asian Experience

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Abstract

This paper looks into the interrelation between economic growth, inequality, and poverty. Using the notion of pro-poor growth, this study examines to what extent the poor benefit from economic growth. First, various approaches to defining and measuring pro-poor growth are scrutinized using a variety of criteria. It is argued that the satisfaction of a monotonicity axiom is a key criterion for measuring pro-poor growth. The monotonicity axiom sets out a condition that the proportional reduction in poverty is monotonically an increasing function of the pro-poor growth measure. This paper proposes a pro-poor growth measure that satisfies the monotonicity criterion. This measure is called the ‘poverty equivalent growth rate’, which takes into account both the magnitude of growth and how the benefits of the growth are distributed to the poor and the non-poor. As the new measure satisfies the criterion of monotonicity, it is indicative that to achieve a rapid poverty reduction, the poverty equivalent growth rate ought to be maximized rather than the actual growth rate. The methodology developed in the paper is then applied to Asian countries, including the Republic of Korea, Thailand, and Vietnam.

Keywords: economic growth, poverty, inequality

JEL classification: O40, I32, D31

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Acronyms

PEGR poverty equivalent growth rate

PBG poverty bias of growth

PPGI pro-poor growth index

SES socio-economic surveys

VLSS Vietnamese Living Standard Surveys

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1 Introduction

The basic idea of globalization is that it moves resources from less productive uses to more productive uses, thus enhancing economic growth by utilizing comparative advantage, which is endowed differently from one country to another. Similarly, some are in favour of globalization because many economies have achieved unprecedented material progress, contributing significantly to a reduction in global poverty. However, a recent study by Kakwani and Son (2006) has shown that the current process of globalization is generating unbalanced outcomes; many countries and people are left behind from the benefits of globalization. Their cross-country study of 80 countries during the period of 1984-2001 revealed that out of 237 growth spells, 106 (44.7 per cent) had negative growth rates and 131 (55.3 per cent) positive growth rates. Of 131 spells when growth rates were positive, growth was pro-poor in 55 (23.2 per cent) cases and anti-poor in 76 (32.1 per cent) cases. In 53 out of 106 spells of negative growth rates, the poor suffered proportionally greater decline in their consumption compared to the non-poor. For a rapid reduction in poverty, a country needs to achieve positive growth rates that are pro-poor. According to these results, this does not seem to be happening globally.

The most important goal for the developmental effort has become poverty reduction, which can be achieved by economic growth and/or by the redistribution of income. Issues related to the benefits of growth accrued to the poor have been a priority of development policy in the 1990s. An emerging consensus is that growth alone is a rather blunt tool for poverty reduction. To achieve a rapid reduction in poverty, policies of redistribution of income and assets, providing equal access to opportunities for work and employment, social services and benefits need to be emphasized. A policy agenda that addresses both distributional concerns and poverty reduction could lead to the enhancement of both economic growth and equity. Indeed, the growth-poverty-inequality relation is complex and interdependent between each other. Merely increasing the degree of globalization is unlikely to solve these complex issues.

A view widely held in the domain of development economics is that the benefits of economic growth diffuse automatically across all segments of society. This is indeed the well-known trickle down hypothesis, which was a dominant thinking in the 50s and 60s. In a similar manner, the result derived from a number of recent studies suggests that economic growth overall reduces poverty. Among these studies, the paper by Dollar and Kraay (2000) has attracted much attention.¹ This study, based on cross-country regressions, has been criticized for depicting only an average picture of the relation between growth and poverty. When large differences across countries are averaged out, the results are potentially deceptive because country-specific experiences can differ widely. Under the surface of aggregate outcomes there are often individual countries that experience an increase in poverty during spells of positive economic growth, at least in the short run (Ravallion 2001).

The relation between growth and inequality has also been debated extensively. In his well-known 1955 article, Simon Kuznets found an inverted-U pattern between per capita income and inequality based on a cross-section of countries: as per capita income

¹ Other studies include Christianensen, Demery, and Paternostro (2002); White and Anderson (2001); World Bank (2000); and Bruno, Ravallion and Squire (1998).

risers, inequality first worsens and then improves. The major driving force was presumed to be structural change that occurred because of labour shifts from a poor and less productive traditional sector to a more productive and differentiated modern sector. The hypothesis was supported by a number of studies—including Kravis (1960), Oshima (1962), Adelman and Morris (1971), Paukert (1973), Ahluwalia (1974, 1976), Robinson (1976), and Ram (1988). Yet, with better quality datasets and testing on individual countries, Kuznets' inverted-U has been challenged and seems to have evaporated (Anand and Kanbur 1984; Fields 1989; Oshima 1994; Deininger and Squire 1996). For instance, Deininger and Squire (1996) attempted a comprehensive test of the hypothesis and confirmed that there was no evidence of an inverted-U curve for individual countries.

Overall, the relation between growth and poverty is complex to explain, and is also determined by the level and changes in inequality. Pro-poor growth is concerned with the interrelation between these three elements: growth, poverty, and inequality. While there remains no consensus on how to define or measure pro-poor growth, the issue has attracted a fair amount of attention within academia as well as among development practitioners. The pro-poor growth debate has its roots in the pro-distribution arguments by Chenery and Ahluwalia in the 1970s. Chenery and Ahluwalia's (1974) model of 'redistribution with growth' could be regarded as the inception of the whole debate on pro-poor growth, as well as a culmination of the critique of the trickle-down hypothesis. More recently, pro-poor growth was also implicit in the term 'broad-based growth' used in the 1990 *World Development Report*. While the concept was never defined at that time, it subsequently shifted to become referred to as pro-poor growth during the course of the 1990s.

This paper proposes a measure of pro-poor growth derived from the idea of 'poverty equivalent growth rate (PEGR)', which takes into account not only the magnitude of growth, but also how much benefit the poor receive from the growth. It is shown that proportional reduction in poverty is a monotonically increasing function of the PEGR; the larger the PEGR, the greater the proportional reduction in poverty will be. Thus, maximizing the PEGR implies a maximum reduction in poverty. This paper derives the PEGR for an entire class of additively decomposable Foster-Greer-Thorbecke (1984) poverty measures.

Including section 1 (the introduction), this paper is organized in eight sections. Section 2 provides a practical review of various approaches for defining and measuring pro-poor growth. It discusses the relative strengths and weaknesses of different approaches to defining and measuring pro-poor growth. Section 3 describes additively decomposable poverty measures, whilst section 4 is devoted to the formal derivation of the poverty equivalent growth rate. Section 5 explains how to compute the new pro-poor growth measure. While section 6 outlines the data sources as well as the concepts used in the paper, section 7 illustrates empirical results on Korea, Thailand, and Vietnam. Section 8 contains some concluding remarks.

2 Pro-poor growth classification

Pro-poor growth may be referred as growth that benefits the poor and provides them with opportunities to improve their economic situation, as often cited by international

agencies (UN 2000; OECD 2001). This definition is vague and provides little guidance to its measurement or to its policy implications. While there remains no consensus as to the definition of this concept and its measurement, the issue has received a fair amount of attention within academia and among development practitioners. Lately, a number of studies have attempted to define and measure a pro-poor growth. These studies include Kakwani and Pernia (2000), McCulloch, Robson, and Boulch (2000), Ravallion and Chen (2003), and Son (2003).² Each of these studies has its own merits and limitations. A brief review of different approaches is given below.

2.1 General verses strict approach

The World Bank's definition of pro-poor growth is *general* and less strict. It defines growth as pro-poor if it reduces poverty (howsoever small) (Ravallion 2004). Under this general definition, the poor may receive only a small fraction of total benefits of growth, still the growth process will be called pro-poor. In this paper, we characterize this situation as trickle-down when the poor receive proportionally less benefits from growth than the non-poor. Literally, 'pro-poor' implies that the poor should receive relatively more (at least not less than) benefits compared to the non-poor. The World Bank's definition is rather too general and will classify most growth processes as pro-poor.

The other broad definition of pro-poor growth is rather *strict* and emphasizes inequality reduction that occurs with poverty reduction during economic growth. Studies—including McCulloch and Baulch (2000), Kakwani and Pernia (2000), and Son (2003)—all suggest a measure of pro-poor growth that takes into account improvement in inequality.

While the definition of pro-poor growth used in this paper is strict, our approach is further categorized in terms of *relative* or *absolute* pro-poor growth. The relative concept arises when economic growth benefits the poor proportionally more than the non-poor. The implication is that while growth reduces poverty, it also improves relative inequality. This definition may be referred to as a relative approach, as it implies a reduction in relative inequality. Conversely, a measure of pro-poor growth is absolute if the poor receive the absolute benefits of growth equal to, or more than, the absolute benefits received by the non-poor. Under this definition, absolute inequality would fall during the course of economic growth. In fact, this is the strongest requirement for achieving pro-poor growth, and may thus be referred to as 'super pro-poor'.

When growth is negative, poverty in general increases. However, there may be a situation where a negative growth results in poverty reduction. This situation can take place only if the effect of inequality reduction on poverty outweighs the adverse impact of negative growth on poverty. This growth scenario may be termed as 'strongly pro-poor'. Another classification of a growth scenario occurs when negative growth raises poverty. This may be termed as 'anti-poor' even if inequality improves during the course of growth. In this situation, the proportional reduction in incomes of the poor is less than the proportional reduction in incomes of the non-poor. Taking a step further

² In relation to defining and measuring pro-poor growth, there are also studies proposed by White and Anderson (2001); Hanmer and Booth (2001); Klasen (2003), and Duclos and Wodon (2003).

from anti-poor, a situation may be called ‘strongly anti-poor’ if both poverty and inequality become worse during the spells of negative growth.

2.2 Partial or full approach

The *partial approach* classifies under what conditions growth can be said to be pro-poor or anti-poor without specifying a poverty line and a poverty measure. A measure suggested by Ravallion and Chen (2003) falls into this classification in the sense that pro-poor growth is measured based on the first-order stochastic dominance condition. Similarly, a pro-poor growth measure proposed by Son (2003) can be also categorized as partial because a growth process is primarily determined to be pro-poor (or not pro-poor) by the second order stochastic dominance condition. The greatest advantage of using this partial approach is that it is valid for all poverty lines and poverty measures. On the other hand, one limitation of this approach is that if the dominance conditions are not met, then one cannot infer whether a growth process is pro-poor or not pro-poor. On this ground, the approach derived from the dominance conditions may be referred to as ‘partial’. Under this partial approach, there are certain circumstances where it is impossible to draw conclusive results on the pattern of growth. Another limitation of the partial approach is that it does not provide an answer as to the degree of pro-poor growth. In other words, the partial approach does not tell us by how much one growth process is more pro-poor than another growth process.

The *full approach*, on the other hand, is always able to provide us with a conclusive result as to whether or not growth is pro-poor. Studies—including McCulloch and Baulch (2000), Kakwani and Pernia (2000), and Ravallion and Chen (2003)—are based on the full approach.³ This approach gives the complete rankings of growth processes because unlike the partial approach, a growth process under the full approach is judged from a rate or an index of pro-poor growth, not from a curve. To implement this full approach, though, a poverty line as well as a poverty measure needs to be specified. This demands an inevitable value judgement in choosing the poverty line and poverty measures. The PEGR suggested in this paper can be regarded as the full approach.

2.3 Monotonicity criterion

The *monotonicity* axiom implies that the magnitude of poverty reduction should be a monotonically increasing function of the pro-poor growth rate. As poverty reduction depends on both growth and the distribution of its benefits among the poor and the non-poor, maximizing growth alone is a necessary—but not sufficient—condition for poverty reduction. This suggests that there is no monotonic relation between growth and poverty reduction. This calls for a measure of pro-poor growth that captures a direct linkage (or monotonic relation) with poverty reduction, indicating that poverty reduction takes into account not only growth but also how benefits of growth are shared by individuals in society. On this account, a pro-poor growth measure that

³ The pro-poor growth measure suggested by Ravallion and Chen (2003) is based on both partial and full approaches: It first derives the growth incidence curve (partial approach) and, at the second stage, it derives the pro-poor growth rate as the area under the growth incidence curve (full approach).

satisfies the monotonicity axiom provides a necessary and sufficient condition for the reduction of poverty.

McCulloch and Baulch (2000) propose a measure of pro-poor growth known as the poverty bias of growth (PBG). The PBG is derived from the negative of the inequality component obtained from the symmetric poverty decomposition methodology, which was suggested by Kakwani (2000).⁴ The PBG does not always satisfy the monotonicity criterion. Higher values of the PBG may not imply a greater reduction in poverty because poverty also depends on the growth effect.⁵ Thus, the PBG will only satisfy the monotonicity criterion if it is assumed that the growth effect is constant (which is highly unlikely).

Ravallion and Chen's pro-poor growth measure also violates the monotonicity axiom. This occurs because they estimate their pro-poor growth measure using numerical integration up to the headcount ratio in the initial period (see Appendix). Their measure does not utilize the poverty rate in the terminal period.⁶

Kakwani and Pernia (2000) proposed an index to measure the degree of pro-poor index. This index is known as the pro-poor growth index (PPGI), and is the ratio of total poverty reduction to poverty reduction that would occur if growth were distribution-neutral. A growth process is said to be pro-poor if PPGI is greater than 1. The values of PPGI are defined separately for the trickle-down and immiserizing growth scenarios.⁷ Like the PBG, the PPGI is merely an index that does not address the monotonicity axiom.

While the PPGI captures the distribution of growth benefits among the poor and non-poor, the index does not take into account the level of the actual growth rate. In response to this, we propose another pro-poor growth measure called a 'poverty equivalent growth rate' (PEGR) which takes into account the limitation underlying the PPGI measure. Moreover, the PEGR satisfies the monotonicity criterion. Its formal derivation is shown in section 4.

⁴ To evaluate whether growth is pro-poor (or anti-poor), the PBG measures the extent to which the observed pattern of growth deviates from a distributionally neutral benchmark. McCulloch and Baulch capture the measure of pro-poor growth by comparing the actual distribution of income with the one that would have occurred under the distribution-neutral scenario. In this respect, their measure reflects a relative approach to defining pro-poor growth.

⁵ Growth effect measures the change in poverty due to a change in mean income when the distribution of income does not change.

⁶ See Appendix, which shows that Ravallion and Chen's pro-poor growth measure violates monotonicity using a numerical example. Similarly, Klasen (2003) has pointed out that as Ravallion and Chen's measure deals with the growth rates of quantiles of the income distribution, individuals in the initial period may be excluded from the terminal period or vice versa in the process of calculating the pro-poor growth rate suggested by Ravallion and Chen.

⁷ PPGI lies between zero and one in the case of trickle-down, whereas the index is negative for immiserizing growth scenarios. Immiserizing growth refers to a situation where a positive growth increases poverty (Bhagwati 1988).

3 Additively decomposable poverty measures

Poverty can be conceptualized in terms of absolute deprivation suffered by the population. A person suffers from absolute deprivation if he or she cannot enjoy the society's minimum standard of living to which everyone should be entitled. In practice we cannot directly measure the deprivation suffered by any individual because of non-availability of income or consumption enjoyed by individuals so we measure this deprivation using the per capita consumption (or income) of households, which is readily available from household surveys. Suppose we have a household survey consisting of n sample households, of which the i th household has per capita consumption of x_i . Then the deprivation suffered by the i th sample household can be measured by the variable I_i given by:⁸

$$I_i = 1 \quad \text{if } x_i < z$$

$$= 0 \quad \text{if } x_i \geq z$$

where z is the per capita household poverty line. Suppose w_i is the share of population that is represented by the i th sample household. Then the average deprivation suffered by the whole society is given by:

$$H = 100 \times \sum_{i=1}^n I_i w_i$$

H is the percentage of population that suffers the deprivation because their income is below the society's minimum standard of living. H , thus, measures the incidence of poverty in the society and is called the headcount ratio.

The headcount ratio is a crude measure of poverty. It assumes that everyone whose income is below the poverty line suffers the same degree of deprivation. Thus it does not take account of the intensity of deprivation suffered by the poor. To take into account this intensity, we define the degree of absolute deprivation suffered by individuals in the i th household as:

$$D(x) = \left[\frac{z - x_i}{z} \right]^\alpha \quad \text{if } x_i < z$$

$$= 0 \quad \text{if } x_i \geq z$$

which implies that the deprivation decreases monotonically with consumption (or income). The degree of poverty in the society may be measured by the average deprivation that is suffered by the society, which is given by:

⁸ A person suffers deprivation when his/her consumption is less than the poverty line, in which case I_i takes value 1 and if his/her income is greater than the poverty line, he/she does not suffer any deprivation, in which case I_i takes value 0. If a household is identified as suffering deprivation, then all its members are also assumed to be suffering deprivation.

$$P_{\alpha} = \sum_{i=1}^n I_i \left[\frac{z - x_i}{z} \right]^{\alpha} w_i \quad (1)$$

which gives estimates of class of Foster-Greer-Thorbecke (1984) poverty measures, where α is the inequality aversion parameter. When $\alpha=0$, P_{α} gives the headcount ratio; when $\alpha=1$, P_{α} gives the poverty gap ratio; and when $\alpha=2$, P_{α} gives the severity of poverty index. The larger the value of α , the greater weight is given to the poor who are further below the poverty line. In this paper, the pro-poorness of growth is analysed using these three poverty measures.⁹

4 Poverty equivalent growth rate (PEGR)

How does economic growth affect poverty reduction? To answer this question, we need to measure the factors that contribute to poverty reduction. Poverty reduction largely depends on two factors. The first factor is the magnitude of the economic growth rate: the larger the growth rate, the greater the reduction of poverty. Growth is generally accompanied by changes in inequality; an increase in inequality reduces the impact of growth on poverty reduction. The PEGR combines these two factors into one index, which has a monotonic relationship to the magnitude of poverty reduction.

Suppose η is the poverty elasticity with respect to growth, which is defined as the proportional change in poverty when there is a positive growth rate of 1 per cent. η can be decomposed into sum of two components, δ and ε such that:¹⁰

$$\eta = \delta + \varepsilon \quad (2)$$

where δ is the pure growth effect and ε is the inequality effect. δ is the proportional change in poverty when the distribution of income does not change, whereas ε is the proportional change in poverty when inequality changes in the absence of growth. δ will always be negative because when growth rate is positive, poverty always reduces and when growth rate is negative, poverty always increase, with distribution remaining constant. ε can be either negative or positive depending on whether change in inequality accompanying growth reduces or increases poverty. Growth will obviously be pro-poor if ε is negative. Thus the degree of pro-poor growth can be measured by an index (Kakwani and Pernia 2000):

$$\phi = \frac{\eta}{\delta} \quad (3)$$

ϕ will be greater than 1 when $\varepsilon < 0$. Thus, growth will be pro-poor if $\phi > 1$, meaning that the poor benefit proportionally more than the non-poor: growth results in a

⁹ The methodology presented here is general and can be applied to all poverty measures, including non-additively-decomposable poverty measures such as Sen's (1976) and Kakwani's (1980a and 1980b).

¹⁰ See Kakwani, Khandker and Son (2004).

redistribution in favour of the poor. When $0 < \phi < 1$, growth is not strictly pro-poor (i.e., growth results in a redistribution against the poor) even though it still reduces the incidence of poverty. This situation may be generally characterized as ‘trickle-down’ growth. If $\phi < 0$, then economic growth actually leads to an increase in poverty. This situation may be characterized as ‘immiserizing’ growth (Bhagwati 1988).

The index ϕ measures how the benefits of growth are distributed across the population. Suppose g is the growth rate and P_α is a poverty measure, the proportional change in poverty may be written as:

$$\Delta \log(P)_\alpha = f(g, \phi) \quad (4)$$

which implies that there are two factors that determine a country’s performance in poverty reduction. First is the growth rate g , which affects the mean income of society and second factor relates to the distribution of benefits of economic growth, which is measured by the pro-poor index ϕ .

To determine $f(g, \phi)$, we introduce the idea of poverty equivalent growth rate g^* which is defined as the growth rate that will result in the same level of proportional poverty reduction as the present growth rate with no change in income inequality, i.e. when everyone receives the same proportional benefits of growth. It is obvious that g^* will be given by:

$$f(g^*, 1) = f(g, \phi) \quad (5)$$

Note that $\phi = 1$ when everyone receives the same proportional benefits. From (4), we write:

$$\Delta \log(P_\alpha) = f(g, \phi) = g \eta \quad (6)$$

Which, when $\phi=1$ and $\eta = \delta$, gives

$$f(g^*, 1) = \delta g^* \quad (7)$$

which, in view of (3), (6) and (7), immediately gives the PEGR as:

$$g^* = g \phi \quad (8)$$

which can also be written as:

$$g^* = g + (\phi - 1)g \quad (9)$$

The PEGR measured by g^* is the effective growth rate for poverty reduction. It can be seen that the proportional reduction in poverty is an increasing function of g^* : the larger g^* , the greater will be the proportional reduction in poverty. Thus, maximizing g^* will be equivalent to maximizing the total proportional reduction in poverty. This suggests that a country’s performance should be judged on the basis of the poverty equivalent growth rate and not by growth rate alone.

The second term in the right-hand side of (9) gives gain (loss) in growth rate when growth is pro-poor (anti-poor). To make our message clearer, suppose a country's total poverty elasticity is $2/3$ of the growth elasticity of poverty, in which case $\phi=2/3$. Then from (9), we note that the country's actual growth rate of 9 per cent is equal to the poverty equivalent growth rate of only 6 per cent. Thus, the effective growth rate for poverty reduction is 3 per cent lower than the actual growth rate because the country is not following pro-poor policies. On the other hand, if the total poverty elasticity is supposedly 20 per cent higher than the growth elasticity of poverty, in which case $\phi=1.2$ then the country's actual growth rate of 9 per cent will be equal to the poverty equivalent growth rate of 10.8 per cent. Thus, there will be gain in growth rate of 1.8 per cent points because growth is pro-poor.

Equation (9) implies that growth is pro-poor (anti-poor) if g^* is greater (less) than g . If g^* lies between 0 and g , the growth is accompanied by increasing inequality but still reduces poverty. This situation may be characterized as trickle-down process when the poor receive proportionally less benefits from than the non-poor. However, it is possible that positive growth increases poverty in which case g^* is negative. This can happen when inequality increases so much that the beneficial impact of growth is more than offset by the adverse impact of rising inequality. Bhagwati (1988) calls it 'immiserizing growth'. He gives a scenario where the more affluent farmers adopt new seeds and raise grain production, resulting in lower prices. By contrast, the marginal farmers who cannot adopt the new technology find their stagnant output yielding even less income. Thus, the green revolution may immiserize the poor. This situation may be rare, however, because in the long run the marginal farmers may also catch up with the new techniques. The more common situation is where the poor farmers also benefit from economic growth but to a much smaller extent than the better-off ones.

During the recession period, when $g < 0$, poverty generally increases but if inequality reduces so much that poverty decreases, in which case $g^* > 0$, then we call the recession as strongly pro-poor. The recession will be pro-poor if $g < g^* < 0$, in which case, poverty increases but the poor are hurt proportionally less than the non-poor. The recession will be anti-poor if $g^* < g < 0$, in which case poverty increases and also the poor are hurt proportionally more than the non-poor.

5 How to calculate the poverty equivalent growth rate

This section presents a methodology to estimate the PEGR by utilizing unit record data available for any two periods. Any poverty measure P can be characterized fully by the poverty line z , mean income μ and the Lorenz curve $L(p)$, where p varies from 0 to 1:

$$P = P(z, \mu, L(p))$$

Since households differ in size, age composition and other characteristics, it is expected that they will have different needs. We assume that the household consumption (or income), which is the basis for computing μ and $L(p)$ has been adjusted for the different household needs. Furthermore, if we are comparing poverty estimates over time, the mean consumption (or income) must also be adjusted for price changes. Thus, growth rates should be computed using the real consumption (or income).

We propose that the estimates of PEGR must satisfy the following intuitively natural axioms.

Axiom 1: The magnitude of poverty reduction must be monotonically an increasing function of the PEGR.

This is an essential axiom because maximization of PEGR must imply the maximum reduction in poverty. This is possible only if there is a monotonic relationship between the magnitude of poverty reduction and the PEGR.

Suppose that g_{ij}^* is the PEGR when going from the base year i to the terminal year j , and similarly, g_{ji}^* is the PEGR when going from the terminal year j to the base year i . There should be symmetry between base and terminal years. This suggests the following axiom.

Axiom 2: $g_{ij}^* = -g_{ji}^*$ for all i and j .

This implies that if PEGR is 5 per cent when going from year i to year j , then intuitively PEGR must be -5 per cent when going from year j to year i .

Suppose the income distributions in the base year i and terminal year j have mean incomes μ_i and μ_j with the Lorenz curves $L_i(p)$ and $L_j(p)$, respectively. The total poverty elasticity in Equation (1) between years i and j can be estimated as:

$$\hat{\eta}_{ij} = (\text{Ln}[P(z, \mu_j, L_j(p))] - \text{Ln}[P(z, \mu_i, L_i(p))]) / \hat{g}_{ij} \quad (10)$$

where \hat{g}_{ij} given by:

$$\hat{g}_{ij} = \text{Ln}(\mu_j) - \text{Ln}(\mu_i)$$

is an estimate of the growth rate of mean income. It can be easily seen that $\hat{\eta}_{ij} = \hat{\eta}_{ji}$, which is an intuitive result because the total poverty elasticity must not change whether we estimate it by observing a change from i to j or from j to i .

The estimate of PEGR is given by:

$$\hat{g}_{ij}^* = \left(\frac{\hat{\eta}_{ij}}{\hat{\delta}_{ij}} \right) \hat{g}_{ij} = \hat{\phi}_{ij} \hat{g}_{ij} \quad (11)$$

where $\hat{\delta}_{ij}$ is an estimate of the pure growth elasticity of poverty, which should satisfy the Equation (2):

$$\hat{\eta}_{ij} = \hat{\delta}_{ij} + \hat{\varepsilon}_{ij} \quad (12)$$

where $\hat{\epsilon}_{ij}$ is an estimate of the inequality effect of poverty reduction when going from year i to j . Kakwani's (2000) poverty decomposition methodology can then be used to estimate $\hat{\delta}_{ij}$ and $\hat{\epsilon}_{ij}$ by the following formulae:

$$\hat{\delta}_{ij} = \frac{1}{2} \left[\ln(P(z, \mu_j, L_i(p))) - \ln(P(z, \mu_i, L_i(p))) + \ln(\theta(z, \mu_j, L_j(p))) - \ln(\theta(z, \mu_i, L_j(p))) \right] \quad (13)$$

and

$$\hat{\epsilon}_{ij} = \frac{1}{2} \left[\ln(P(z, \mu_i, L_j(p))) - \ln(P(z, \mu_i, L_i(p))) + \ln(P(z, \mu_j, L_j(p))) - \ln(P(z, \mu_j, L_i(p))) \right]$$

which will always satisfy Equation (11).¹⁰ This methodology can be used to estimate the PEGR for the entire class of poverty measures given in Equation (1).

The proportional reduction in poverty from year i to year j (as shown in Equation (10)) is equal to $\hat{\eta}_{ij} \hat{g}_{ij}$, which is equal to $\hat{\delta}_{ij} \hat{g}_{ij}^*$. Since $\hat{\delta}_{ij}$ in (13) is always negative (unless $\mu_1 = \mu_2$), the magnitude of poverty reduction will be monotonically an increasing function of \hat{g}_{ij}^* ; the larger the \hat{g}_{ij}^* , the greater the proportional reduction in poverty between the years from i to j . Thus *Axiom 1* will be always satisfied by the proposed estimator of PEGR.¹¹

Further from (13), it can be seen that $\hat{\delta}_{ij} = \hat{\delta}_{ji}$ for all i and j , which on substituting in Equation (11) gives $\hat{\phi}_{ij} = \hat{\phi}_{ji}$ and $\hat{g}_{ij}^* = -\hat{g}_{ji}^*$ for all i and j . Thus, *Axiom 2* is always satisfied.

6 Data sources and concepts used

The data for Korea comes from the country's household survey, which is called the Family Income and Expenditure Survey and is conducted every year by the National Statistical Office in Korea. These household surveys are unit-recorded data, and are used for this study covering the period from 1990 to 1999. They include income and consumption components for more than 20,000 households in urban areas. We utilized the minimum cost of living basket developed in 1994 by the Korean Institute for Health and Social Affairs (KIHASA) as the poverty line. We modify this poverty line by taking into account different costs of living between Seoul and other cities. The poverty line

¹⁰ Kakwani (2000) justifies this decomposition using an axiomatic approach. Kraay (2003) estimates the growth and inequality effects using Datt and Ravallion's (1992) poverty decomposition, which consists of three components, namely, growth component, inequality component and a residual term. He calls this decomposition as the discrete-time analog of (11). Equation (11) consists of only growth and inequality components. So estimating Equation (11) using a discrete-time analog with three components will give inconsistent estimates of growth and inequality components.

¹¹ Our estimator of PEGR satisfies the monotonicity requirement but in the Appendix we show that the pro-poor growth rate proposed by Ravallion and Chen (2003) violates the monotonicity axiom.

has been updated for other years by using the separate consumer price indices for Seoul and other cities.

It must be emphasized that we have used a Korea-specific poverty line, which measures the minimum acceptable standard of living in Korea. Therefore, the incidence of poverty computed here cannot be compared with the incidence of poverty in other countries. Our main objective here is to analyse changes in poverty and how it has been affected by the economic growth in Korea.

The data source for Thailand comes from the socio-economic surveys (SES) covering the period from 1988 to 1998. These SES data are unit record household surveys conducted every two years by the National Statistical Office in Thailand. The survey is nation-wide and covers all private, non-institutional households residing permanently in municipalities, sanitary districts, and villages. However, it excludes parts of the population living in transient hotels or rooming houses, boarding schools, military barracks, temples, hospitals, prisons, and other such institutions. The SES contains, on average, information on more than 17,000 households between 1988 and 1998.

In estimating poverty, this paper uses the official poverty line developed for Thailand, which takes into account spatial price indices as well as individual needs that differ depending on household size and its composition.

For the Vietnam case, the Vietnamese Living Standard Surveys (VLSS) are utilized covering the period 1992/3-1997/8. While the 1992/3 VLSS included 4,800 households, 5,999 households were interviewed in the 1997/8 VLSS. These comprise the living standard measurement surveys, which provide information on total expenditure of each household included in the survey. The poverty lines used for this study are 1,160.842 and 1,793.903 thousand dong per capita per annum in 1992/3 and 1997/8, respectively.

We use per capita welfare consumption expenditure as a welfare measure in estimating poverty in Korea, Thailand, and Vietnam. Per capita welfare consumption expenditure is expressed as the ratio of per capita total consumption expenditure to the per capita poverty line (expressed in percentage).

7 Empirical illustration: the Asian experience

As presented in Table 1, the poverty equivalent growth rates overall are higher than the actual growth rates in Korea during the 1990s. This is particularly so before the crisis. For instance, the PEGR was 9 per cent in 1996-97, whereas the annual growth rate was actually only 1.8 per cent in that same period. What does this imply? It suggests that before the crisis, the poor benefited proportionally much more than the non-poor, as was reflected in a dramatic reduction in poverty; the headcount ratio in Korea decreased from 39.6 per cent in 1990 to 8.6 per cent in 1997 (Kakwani and Son 2002). This rapid reduction in poverty during the 1990-97 period was achieved due to two factors. One factor was a high economic growth rate of about 7-8 per cent per annum that had

prevailed in the economy. The other factor was a steady decline in inequality,¹² which facilitated a rapid reduction in poverty in addition to the positive growth rates.

After the onset of the financial crisis, actual growth rates became higher than the PEGRs between 1997 and 1999. This indicates that the crisis had adverse impacts on the poor rather than on the non-poor. This result is to be expected as poor people are more vulnerable to such unexpected economic shocks. This, in turn, calls for a permanent system of social safety nets, which can protect vulnerable groups of people in society from economic downturns.

Note that there has been a sign of recovery in the economy in 1998-99; the headcount ratio declined from 19 per cent in 1998 to 13.4 per cent in 1999 (Kakwani 2000). Despite this positive sign, our result suggests that the growth process is not classifiable as pro-poor. The benefits generated from the positive growth during 1998-99 did flow proportionally more to the non-poor than to the poor. More interestingly, our result points out that compared to the non-poor, the poor overall benefited less from the recovery process; among poor people, the ultra-poor received proportionally more benefits than not-so-poor ones (which is indicated by the higher values of PEGR for the severity of poverty). This could have happened because of the Korean government's prompt response to the crisis through social welfare programmes. In response to the financial crisis, the government introduced many social welfare programmes, including public works programmes and temporary livelihood protection. Public works programmes were particularly effective in helping the ultra-poor, who were largely unemployed and laid-off within the labour market during the economic downturn. Similarly, temporary livelihood protection (which was implemented based on an income means test) was also more helpful to the ultra-poor.

What has been Thailand's growth experience in the 1990s? During 1988-92, growth was not classified as pro-poor. In spite of more than 8 per cent annual rate of economic growth for that period, the poverty reduction was small during the same period. This occurred because the growth process benefited the non-poor proportionally more than the poor. Furthermore, the proportional benefit flowing to the ultra-poor in 1990-92 was even less than that flowing to the poor: in Table 2, the magnitude of PEGRs gets smaller as the poverty measure becomes more sensitive to the wellbeing of poorer individuals.

Table 1
Poverty equivalent growth rates for Korea

	Actual growth rate	Poverty equivalent growth rate		
		Percentage of poor	Poverty gap ratio	Severity of poverty
1990-91	9.6	10.7	10.4	10.0
1991-92	4.0	4.1	3.7	3.6
1992-93	4.8	5.8	6.6	6.8
1993-94	7.3	7.2	7.3	7.5
1994-95	8.2	9.7	9.5	8.9
1995-96	5.8	5.1	5.0	4.6
1996-97	1.8	9.0	8.3	9.6
1997-98	-7.6	-9.0	-10.0	-10.9
1998-99	9.8	9.6	10.5	11.5

¹² The Gini index steadily declined from 29 per cent in 1990 to 27.9 per cent in 1997 (Son 2002).

Table 2
Poverty equivalent growth rates for Thailand

	Actual growth rate	Poverty equivalent growth rate		
		Headcount ratio	Poverty gap ratio	Severity of poverty
1988-90	9.06	5.5	5.9	6.1
1990-92	7.49	4.3	3.4	3.0
1992-94	7.65	8.8	8.7	8.8
1994-96	5.75	7.4	7.2	7.2
1996-98	-1.00	-2.7	-2.5	-2.5
1998-00	-0.85	-2.3	-3.8	-4.4
1988-2000	4.68	3.6	3.3	3.1

The trend was reversed during 1992-96, when the PEGRs were higher than the actual growth rates. Thus, growth is found to be pro-poor between 1992 and 1996. The large poverty reduction that happened during that period stemmed from the positive effects of both high growth rates and inequality decline.¹⁴

During 1996-2000, the Thai economy was influenced by the financial crisis. As expected, its economic and social impacts were extremely detrimental: while the growth in per capita welfare declined at an annual rate of almost 1 per cent, poverty increased sharply from 11.4 per cent in 1996 to 16.2 per cent in 2000 (Son 2003). As shown in Table 2, the adverse impacts of the crisis were prevalent throughout the period and were deepened among the ultra-poor in 1998-2000. Unlike Korea, there were no prompt responses to the crisis from the Thai government to protect the ultra-poor and the vulnerable from the economic shock.

Although the Thai government has provided little by way of programmes constituting social safety nets, the financial crisis has clearly enabled the government to learn how existing social systems function under duress. The crisis has revealed that considerable effort needs to be directed to the setting up, or further development, of social safety nets in the country. This is especially so because traditional family systems of support—though resilient during the early part of the crisis—are likely to weaken over time, given continuous socioeconomic change and urbanization, and the further demands placed on them. Household-coping mechanisms and the informal safety nets provided through traditional family systems have their limitations during such a crisis.

Table 3 presents the empirical results for Vietnam. It shows that during the 1992-97 period, the PEGRs were consistently higher than the annual growth rates of per capita expenditure (5.02 per cent for Vietnam as a whole). This indicates that the growth process in the country was pro-poor in a way that benefited the poor proportionally more than the non-poor. The PEGR for the severity of poverty index is greater than those for the poverty gap ratio and the poverty incidence. This implies that during 1992-97, growth in Vietnam had more beneficial impact on the ultra-poor. Similarly, both urban and rural sectors have experienced pro-poor growth. This occurred because not only did both sectors enjoy high growth rates, but both also showed a decline in inequality, as estimated by the Gini index of per capita expenditure. The Gini index for

¹⁴ The Gini index declined from 41 and 39.2 per cent in 1992 and 1996, respectively (Kakwani and Son 2002).

urban areas fell from 35.07 per cent in 1992/3 to 34.17 per cent in 1997/8, whereas for rural areas it declined to 26.42 per cent in 1997/8 from 28.86 per cent in 1992/3 (Son 2003).

Vietnam has emerged as one of the fastest-growing economies in Asia over the last two decades. More importantly, our results have presented that its growth process undertaken during 1992/3-1997/8 has been pro-poor, thus benefiting the poor proportionally more than the non-poor. This has been attributed to a series of reforms, known as *doi moi*, which were launched in the latter part of the 1980s. Reforms began primarily in the agricultural sector which, at the time, accounted for close to 40 per cent of GDP and 70 per cent of total employment. The country's reform effort focused initially on the dismantling of collective farms, the redistribution of land to peasant households through long-term leases, and an abolition of price controls on goods and services. It then eliminated production and consumption subsidies and streamlined the public sector (Dollar and Litvack 1998; Wejnns 1998). Furthermore, the reform effort included the stabilization of inflation and the liberalization of foreign trade and investment (Dollar 2002). This series of reforms paved the way for the country's spectacular growth in the 1990s, which in turn contributed to a remarkable poverty reduction

Table 3
Poverty equivalent growth rates for Vietnam, 1992/3-1997/8

	Total	Urban	Rural
Actual growth rate	5.02	5.28	4.04
Poverty equivalent growth rates for			
Headcount ratio	5.08	6.28	4.61
Poverty gap ratio	5.33	6.46	5.04
Severity of poverty	5.43	6.59	5.19

8 Concluding remarks

This paper has proposed a measure of pro-poor growth denominated 'poverty equivalent growth rate', which can be calculated for any poverty measures. This measure takes into account not only the magnitude of growth, but also how the benefits of growth are distributed to the poor and the non-poor. It has been argued in the paper that this new measure satisfies the monotonicity axiom, which sets out a condition that the proportional reduction in poverty is a monotonically increasing function of the poverty equivalent growth rate. As the poverty equivalent growth rate meets the monotonicity criterion, it can be said that in order to achieve a rapid reduction in poverty, the poverty equivalent growth rate should be maximized rather than the actual growth rate.

The methodology developed in this paper has been applied to a few Asian countries, including Korea, Thailand, and Vietnam. By and large, while Korea and Vietnam have experienced a pro-poor growth pattern in the 1990s, Thailand has on the whole not been pro-poor. Two other important policy implications emerge from the empirical analysis. First, the financial crisis experienced by both Korea and Thailand at the end of the 1990s has revealed that considerable effort needs to be directed to the setting up, or further development, of social safety nets in these countries. Although the Korean

government's response to the crisis included the prompt expansion of various social welfare programmes, the crisis demonstrated a call for social safety nets to be enacted on a permanent basis. During the crisis it was realized that household-coping mechanisms and traditional family systems of support cannot insulate people from such substantial economic shocks. Second, as the Vietnam experience presents, a 'growth with redistribution' strategy has played a significant role in achieving impressive growth and poverty outcomes. Redistribution policies, such as land reforms, may be necessary to set up the economic and political conditions necessary to ensure that subsequent economic growth is not highly unequalizing (Adelman 1975). This has also proved to be the case for some countries—including Korea and Taiwan—in their early stages of economic development.

The main message of this paper has been that broad policies such as 'growth is good for the poor' or 'globalization will generate material progress for all' are very deceptive because individual country-specific experiences can differ widely. This paper has provided methodologies to analyse the pro-poorness of economic growth in individual countries. Future research should focus on determining why growth is pro-poor in some countries and not in other countries or pro-poor in one period and not in another period.

References

- Adelman, I. (1975). 'Development Economics: A Reassessment of Goals'. *American Economic Review*, 65 (May): 302.
- Adelman, I., and C. T. Morris (1971). *Economic Growth and Social Equity in Developing Countries*. Stanford, CA: Stanford University Press.
- Ahluwalia, M. S. (1974). 'Income Inequality: Some Dimensions of the Problem, in H. Chenery *et al.* (eds), *Redistribution with Growth*. Oxford: Oxford University Press
- Ahluwalia, M. S. (1976). 'Inequality, Poverty and Development.' *Journal of Development Economics*, 3 (4): 307-42.
- Anand, S., and S. M. R. Kanbur (1984). 'The Kuznets Process and the Inequality Development Relationship'. *Journal of Development Economics*, 40 (1): 25-52.
- Barro, R. J. (1999). 'Inequality, Growth and Investment'. Cambridge, MA: Harvard University. Mimeo.
- Bhagwati, J. N. (1988). 'Poverty and Public Policy'. *World Development Report* 16 (5): 539-54.
- Brock, W. A., and S. N. Durlauf (2000). 'Growth Economics and Reality'. NBER Working Paper Series No. 8041. Cambridge, MA: National Bureau of Economic Research, 1-48.
- Bruno, M., M. Ravallion, and L. Squire (1998). 'Equity and Growth in Developing Countries: Old and New Perspectives of the Policy Issues', in V. Tanzi and K.-Y. Chu (eds), *Income Distribution and High-Quality Growth*. Cambridge, MA: MIT Press.
- Chenery, H., and M. Ahluwalia (1974). *Redistribution with Growth*. Oxford: Oxford University Press.

- Christianensen, L., L. Demery, and S. Paternostro (2002). 'Economic Growth and Poverty in Africa: Message from the 1990s'. Washington, DC: World Bank. Mimeo.
- Datt, G., and M. Ravallion (1992). 'Growth and Redistribution Component of Changes in Poverty Measures: A Decomposition with Applications to Brazil and India in the 1980s'. *Journal of Development Economics*; 38: 275-95.
- Deininger, K., and L. Squire (1996). 'Measuring Income Inequality: a New Data-Base'. *World Bank Economic Review*, 10 (3): 565-91.
- Dollar, D. (2002). 'Reform, Growth, and Poverty Reduction in Vietnam'. WB Policy Research Working Paper No. 2837. Washington, DC: World Bank.
- Dollar, D., and A. Kraay (2000). 'Growth is Good for the Poor'. WB Working Paper. Washington, DC: Development Research Group, World Bank.
- Dollar, D., and J. Litvack (1998). 'Macroeconomic Reform and Poverty Reduction in Vietnam', in D. Dollar, P. Glewwe, and J. Litvack (eds), *Household Welfare and Vietnam's Transition*. Washington, DC: World Bank.
- Duclos, J., and Q. Wodon (2003). 'Pro-Poor Growth'. Washington, DC: World Bank. Mimeo.
- Fields, G. S. (1989). 'Changes in Poverty and Inequality in the Developing Countries'. Ithaca: Cornell University. Mimeo.
- Foster, J., J. Greer, and E. Thorbecke (1984). 'A Class of Decomposable Poverty Measures'. *Econometrica*, 52 (3): 761-66.
- Hanmer, L., and D. Booth (2001). 'Pro-Poor Growth: Why Do We Need It?'. London: ODI. Mimeo.
- Kakwani, N. (1980). 'On a Class of Poverty Measures'. *Econometrica*, 48 (2): 437-46.
- Kakwani, N. (1980). *Income Inequality and Poverty: Methods of Estimation and Policy Applications*. New York: Oxford University Press.
- Kakwani, N. (2000). 'On Measuring Growth and Inequality Components of Poverty with Application to Thailand'. *Journal of Quantitative Economics*, 16.
- Kakwani, N., S. Khandker, and H. Son (2004). 'Pro-Poor Growth: Concepts and Measurement with Country Case Studies'. Working Paper No. 1: Brasilia: UNDP-International Poverty Centre.
- Kakwani, N., and E. Pernia (2000). 'What is Pro-poor Growth?'. *Asian Development Review*, 16 (1): 1-22.
- Kakwani, N., B. Prakash, and H. Son (2000). 'Economic Growth, Inequality and Poverty: An Introductory Essay'. *Asian Development Review*, 16 (2): 1-22.
- Kakwani, N., and H. Son (2001). 'Korean Pro-Poor Growth: Poverty Equivalent Growth Rates'. Presented at the conference on Productive Welfarism in Korea, organized by the Ministry of Finance and KIHASA. Seoul: Korea.
- Kakwani, N., and H. Son (2002). 'Economic Growth, Inequality and Poverty: Korea and Thailand', in D. Newman, G. Asher and T. Snyder (eds), *Public Sector Policy in Asia: Implications for Business and Government*. Westport: Green Publishing Group, Inc.
- Kakwani, N., and H. Son (2002). 'Pro-poor Growth and Poverty Reduction: The Asian Experience'. Bangkok: Poverty Center, Office of Executive Secretary, ESCAP.

- Kakwani, N., and H. Son (2006). 'Global Estimates of Pro-Poor Growth'. Brasilia: UNDP-International Poverty Centre. Mimeo.
- Klasen, S. (2003). 'In Search of The Holy Grail: How to Achieve Pro-Poor Growth?'. To be appeared in Proceedings of ABCDE-Europe.
- Korean Institute for Health and Social Affairs (1994). The Estimation of Minimum Cost of Living. Seoul: KIHASA.
- Kraay, A. (2004). 'When is Growth Pro-poor? Cross-Country Evidence'. IMF Working Paper WP04/47. Washington, DC: IMF.
- Kravis, I. B. (1960). 'International Differences in the Distribution of Income'. *Review of Economics and Statistics*, 42: 408-16.
- Kuznets, S. (1955). 'Economic Growth and Income Inequality'. *American Economic Review*, 45:1-28.
- McCulloch, N., and B. Baulch (2000). 'Tracking Pro-Poor Growth'. ID21 *Insights*, 31. Sussex: Institute of Development Studies.
- McCulloch, N., M. Robson, and B. Baulch (2000). 'Growth, Inequality and Poverty in Mauritania: 1987-1996'. IDS Working Paper. Sussex: Institute of Development Studies.
- OECD (2001). 'Rising to the Global Challenge: Partnership for Reducing World Poverty'. Statement by the DAC High Level Meeting, 25-26 April. Paris: OECD.
- Oshima, H. (1962). 'International Comparison of Size Distribution of Family Incomes with Special Reference to Asia'. *Review of Economics and Statistics*, 44 (Nov.): 439-45.
- Oshima, H. (1994). 'Kuznets Curve and Asian Income Distribution', in T. Mizoguchi, (ed.), *Making Economies More Efficient and More Equitable: Factors Determining Income Distribution*. Economic Research Series No. 29. The Institute of Economic Research, Hitotsubashi University. Tokyo: Oxford University Press.
- Paukert, F. (1973). 'Income Distribution at Different Levels of Development: A Survey of Evidence'. *International Labour Review*, 108 (2): 97-125.
- Ram, R. (1988). 'Economic Development and Income Inequality: Further Evidence on the U-curve Hypothesis'. *World Development*, 16 (11): 1371-6.
- Ravallion, M. (2004). 'Pro-poor Growth: A Primer'. WB Policy Research Working Paper No. 3242. Washington, DC: World Bank.
- Ravallion, M., and S. Chen (2003). 'Measuring Pro-poor Growth'. *Economic Letters*, 78 (1): 93-9.
- Robinson, S. (1976). 'Sources of Growth in Less Developed Countries'. *Quarterly Journal of Economics*, 85 (3): 391-408.
- Sen, A. (1976). 'Poverty: An Ordinal Approach to Measurement'. *Econometrica*, 44: 219-31.
- Son, H. (2003). 'Pro-Poor Growth: Definitions and Measurements'. Washington, DC: World Bank.
- Son, H. (2004). 'A Note on Pro-Poor Growth'. *Economics Letters*, 82 (3): 307-14.
- United Nations (2000). *A Better World For All*. New York: United Nations.

- Watts, H. (1968). 'An Economic Definition of Poverty', in D. P. Moynihan (ed.), *On Understanding Poverty*. New York: Basic Books.
- Weinns, T. B. (1998). 'Agriculture and Rural Poverty in Vietnam', in D. Dollar, P. Glewwe, and J. Litvack (eds), *Household Welfare and Vietnam's Transition*. Washington, DC: World Bank Regional and Sectoral Studies.
- White, H., and E. Anderson (2001). 'Growth versus Distribution: Does the Pattern of Growth Matter?'. Brighton: IDS. Mimeo.
- World Bank (2000). *World Development Report 1990*. New York: Oxford University Press.

Appendix

In this Appendix, we demonstrate theoretically as well as empirically with the help of a hypothetical example, that Ravallion and Chen's (2003) estimate of pro-poor growth will violate their basic *Axiom 1*:

Axiom 1: The measure should be consistent with the direction of change in poverty, in that a positive (negative) rate of pro-poor growth implies a reduction (increase) in poverty.

The violation of this axiom will imply that the magnitude of poverty reduction will not necessarily be a decreasing function of the pro-poor growth. Thus our *Axiom 1* is violated by their measure.

The estimate of Ravallion and Chen's (2003) is given by:

$$RC_t = \frac{\int_0^{H_{t-1}} \Delta \ln(x_{t-1}(p)) dp}{H_{t-1}} \quad (A.1)$$

where H_{t-1} is the head-count ratio in period $t-1$. The motivation of this index comes from their equation:

$$dW = -\int_0^H d \ln(x(p)) dp \quad (A.2)$$

where W is the Watts measure of poverty.

In order that *Axiom 1* is satisfied, $RC_t > 0$ (< 0) should always imply $\Delta W_t < 0$ (> 0), where:

$$\Delta W_t = \int_0^{H_t} \ln(z/x_t(p)) dp - \int_0^{H_{t-1}} \ln(z/x_{t-1}(p)) dp$$

which will not always hold because equation (A.2) does not imply equation (A.3) given by:

$$\Delta W_t = -\int_0^{H_{t-1}} \Delta \ln(x(p)) dp \quad (A.3)$$

Thus, Ravallion and Chen's (2003) estimate of pro-poor index will violate *Axiom 1*, which implies that the magnitude of poverty reduction will not necessarily be a decreasing function of the pro-poor index.

Table A.1 presents a hypothetical example giving welfare levels of 20 persons. The poverty line is 100. It can be seen that the percentage of poor has decreased from 50 per cent to 35 per cent but the Watts measure has increased from 20.3 to 22.8. The Ravallion and Chen's index of pro-poor growth is computed to be 11.3 per cent, which

means that Ravallion and Chen's index violates their basic *Axiom 1*. This also implies that maximization of Ravallion and Chen's index does not necessarily lead to the maximization of poverty reduction. This monotonicity property is always satisfied by our pro-poor growth measure.

Table A.1
A hypothetical example

No. of people	Welfare in:		% of poor in:		Watts measure		Growth rate of welfare	R-C pro-poor index
	Period 1	period 2	period 1	period 2	period 1	period 2		
1	25	30	100	100	138.6	120.4	20.0	20.0
2	58	40	100	100	54.5	91.6	-31.0	-31.0
3	60	40	100	100	51.1	91.6	-33.3	-33.3
4	65	50	100	100	43.1	69.3	-23.1	-23.1
5	70	80	100	100	35.7	22.3	14.3	14.3
6	75	100	100	0	28.8	0.0	33.3	33.3
7	80	120	100	0	22.3	0.0	50.0	50.0
8	85	90	100	100	16.3	10.5	5.9	5.9
9	90	60	100	100	10.5	51.1	-33.3	-33.3
10	95	200	100	0	5.1	0.0	110.5	110.5
11	100	120	0	0	0.0	0.0	20.0	0.0
12	105	150	0	0	0.0	0.0	42.9	0.0
13	110	120	0	0	0.0	0.0	9.1	0.0
14	115	120	0	0	0.0	0.0	4.3	0.0
15	120	120	0	0	0.0	0.0	0.0	0.0
16	125	120	0	0	0.0	0.0	-4.0	0.0
17	130	120	0	0	0.0	0.0	-7.7	0.0
18	135	120	0	0	0.0	0.0	-11.1	0.0
19	140	120	0	0	0.0	0.0	-14.3	0.0
20	145	120	0	0	0.0	0.0	-17.2	0.0
Average	96.4	102	50	35	20.3	22.8	5.8	11.3

Note: R-C pro-poor index: Ravallion and Chen (2003).