



## Chronic and transient poverty in rural China

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### HIGHLIGHTS

- Rectify the popular poverty decomposition framework that violates the Focus Axiom.
- Empirical results show the dominance of chronic poverty in rural China.
- Suggest capacity building not social protection as the main policy measure.

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### ABSTRACT

This paper rectifies the poverty decomposition framework of Rodgers and Rodgers (1993) which violates the Focus Axiom of Sen (1976). An empirical application of the rectified technique reveals that poverty in rural China was dominated by the chronic component.

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## 1. Introduction

Two main approaches exist for measuring transient and chronic poverty. The spell approach examines the frequency of economic agents falling below the poverty line over a certain time period and those with a higher frequency than a benchmark are identified as chronically poor and the remaining poor are the transiently poor. As pointed out by Foster (2007), this approach is not sensitive to the depth of poverty experienced by the poor. Also, inter-temporal income transfer is implicitly assumed away.

The other approach characterizes the chronically poor as those with their mean income or consumption below the poverty line. The extent of chronic poverty is captured by the gap between the mean consumption or income and the poverty line, and the

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residual is defined as transient poverty. This approach is based on the expected utility theory (Ravallion, 1988) and overcomes some of the deficiencies of the spell approach (Rodgers and Rodgers, 1993). See Gibson (2001) for various applications and references. However, poverty decomposition under this framework violates the important Focus Axiom of Sen (1976), as shown below.

## 2. Measuring chronic and transient poverty

Let  $t = 1, 2, \dots, T$  index time,  $i = 1, 2, \dots, N$  index economic agents such as households or individuals,  $z$  denote a poverty line, and vector  $Y_{i,T} = (y_{i,1}, y_{i,2}, \dots, y_{i,T})$  denote the consumption or income stream for  $i$ . According to Rodgers and Rodgers (1993) and Jalan and Ravallion (1998), the transient component of poverty for an economic agent  $TP_i$  can be expressed as:

$$TP_i = P_i - CP_i \quad (1)$$

where  $P_i$  denotes total inter-temporal poverty for  $i$ , measured by the squared poverty gap index of Foster et al. (1984):

**Table 1**  
Chronic and transient poverty in rural China (\$1.25 poverty line).

$T = 3$	1995–97	1996–98	1997–99	1998–00	1999–01	2000–02	2001–03	2002–04	2003–05
Total poverty	6.05	4.93	4.11	4.01	4.24	4.22	3.72	2.83	2.12
Chronic poverty	5.50	4.40	3.72	3.61	3.88	3.80	3.31	2.38	1.82
Transient poverty	0.55	0.54	0.39	0.40	0.37	0.41	0.41	0.45	0.31
Share of chronic poverty (%)	90.92	89.08	90.57	90.12	91.38	90.17	88.88	84.08	85.58
$T = 4$	1995–98	1996–99	1997–00	1998–01	1999–02	2000–03	2001–04	2002–05	
Total poverty	5.49	4.67	4.16	4.14	4.14	3.86	3.26	2.55	
Chronic poverty	4.96	4.19	3.81	3.76	3.80	3.48	2.88	2.17	
Transient poverty	0.53	0.48	0.35	0.38	0.34	0.39	0.37	0.37	
Share of chronic poverty (%)	90.34	89.69	91.59	90.94	91.73	90.00	88.51	85.34	
$T = 5$	1995–99	1996–00	1997–01	1998–02	1999–03	2000–04	2001–05		
Total poverty	5.17	4.60	4.23	4.08	3.87	3.47	2.95		
Chronic poverty	4.66	4.14	3.86	3.70	3.51	3.09	2.60		
Transient poverty	0.51	0.46	0.38	0.38	0.36	0.38	0.35		
Share of chronic poverty (%)	90.14	90.05	91.10	90.80	90.79	89.11	88.20		

Note: Poverty is measured according to Eq. (2) and decomposed according to Eq. (7) all expressed in percentage terms.

$$P_i = 1/T \sum_{t=1}^T \left(1 - \frac{y_{i,t}}{z}\right)^2 \quad \text{if } y_{i,t} < z$$

$$= 0 \quad \text{if } y_{i,t} \geq z, \quad (2)$$

and  $CP_i$  denotes chronic poverty for  $i$ , measured as

$$CP_i = 1/T \sum_{t=1}^T \left(1 - \frac{\bar{y}_i^T}{z}\right)^2 \quad \text{if } \bar{y}_i^T < z$$

$$= 0 \quad \text{if } \bar{y}_i^T \geq z, \quad (3)$$

where  $\bar{y}_i^T = 1/T \sum_{t=1}^T y_{i,t}$ . Consequently,  $TP_i$  becomes:

$$TP_i = 1/T \sum_{t=1}^T \left[ \left(\frac{\hat{y}_{i,t}^T}{z}\right)^2 - \frac{2\hat{y}_{i,t}^T}{z} \left(1 - \frac{\bar{y}_i^T}{z}\right) \right] \quad (4)$$

where  $\hat{y}_{i,t}^T = y_{i,t} - \bar{y}_i^T$  represent deviations of the elements in  $Y_{i,T}$  from  $\bar{y}_i^T$ .

Clearly,  $\bar{y}_i^T$  is obtained by averaging *all* consumption of  $i$  over the entire  $T$  time period, irrespective of the poverty status of the economic agent in any particular time  $t$ . In other words, consumption in poor and non-poor times all determine chronic and transient poverty (see Eqs. (3) and (4)) although the total inter-temporal poverty is determined by consumption in poor times only (see Eq. (2)). Thus, both the chronic and transient components in (1) violate Sen's Focus Axiom while the total inter-temporal poverty does not. Note that the Focus Axiom states that poverty measurement shall be independent of observations of the non-poor people or non-poor times.

To rectify the above problem, let  $Y_{i,M} = (y_{i,1}, y_{i,2}, \dots, y_{i,M})$  be the sub-vector of  $Y_{i,T}$ , containing those observations in  $Y_{i,T}$  that are below the poverty line  $z$  ( $M = T$ ). The mean consumption of  $i$  corresponding to  $Y_{i,M}$  is given by:

$$\bar{y}_i^M = 1/M \sum_{t=1}^M y_{i,t}. \quad (5)$$

Now, let  $\hat{y}_{i,t}^M$  denote deviations of the elements in  $Y_{i,M}$  from  $\bar{y}_i^M$ , we have:

$$y_{i,t} = \bar{y}_i^M + \hat{y}_{i,t}^M, \quad t = 1, 2, \dots, M. \quad (6)$$

Dividing both sides of (6) by  $z$ , and substituting into (2), we can obtain after some manipulations:

$$P_i = 1/T \sum_{t=1}^M \left(1 - \frac{\bar{y}_i^M}{z}\right)^2 + 1/T \sum_{t=1}^M \left(\frac{\hat{y}_{i,t}^M}{z}\right)^2. \quad (7)$$

Note that the total inter-temporal poverty  $P_i$  in (7) is identical to what is defined by Rodgers and Rodgers (1993) and Jalan and Ravallion (1998), which does not violate the focus theorem. It is important to point out that in addition to the Focus Axiom, poverty decomposition proposed in (7) also satisfies the monotonicity axiom, the weak transfer axiom and so on.

The first term on the right hand side of (7) represents chronic poverty. It is completely determined by the mean of consumption stream during the poor times only. The second term represents transient poverty, which is completely determined by consumption fluctuations around the mean or consumption risk during the poor times only.<sup>1</sup> The aggregate poverty for the whole population can be easily obtained by computing the simple average of  $P_i$  in the case of individual data or household-size weighted average in the case of household data (see Jalan and Ravallion, 1998).

### 3. Empirical illustration

To illustrate the application of the proposed poverty decomposition, panel data for 1832 rural households over 1995–2005 was constructed based on a nation-wide survey conducted annually by China's Ministry of Agriculture. Although the survey started in 1984 and covers around 24000 households in 300 villages of 30 provinces, we only have access to data from Jiangsu, Zhejiang, Shandong, Shanxi and Shanghai for 1995–2005.

Using the international poverty lines of \$1.25 adjusted by purchasing power parity, decomposition results are summarized in Table 1.<sup>2</sup> It is clear that total poverty had been declining over time despite some regress around the turn of the new millennium. The declining trend is also visible when chronic and transient poverty is measured separately.

A striking finding is that chronic poverty dominates total poverty irrespective of the time periods under consideration. Typically, the share of chronic poverty amounts to more than 85% of the total with the only exception of 84.08% for the period of 2002–2004 under  $T = 3$ .

For the purpose of comparison, the decomposition results using the method of Rodgers and Rodgers (1993) and Jalan and Ravallion (1998) are tabulated in Table 2. They indicate considerable underestimation of chronic poverty, with the share of chronic poverty typically in the range of 70% of the total. The lowest share of chronic

<sup>1</sup> In the case of  $M = 1$ , we set  $P = TP$ .

<sup>2</sup> Results using the \$2 poverty line are similar and available upon request from the authors.

**Table 2**  
Chronic and transient poverty in rural China (\$1.25 poverty line) based on Rodgers and Rodgers.

$T = 3$	1995–97	1996–98	1997–99	1998–00	1999–01	2000–02	2001–03	2002–04	2003–05
Total poverty	6.05	4.93	4.11	4.01	4.24	4.22	3.72	2.83	2.12
Chronic poverty	4.71	3.69	3.13	3.13	3.44	3.36	2.68	1.94	1.56
Transient poverty	1.34	1.25	0.98	0.98	0.80	0.86	1.04	0.89	0.56
Share of chronic poverty (%)	77.82	74.71	76.05	78.20	81.10	79.59	71.98	68.61	73.74
$T = 4$	1995–98	1996–99	1997–00	1998–01	1999–02	2000–03	2001–04	2002–05	
Total poverty	5.49	4.67	4.16	4.14	4.14	3.86	3.26	2.55	
Chronic poverty	3.86	3.23	2.96	3.03	3.12	2.62	2.04	1.60	
Transient poverty	1.64	1.44	1.20	1.11	1.02	1.25	1.22	0.95	
Share of chronic poverty (%)	70.24	69.17	71.16	73.13	75.29	67.70	62.56	62.68	
$T = 5$	1995–99	1996–00	1997–01	1998–02	1999–03	2000–04	2001–05		
Total poverty	5.17	4.60	4.23	4.08	3.87	3.47	2.95		
Chronic poverty	3.40	3.02	2.85	2.82	2.56	2.05	1.66		
Transient poverty	1.77	1.58	1.38	1.26	1.31	1.42	1.29		
Share of chronic poverty (%)	65.74	65.66	67.29	69.10	66.25	59.24	56.44		

Note: Poverty is measured according to Eq. (2) and decomposed according to Eq. (7) all expressed in percentage terms.

poverty is 56.44%, implying almost equal importance of chronic and transient poverty in rural China over the period of 2001–2005.

Apart from the under-estimation, it is noted that there is a general decrease in the share of chronic poverty as  $T$  increases when using Rodgers and Rodgers (1993) and Jalan and Ravallion (1998). This does not apply to the results in Table 1.

#### 4. Conclusion

The decomposition technique developed in this paper satisfies the Focus Axiom and other major axioms in poverty measurement. Empirical results based on the proposed framework appeals for preventive measures such as capacity building for tackling poverty in rural China.

On the contrary, application of Rodgers and Rodgers (1993) or Jalan and Ravallion (1998) leads to considerable under-estimation of chronic poverty and over-estimation of transient poverty in rural China. The same can be concluded according to Baulch and Hoddinott (2000) and Jalan and Ravallion (1998) who found, not surprisingly, a prevalence of transient poverty. The biased estimation can mislead policy makers to rely on protective policy measures such as insurance and social welfare systems when designing and implementing development policies. Protective measures will be inefficient and ineffective when chronic poverty prevails.

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