A note on pro-poor growth

Hyun Hwa Son*

School of Economics, Macquarie University, Sydney 2109, Australia

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Abstract

This paper proposes a ‘poverty growth curve’ that measures whether economic growth is pro-poor or not pro-poor. Our methodology is developed based on Atkinson’s theorem linking the generalized Lorenz curve and changes in poverty. This methodology is applied to both Thailand’s unit record household surveys and international cross-country data. Empirical study illustrates that our approach to measuring pro-poor growth provides conclusive results in the majority of cases.

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1. Introduction

Growth performance differs among countries. Some countries have experienced a higher growth rate than others. Likewise, the cross-country evidence shows that there can be a large variation in poverty reduction for the same growth rate. This suggests that growth in some countries is more pro-poor than in other countries. This note is concerned with the measurement of the degree to which economic growth is pro-poor.

We propose a ‘poverty growth curve’ that measures whether economic growth is pro-poor or not pro-poor. This methodology is applied to Thailand’s Socio-Economic Surveys (SES) covering the period from 1988 to 2000. We also show that our methodology is easily applicable to international cross-country data. Our empirical illustration shows that the proposed poverty growth curve can provide conclusive results about the pro-poorness of growth in more than 80% of the cases.
2. Poverty growth curve

Suppose $L(p)$ is the Lorenz curve that describes the percentage share of income (expenditure) enjoyed by the bottom $p$ percent of population and is defined as:

$$L(p) = \frac{1}{\mu} \int_0^\mu y f(y) dy$$

where

$$p = \int_0^\mu f(y) dy$$

$L(p)$ being the mean income of society and $y$ is a person’s income with its probability density function, $f(y)$. The Lorenz curve lies in a unit square and satisfies the following properties (Kakwani, 1980): (i) $L(p) = 0$ when $p = 0$; (ii) $L(p) = 100$ when $p = 100$; (iii) $dL(p)/dp = y/\mu > 0$ and $d^2L(p)/dp^2 = 1/\mu f(y) > 0$; (iv) $L(p) \leq p$ for all $p$ in the range $0 \leq p \leq 100$. When $L(p) = p$, we have a perfectly equal distribution of income.

Following Kakwani and Pernia (2000), economic growth may be called pro-poor if the poor enjoy the benefits of growth proportionally more than the non-poor. In this scenario, inequality is concurrently declined during the course of growth. A change in the Lorenz curve indicates whether inequality is increasing or decreasing with economic growth. Thus, growth is unambiguously pro-poor if the entire Lorenz curve shifts upward, $\Delta L(p) \geq 0$ for all $p$.

Suppose $\mu$ is the mean income (expenditure) of society and then $\mu L(p)$ is called the generalized Lorenz curve. When the entire generalized Lorenz curve shifts upward, we can argue that the new distribution has second-order dominance over the old distribution. In this respect, the generalized Lorenz curve may also be called the second-order dominance curve. Atkinson (1987) has provided a useful link between second-order dominance and changes in poverty. To show this linkage, consider a general class of additive poverty measures:

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

where $f(x)$ is the density function of income $x$ and $z$ is the poverty line and

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

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

Using Atkinson’s (1987) theorem concerning the relationship between second-order dominance and poverty reduction, we can show that if $\Delta(\mu L(p)) \geq 0$ for all $p$, then $\Delta \theta \leq 0$ for all poverty lines and the entire class of poverty measures given in Eq. (3). This indicates that when the entire generalized Lorenz

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1 The most widely used poverty measures are those of Foster, Greer and Thorbecke (1984), which are obtained from Eq. (3) when $P(z,x) = (1-x/z)^a$, which satisfies all the conditions given in Eq. (4). When $a = 0, 1, \text{and} 2$, we obtain the headcount ratio, the poverty gap ratio, and severity of poverty measure, respectively.
curve shifts upward (downward), we can unambiguously say that poverty has decreased (increased). This result holds for the entire class of poverty measures and all poverty lines. This is a powerful theorem and will serve as the basis of our poverty growth curve.

From the definition of the Lorenz curve, we can always write:

\[ L(p) = \frac{\mu_p p}{\mu} \]  

which is the share of mean income of the bottom \( p \) percent of population and where \( \mu_p \) is the mean income of the bottom \( p \) percent of population. On taking the logarithm of both sides, Eq. (5) becomes

\[ \ln(\mu_p) = \ln(\mu L(p)) - \ln(p) \]  

Taking the first difference in Eq. (6) gives

\[ g(p) = \Delta \ln(\mu L(p)) \]  

where

\[ g(p) = \Delta \ln(\mu_p) \]

is the growth rate of the mean income of the bottom \( p \) percent of the population when individuals are ranked by their per capita income (expenditure). \( g(p) \) varies with \( p \) ranging from 0 to 100 and may be called poverty growth curve. From the Atkinson’s theorem and Eq. (7), we can say that if \( g(p) > 0 \) (\( g(p) < 0 \)) for all \( p \), then poverty has decreased (increased) unambiguously between two periods.

Eq. (7) can also be written as

\[ g(p) = g + \Delta \ln(L(p)) \]

and

\[ g = \Delta \ln(\mu) \]

where \( g \) is the growth rate of the mean income of the whole society. Note that when \( p = 100 \), \( g(p) = g \) because \( \Delta L(p) = 0 \) at \( p = 100 \).

From Eq. (8), it follows that if \( g(p) > g \) for all \( p < 100 \), then growth is pro-poor because the entire Lorenz curve shifts upward (\( L(p) > 0 \) for all \( p \)). If \( 0 < g(p) < g \) for all \( p < 100 \), then growth reduces poverty but is accompanied by an increase in inequality (\( L(p) < 0 \) for all \( p \)). This situation may be characterized as trickle-down growth; growth reduces poverty but the poor receive proportionally less benefits than the non-poor. If \( g(p) < 0 \) for all \( p < 100 \) and \( g \) is positive, then we have an immiserizing growth where the positive growth increases poverty (Bhagwati, 1988).2

2 Note that there is a similarity between pro-poor growth and tax progressivity. A fiscal system is called progressive (regressive) if it redistributes income favoring the poor (rich). The idea of pro-poor growth presented here can also be applied to evaluate a country’s fiscal system.
3. How does the poverty growth curve (PGC) differ from the growth incidence curve (GIC)?

Suppose \( x_p \) is the per capita income (expenditure) at the \( p \)th percentile, which can be written as

\[
x_p = \mu L'(p)
\]

where \( L'(p) \) is the first derivative of the Lorenz curve \( L(p) \). By taking the logarithm and then the first difference of Eq. (9), we obtain

\[
r(p) = g + \Delta \ln(L'(p))
\]

where

\[
r(p) = \Delta (\ln(x_p))
\]

is the growth rate of income (expenditure) of an individual at the \( p \)th percentile. \( r(p) \) is the growth incidence curve (GIC) proposed by Ravallion and Chen (2003). The higher this curve shifts upward, the greater the reduction in poverty.

What are the major differences between our PGC and the GIC proposed by Ravallion and Chen?

First, while the GIC is derived from first-order dominance, our PGC is based on second-order dominance. Thus, GIC results will be stronger than our PGC if the dominance requirement conditions are satisfied. However, since first-order dominance implies second-order dominance, the second-order dominance requirement is likely to be satisfied more often than the first order dominance. Therefore, the PGC would provide more conclusive results.

Secondly, in estimating the GIC, the growth rate of per capita income at the \( p \)th percentile \( (r(p)) \) is used. The estimation of \( r(p) \) based on unit record data like household surveys will be subject to more errors because the data source is discrete. Even if one attempts to fit the Lorenz curve to make discrete data continuous, the accuracy of the results depends on the goodness of the fit of the Lorenz curve.

In contrast, the dominance requirement of PGC is based on the estimation of the growth rate of the mean income up to the \( p \)th percentile \( (g(p)) \). As such, the estimation of \( g(p) \) will be subject to
le error. Finally, to compute the PGC, only decile or quintile shares and mean income are required.

4. Empirical illustration

The poverty growth curve can be easily calculated if we know decile or quintile shares and the mean income for any two periods. We applied this idea to Thailand. The results are presented in Table 1. The data source for Thailand comes from the Socio-Economic Surveys (SES) covering the period from 1988 to 2000. The SES data are unit record household surveys conducted every 2 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. On average, each SES contains information on more than 17,000 households.

Note that $g(p) = g$, when $p = 100$. Thus the last row in Table 1 gives the growth rate of the mean income. Since the application of methodology involves sample surveys, it would be appropriate for testing if $g(p)$ deviates significantly from $g$. Such a test can be developed by computing the asymptotic standard errors of estimated $g(p) - p$ at each point of $p$. We can derive the asymptotic standard errors following from a procedure similar to that of Senders (1979), which has an attractive feature of being distribution free. If we wish to construct confidence contours about the poverty growth curve, we can apply Beach and Davidson’s (1983) methodology to construct joint variance–covariance matrix for the poverty growth curve. This will be a substantial extension and will be undertaken in our future research.

The annual growth rate of the mean income in the 1988–1990 period is 9.06%. Note that from $g(p) > 0$ for all $p$, we can conclude that poverty has declined unambiguously between 1988 and 1990. Since $g(p)$ is less than 9.06 for all $p < 100$, it implies that the growth has not been pro-poor during this period (Fig. 1).

A similar situation occurs in the next period, 1990–1992. The annual growth rate of per capita income is 7.49% but growth is not pro-poor; poverty has decreased unambiguously but the benefits of growth received by the poor are proportionally less than those received by the non-poor (Fig. 1).

However, the nature of growth changes in the 1992–1994 period. $g(p)$ is uniformly greater than $g$ for all $p$, which suggests that the growth is unambiguously pro-poor. The growth is also pro-poor in the 1994–1996 period (Fig. 2).

Unfortunately, the pro-poor growth did not continue in the two subsequent periods, 1996–1998 and 1998–2000, when the average growth rate became negative due to the financial crisis. The growth rate of per capita income declined at annual rates of 1% and 0.85% during 1996–1998 and 1998–2000, respectively. In both periods, $g(p)$ is negative for all values of $p$, indicating that poverty in Thailand increased during the two periods. Also note that $g(p) < g$ for all $p$, suggesting that the economic crisis hurt the poor proportionally more than the non-poor (Fig. 3).

Next we applied our methodology to international cross-country data. The data were obtained from the World Bank and covered 87 countries and 241 growth rates. The data contained the

![Fig. 2. Pro-poor poverty growth curve for Thailand: 1992–1994 and 1994–1996.](image)
quintile shares and per capita real GDP at 1985 PPP dollars. Table 2 presents the summary results.

Of 241 spells, growth was found to be pro-poor in 95 cases and not pro-poor in 94 cases. Growth was immiserizing in nine cases where positive growth led to an increase in poverty. In 43 cases, from our methodology we could not arrive at an unambiguous answer. We could possibly minimize these inconclusive results if we chose a smaller value of the percentile, $p$. Growth rate was negative in 42 spells. From these cases, we conclude that our methodology is quite powerful because, in the majority of cases, we can draw definitive conclusions about the nature of growth without specifying the poverty line and the poverty measure.

Table 2
Summary of international poverty growth curve

<table>
<thead>
<tr>
<th></th>
<th>Positive growth</th>
<th>Negative growth</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro-poor</td>
<td>84</td>
<td>11</td>
<td>95</td>
</tr>
<tr>
<td>Not pro-poor</td>
<td>71</td>
<td>23</td>
<td>94</td>
</tr>
<tr>
<td>Immiserizing</td>
<td>9</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Inconclusive</td>
<td>35</td>
<td>8</td>
<td>43</td>
</tr>
<tr>
<td>Total</td>
<td>199</td>
<td>42</td>
<td>241</td>
</tr>
</tbody>
</table>

Details of international poverty growth curve are available from the author upon request.
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References