

Chakravarty, Satya R.; Chattopadhyay, Nachiketa; Silber, Jacques

**Working Paper**

## A poverty line contingent on reference groups: Implications for the extent of poverty in some Asian countries

ADB Working Paper, No. 610

**Provided in Cooperation with:**

Asian Development Bank Institute (ADBI), Tokyo

*Suggested Citation:* Chakravarty, Satya R.; Chattopadhyay, Nachiketa; Silber, Jacques (2016) : A poverty line contingent on reference groups: Implications for the extent of poverty in some Asian countries, ADB Working Paper, No. 610, Asian Development Bank Institute (ADBI), Tokyo

This Version is available at:

<https://hdl.handle.net/10419/163109>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*



<https://creativecommons.org/licenses/by-nc-nd/3.0/igo/>



## **ADB Working Paper Series**

### **A POVERTY LINE CONTINGENT ON REFERENCE GROUPS: IMPLICATIONS FOR THE EXTENT OF POVERTY IN SOME ASIAN COUNTRIES**

---

**Satya R. Chakravarty,  
Nachiketa Chattopadhyay,  
and Jacques Silber**

No. 610  
November 2016

**Asian Development Bank Institute**

Satya R. Chakravarty is a professor at the Indian Statistical Institute, Nachiketa Chattopadhyay is an associate professor at the Indian Statistical Institute, and Jacques Silber is professor emeritus at Bar-Ilan University in Israel.

The views expressed in this paper are the views of the author and do not necessarily reflect the views or policies of ADBI, ADB, its Board of Directors, or the governments they represent. ADBI does not guarantee the accuracy of the data included in this paper and accepts no responsibility for any consequences of their use. Terminology used may not necessarily be consistent with ADB official terms.

Working papers are subject to formal revision and correction before they are finalized and considered published.

The Working Paper series is a continuation of the formerly named Discussion Paper series; the numbering of the papers continued without interruption or change. ADBI's working papers reflect initial ideas on a topic and are posted online for discussion. ADBI encourages readers to post their comments on the main page for each working paper (given in the citation below). Some working papers may develop into other forms of publication.

Suggested citation:

Chakravarty, S. R., N. Chattopadhyay, and J. Silber. 2016. A Poverty Line Contingent on Reference Groups: Implications for the Extent of Poverty in some Asian Countries. ADBI Working Paper 610. Tokyo: Asian Development Bank Institute. Available: <https://www.adb.org/publications/poverty-line-contingent-reference-groups>

Please contact the authors for information about this paper.

Email: [jsilber\\_2000@yahoo.com](mailto:jsilber_2000@yahoo.com)

ADB recognizes "China" as the People's Republic of China.

Asian Development Bank Institute  
Kasumigaseki Building, 8th Floor  
3-2-5 Kasumigaseki, Chiyoda-ku  
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500  
Fax: +81-3-3593-5571  
URL: [www.adbi.org](http://www.adbi.org)  
E-mail: [info@adbi.org](mailto:info@adbi.org)

© 2016 Asian Development Bank Institute

**Abstract**

This paper estimates the number of poor in various countries in Asia by applying an “amalgam poverty line”, which is a weighted average of an absolute poverty line (such as \$1.25 per day or \$1.45 per day) and a reference income (such as the mean or the median income). The number of poor is computed under various values of the weight applied to the absolute poverty line, namely 100%, 90%, 66%, and 50%. The paper provides estimates of the headcount ratio and poverty gap ratio under the various scenarios for 25 different countries or regions examined.

**JEL Classification:** D31, D63, I32, O53

## Contents

1.	INTRODUCTION .....	1
2.	MAKING THE POVERTY LINE DEPENDENT ON REFERENCE GROUPS: AN AXIOMATIC APPROACH .....	2
3.	HAPPINESS, OWN STANDARD OF LIVING, AND REFERENCE GROUPS .....	3
4.	THE EXTENT OF POVERTY WITH AN “AMALGAM POVERTY LINE”: THE CASE OF ASIAN COUNTRIES .....	6
5.	CONCLUSIONS .....	12
	REFERENCES .....	13

# 1. INTRODUCTION

In his *Wealth of Nations*, Adam Smith stated that “by necessities I understand, not only the commodities which are indispensably necessary for the support of life, but whatever the custom of the country renders it indecent for creditable people, even of the lowest order, to be without. A linen shirt, for example, is, strictly speaking, not a necessary of life. The Greeks and Romans lived, I suppose, very comfortably, though they had no linen. But in the present times, through the greater part of Europe, a creditable day-laborer would be ashamed to appear in public without a linen shirt, the want of which would be supposed to denote that disgraceful degree of poverty, which, it is presumed, nobody can well fall into without extreme bad conduct....Under necessities therefore, I comprehend, not only those things which nature, but those things which established rules of decency have rendered necessary to the lowest rank of people” (Smith, 1937: 821–822).

In fact, absolute poverty lines are generally used in poor countries (e.g. \$1.25 per day, which is an updated figure of the earlier proposal \$ 1 per day). On the other hand, in rich countries, such as in Western Europe, the poverty line corresponds to some proportion (60%) of the median income. Ravallion and Chen (2011) have argued that both approaches are justified because, in poor countries, it makes sense that those who are able to feed and clothe themselves should not be considered as poor, whereas, in rich countries, the idea of social exclusion should be of prime importance (see Sen (2000) for more details).

Ravallion and Chen (2012: 3) have actually argued that “if one thinks that it is really only social norms that differ, with welfare depending solely on own consumption, then one would probably prefer an absolute measure, imposing a common norm (though one would presumably also be drawn to consider more than one possible line). However, if one is convinced that there are social effects on welfare then one would be more inclined to use a relative line in the consumption or income space, anchored to a common welfare standard. The problem for global poverty comparisons is that we do not know which of these two interpretations—differing social norms or social effects on welfare—is right. And we may never resolve the matter from conventional empirical evidence. This uncertainty makes it compelling to consider both approaches when measuring global poverty.”

This is why Ravallion and Chen (2011), generalizing somehow the measures proposed by Atkinson and Bourguignon (2001), suggested that there should be a positive lower bound to the costs of social inclusion so that the poverty line would rise with the mean income only above some critical value and it then would do so with an elasticity less than one. A different but still combined approach to the selection of a poverty line was proposed recently by Chakravarty et al. (2015) who developed axiomatically what they called “an amalgam poverty line”. The Atkinson-Bourguignon (2001) and EU (see, Lelkes and Gasior, 2011) standard suggestions for basing the poverty lines on some location parameter are particular cases of this formulation.

Essential to the methodology adopted in the paper is the notion of ‘reference group’. By a reference group we mean a subgroup of population within which an individual confines its aspiration. Since we are concerned with poverty, we identify the reference group by a reference income level, say, the median or mean income.

The novelty of the present paper is that it offers an empirical illustration of the proposal of Chakravarty et al. (2015). Using data on the shares in total expenditures of the deciles of the distribution of expenditures in different Asian countries around 2010, it indicates what the headcount ratio, the number of poor and the poverty gap ratio would be under various scenarios. These scenarios are a function of the absolute poverty line (taken as \$1.25 per day or \$1.45 per day), the “reference income” chosen as either the mean or the median of the distribution of expenditures, and the weight given to the absolute poverty line.

The paper is organized as follows. Section 2 shortly summarizes the main elements of the paper by Chakravarty et al. (2015). Section 3 reviews briefly the role played by reference groups in the growing economic literature on happiness. Section 4 presents the results of the empirical investigation while concluding comments are given in Section 5.

## 2. MAKING THE POVERTY LINE DEPENDENT ON REFERENCE GROUPS: AN AXIOMATIC APPROACH

In a recent paper, Chakravarty et al. (2015) developed an axiomatic approach to the determination of what they called “an amalgam poverty line”. Given a reference income, say, the mean or the median, this “amalgam poverty line” is derived as a weighted average of the existing absolute poverty line and the reference income, the choice of the weight being guided by the policy maker’s preferences for aggregating the two components. The individual utility is assumed to be an increasing concave function of the absolute poverty line but a decreasing convex function of the reference standard. Following Clark and Oswald (1996), Chakravarty et al. (2015) considered both an additive and a multiplicative form of the utility function, using two different sets of intuitively reasonable axioms.

The general idea of their approach is as follows. Imagine some reference income and a person with an income equal to some arbitrarily set poverty line. They first determine the level of the corresponding utility. They then consider an alternative situation where this person has an income identical to some given poverty line. Moreover they suppose that for this individual his/her own income is actually his/her reference income. If it is assumed that the person is equally satisfied in both cases, it is possible to equate the utilities in both states of affairs and to then determine uniquely the arbitrary poverty line. This presumption of equal satisfaction in both situations is quite plausible because in each case the individual is at the existing poverty line income.

Chakravarty et al. (2015) then proceed as follows. Following Clark and Oswald (1998) they examine two options. They first assume that an individual’s utility function depends in part on his/her absolute income. Assuming that the utility function has the properties of *linear translatability* and *linear homogeneity* (see Chakravarty et al., 2015, for more details), they proved that the utility function has the form

$$U(y, (y - r)) = (k - a)y + ar \quad (1)$$

where,  $y > 0$  is the individual income;  $r > 0$  is the reference income;  $k > 0$  and  $a > 0$  are constants. Positivity of  $k$  reflects the view that as income increases, satisfaction increases whereas negativity of  $a$  ensures that satisfaction decreases as the reference income increases.

Chakravarty et al. (2015) show that the “amalgam poverty line” is a weighted average of the traditional absolute poverty line and the specified reference income. But they also explore the case where utility depends on the relative income, that is, income relative to some reference standard. In other words an individual’s utility depends also on his/her relative position (or ‘status’) in the society in terms of some measure of well-being. They assumed linear homogeneity, normalization, and continuity (see Chakravarty et al., 2015, for more details) and then proved that one form of the utility function was of the form

$$U = y \left( \beta - \frac{r}{y} \right) = \beta y - r \quad (2)$$

where  $\beta > 1$  is the ratio between the upper bound  $u$  and lower bound  $l > 0$  of incomes.

It follows that the “amalgam poverty line”  $z_1$  is a weighted average of the traditional absolute poverty line  $z_0$  and the reference income  $r$ . More precisely they derive that

$$z_1 = wz_0 + (1 - w)r \quad (3)$$

with

$$w = \frac{\beta - 1}{\beta}. \quad (4)$$

Since  $\beta > 1$ , it follows that,  $0 < w < 1$ .

As mentioned previously, Clark and Oswald (1996) had suggested taking into account this relativity by making either difference or ratio comparisons. In the empirical section of this paper, we, however, base our analysis on the ‘ratio comparisons model’. In such a model, the extent of an individual’s feeling of deprivation arising out comparison of its own income with respect to a reference income is expressed in terms of the ratio between the two incomes (see the next section).

### 3. HAPPINESS, OWN STANDARD OF LIVING, AND REFERENCE GROUPS

The analysis of subjective well-being has been a growing field of inquiry during the last two decades, especially in recent years. Of particular interest in this literature is the analysis of the impact of so-called reference groups on life satisfaction or satisfaction with income. This question is related to a much older hypothesis, which assumes that utility depends not only on one’s own income but also on that of others. The importance of relative income had been stressed in the work of Duesenberry (1949) who assumed that the utility of an individual is negatively affected by the income of anyone richer than him, as well as the work of Runciman (1966) whose focus was on the concept of relative deprivation.

An empirical application of these ideas may be summarized by the following equation (see, Clark et al., 2008: 100):

$$U(t) = \beta_1 \ln y(t) + \beta_2 \ln \left( \frac{y(t)}{y^*(t)} \right) + Z'(t)\gamma \quad (5)$$



where  $U(t)$  is the individual's utility,  $y(t)$  is his income,  $y^*(t)$  is some reference income,  $Z'$  is a vector of additional determinants and  $\gamma$  is a vector of the coefficients of these determinants, all the variables being measured at time  $t$ .

There are various ways of obtaining measures for  $y^*(t)$ . One can estimate wage equations, controlling for individual characteristics like age, gender, education, area of residence and then obtain a predicted value of  $y^*(t)$  for each individual. Another possibility is to compute cell averages to obtain an estimate of the average wage by, say, gender, education and region, on the basis of either the dataset itself or some external data source. Finally, more recently information about the reference income can be obtained directly from the survey itself. This information may be of a qualitative nature and the respondents were asked how much higher or smaller (on some ordinal scale) their incomes were with respect to their reference incomes (see, for example, Knight et al., 2009). There may even be some quantitative information on the income of the reference group like that available in a Japanese survey where those who participated in this survey were asked to estimate the income of people who had the same age, sex and educational level as theirs (see, Clark et al., 2013). This direct source of information is still very rare although van Praag pleaded recently "for an extension of the happiness paradigm by setting up a new additional agenda for empirical research in order to get quantified knowledge about the referencing process" (van Praag, 2011: 111).

Reference groups have also been introduced in studies of the determinants of the "subjective economic ladder" where people are asked to define their position on some scale of standard of living. For instance, using some Indonesian survey, Powdthavee (2009), rather than selecting relative income as a determinant of this subjective economic ladder, introduced a variable measuring the rank of the individual in the distribution of income/wealth at the local level (see, Powdthavee, 2009).

The next question concerns the determination of the reference group. A first possibility is to consider that the reference group is made of colleagues in which case the emphasis is on "the relation between income gaps in the professional sphere and various notions of satisfaction ranging from job to life satisfaction" (Senik, 2009: 8). Clark and Oswald (1996), for example, analysed job satisfaction on the basis of the British Household Panel Survey (BHPS) and defined the reference group of a worker as the income of employees who had the same age and level of qualification as the worker and were doing the same kind of job. Other studies have assumed that the reference group was composed of people with the same characteristics as the individual, with, for example, the same age, level of education and region of residence (see, Ferrer-i-Carbonell, 2005). Some authors have also used space-based reference incomes such as the average income of individuals of the same race in the cluster and district where the individuals surveyed live (see, Kingdon and Knight, 2007).

The objective rank of an individual in the area where he lives has also been shown to affect the satisfaction he gets from his consumption level, as stressed by Fafchamps and Shilpi (2008) in their work on subjective welfare in Nepal.

The impact of the reference income on subjective well-being is an important issue to be examined. The literature makes a distinction between two possible impacts, one reflecting a signalling effect, the other the role of status. The idea that other people's income may have a positive effect on satisfaction was originally introduced by Hirschman and Rothschild (1973: 545–546): "Suppose that the individual has very little information about his future income, but at some point a few of his relatives, neighbours, or acquaintances improve their economic or social position. Now, he has something to go on: expecting that his turn will come in due course, he will draw

gratification from the advances of others – for a while. It will be helpful to refer to this initial gratification as the ‘tunnel effect’.” Evidence confirming the existence of such signalling effects was provided by Senik (2004, 2008). The more common impact of reference income seems nevertheless to be a status effect: *ceteris paribus* a higher reference income affects negatively satisfaction from life or income (see, for example, the studies of Senik, 2009, and Clark and Senik, 2009).

As far as empirical results are concerned, there are hitherto very few papers in the literature on subjective welfare that estimated the impact on happiness, *ceteris paribus*, of an increase in one’s own income, on the one hand, of a rise in the reference group’s income, on the other hand. Moreover the effect of a change in the reference income, when estimated, was generally derived indirectly. Knight et al. (2009), for example, who looked at subjective well-being in the People’s Republic of China, introduced in their regression a dummy variable indicating whether the household income was much above, above, below or much below the village average. Clark and Senik (2009), using the third wave of the European Social Survey, defined two types of variables to take into account other people’s income: a dummy variable indicating how important it was for the respondent to compare her own income with that of others and another dummy variable showing with what population category the comparison was made (friends, work colleagues, family members, others). In a more recent paper Clark et al. (2013) were however able to introduce a variable referring directly to the income of some reference group. They analysed an internet survey that was conducted in Japan and in which the respondent was asked to indicate what she thought was the average personal income before taxes of people of the same age, gender and educational level as hers. The authors were also able to estimate this individual reference income by looking at the mean values observed in cells corresponding to individuals with the same, age, education, gender and labour force status. Finally Clark et al. (2013) used also external sources to compute the actual income of individuals by labor force status (civil servants, self-employed, etc...). In Table 4 of their paper the authors report the results of a regression where the dependent variable refers to satisfaction with income. It then appears that the coefficient of own income is about three times as high as that of self-reported reference income, and of opposite sign, even when a variable measuring the “comparison intensity” of the individual (how important it is for the respondent to compare her income with that of others) is introduced.

We can now attempt to use this result (a ratio of about three between the coefficient of own income and that of the reference income) and introduce it in equations (2) and (3) above. More precisely this empirical result would imply that the coefficient  $\beta$  in (2) would be equal to 3.

Using (2) we derive that

$$dU = \frac{\partial U}{\partial y} dy + \frac{\partial U}{\partial r} dr = \beta dy - dr \quad (6)$$

so that for a given utility level,

$$\frac{dr}{dy} = \beta \quad (7)$$

Using (4), we then conclude that the weight  $w$  would be equal to (2/3), one of the values which will be used for  $w$  in the empirical section of the present paper.

The data we use do not provide any information on the reference income of individuals. We actually know only the shares in total income of the various deciles as well as the mean and median of the income distribution (or rather the distribution of expenditures) in the various countries for which data are available. We therefore decided that the reference income would be either the mean or the median. If the mean is selected, one implicitly assumes that the extent of poverty should also be a function of the income of those who are not poor, or more generally of the standards of living of all the individuals in the population. If the reference chosen is the median income, then, since the latter does not depend on the incomes of those who are not poor, one really assumes that the extent of poverty depends on the standards of living of those individuals who belong to the middle class, and are in the middle of the income distribution.

We actually prefer the choice of the median as the reference income. As Aristotle (Book 4, Part XI: 96) argued: “the best political community is formed by citizens of the middle class, and that those states are likely to be well-administered, in which the middle class is large.” A large and rich middle class contributes significantly to the welfare of a society in many ways, for instance, with respect to high economic growth, higher contribution to the country’s tax revenue, a better infrastructure and higher level of education. Therefore, a person with a low income may view the median as a reference income and be hopeful about achieving this income (see Chakravarty, 2015).

#### **4. THE EXTENT OF POVERTY WITH AN “AMALGAM POVERTY LINE”: THE CASE OF ASIAN COUNTRIES**

In this section, we present several measures of the extent of poverty in various Asian countries, when an “amalgam poverty line”, is used. For an absolute poverty line, we first use a monthly income of \$38 (at 2005 PPP) which corresponds to \$1.25 per day, as originally suggested by Ravallion et al. (2009). However, following some of the objections raised by Deaton (2001; 2010) in his criticism of a unique poverty line of \$1 per day or \$1.25 per day, we have also introduced, on the basis of the estimations of Han (2014), an absolute poverty line of \$44, which is based only on Asian data and corresponds to \$1.45 a day. We also assumed various possible weights. More precisely we supposed that the weight  $w$  given to the absolute poverty line (the weight of the median or of the mean then being  $(1 - w)$ ), could be 1, 0.9, 0.66 and 0.5.

The database consisted of information on the income shares of ten deciles in the various countries and years for which these figures were available. The computations method used is based on the algorithm proposed by Shorrocks and Wan (2009), which allows to “ungroup” income distributions, that is, to derive, for example, the share of each centile when the only data available originally are the income shares of deciles. The first step of this algorithm consists of building an initial sample with unit mean which is generated from a parametric form fitted to the grouped data. In the second stage the algorithm adjusts the observations generated in the initial sample to the true values available from the grouped data.

In Table 1, we present the value of the headcount ratio in the different Asian countries for which data were available, under several possible scenarios. As expected, for a given weight, the headcount ratio is higher when the weight  $(1 - w)$  refers to the mean rather than the median. Needless to say, the headcount ratio increases with the weight  $w$  and is higher with an absolute poverty line of \$44 than with one of \$38.

We then combined the data on the headcounts given in Table 1 with data on the total population around 2010 of the countries examined to derive an estimate of the total number of poor in each country. All these results are given in Table 2. It is then easy to compare the number of poor under various scenarios with those obtained on the basis of a \$38 absolute poverty line and a value of  $w$  equal to 1 (so that the “amalgam poverty line” is also equal to \$38).

Finally, Table 3 gives the income gap ratios in the different countries under the various scenarios. This index is an indicator of poverty depths of different individuals. When multiplied by the poverty line and the total number of poor, this summary measure has a direct policy interpretation in the sense that the multiplied formula determines the total amount of money required to put all the poor persons at the poverty line. Now, for any country, with a given poverty line and the reference income, we determine the amalgam poverty line using a specific weighting scheme. Given an amalgam poverty line for a country, we can directly estimate the amount of money necessary to place the poor persons of the country at its poverty line using the country's income gap ratio from Table 3 and number of poor from Table 2.

**Table 1: Headcount Ratios under Various Scenarios**

<b>Weighting Scheme (Weight Given to the Absolute Poverty Line)</b>	<b>Armenia (2010)</b>	<b>Azerbaijan (2008)</b>	<b>Bangladesh (2010)</b>	<b>Bhutan (2012)</b>	<b>Cambodia (2009)</b>
<b>Absolute poverty line: \$38. (Weighted with the median)</b>					
100%	0.02	0.00	0.43	0.02	0.19
90%	0.04	0.01	0.44	0.04	0.22
66%	0.16	0.09	0.46	0.17	0.30
50%	0.24	0.19	0.47	0.26	0.35
<b>Absolute poverty line: \$38. (Weighted with the mean)</b>					
90%	0.06	0.01	0.46	0.06	0.25
66%	0.22	0.16	0.52	0.26	0.39
50%	0.34	0.29	0.56	0.38	0.48
<b>Absolute poverty line: \$44. (Weighted with the median)</b>					
100%	0.05	0.00	0.55	0.03	0.28
90%	0.09	0.01	0.54	0.06	0.30
66%	0.20	0.11	0.53	0.20	0.36
50%	0.27	0.21	0.52	0.27	0.39
<b>Absolute poverty line: \$44. (Weighted with the mean)</b>					
90%	0.11	0.02	0.56	0.09	0.33
66%	0.26	0.18	0.59	0.28	0.44
50%	0.37	0.30	0.61	0.39	0.51

*continued on next page*

Table 1 *continued*

Weighting Scheme (Weight Given to the Absolute Poverty Line)	Fiji (2008)	Georgia (2010)	Indonesia Rural (2011)	Indonesia Urban (2011)	Kazhakstan (2009)
<b>Absolute poverty line: \$38. (Weighted with the median)</b>					
100%	0.04	0.18	0.15	0.18	0.00
90%	0.09	0.21	0.19	0.21	0.00
66%	0.22	0.29	0.28	0.30	0.05
50%	0.29	0.35	0.34	0.36	0.16
<b>Absolute poverty line: \$38. (Weighted with the mean)</b>					
90%	0.13	0.23	0.21	0.25	0.00
66%	0.33	0.36	0.36	0.41	0.10
50%	0.44	0.44	0.45	0.49	0.24
<b>Absolute poverty line: \$44. (Weighted with the median)</b>					
100%	0.09	0.23	0.23	0.24	0.00
90%	0.15	0.25	0.26	0.27	0.01
66%	0.25	0.32	0.33	0.34	0.07
50%	0.31	0.37	0.38	0.38	0.18
<b>Absolute poverty line: \$44. (Weighted with the mean)</b>					
90%	0.18	0.28	0.29	0.31	0.01
66%	0.36	0.39	0.41	0.44	0.12
50%	0.46	0.47	0.48	0.52	0.25
Weighting Scheme (Weight Given to the Absolute Poverty Line)	Kyrgyz Republic (2011)	Lao PDR (2008)	Malaysia (2009)	Maldives (2004)	Micronesia (2000)
<b>Absolute poverty line: \$38. (Weighted with the median)</b>					
100%	0.04	0.34	0.00	0.02	0.31
90%	0.08	0.36	0.03	0.04	0.33
66%	0.20	0.40	0.17	0.18	0.38
50%	0.27	0.42	0.26	0.26	0.41
<b>Absolute poverty line: \$38. (Weighted with the mean)</b>					
90%	0.10	0.38	0.05	0.06	0.38
66%	0.25	0.48	0.28	0.24	0.51
50%	0.35	0.50	0.40	0.36	0.58
<b>Absolute poverty line: \$44. (Weighted with the median)</b>					
100%	0.08	0.44	0.01	0.03	0.35
90%	0.13	0.45	0.03	0.07	0.37
66%	0.22	0.46	0.18	0.20	0.41
50%	0.29	0.47	0.27	0.27	0.43
<b>Absolute poverty line: \$44. (Weighted with the mean)</b>					
90%	0.14	0.47	0.06	0.09	0.41
66%	0.28	0.54	0.28	0.26	0.52
50%	0.38	0.58	0.41	0.37	0.59

*continued on next page*

Table 1 *continued*

Weighting Scheme (Weight Given to the Absolute Poverty Line)	Nepal (2010)	Pakistan (2008)	Papua New Guinea (1996)	Philippines (2009)	Sri Lanka (2009)
<b>Absolute poverty line: \$38. (Weighted with the median)</b>					
100%	0.25	0.21	0.36	0.19	0.03
90%	0.27	0.24	0.37	0.22	0.06
66%	0.34	0.31	0.41	0.31	0.20
50%	0.38	0.36	0.43	0.36	0.27
<b>Absolute poverty line: \$38. (Weighted with the mean)</b>					
90%	0.29	0.27	0.41	0.26	0.09
66%	0.40	0.39	0.52	0.41	0.28
50%	0.47	0.47	0.58	0.50	0.40
<b>Absolute poverty line: \$44. (Weighted with the median)</b>					
100%	0.34	0.33	0.42	0.25	0.07
90%	0.36	0.35	0.43	0.28	0.12
66%	0.40	0.39	0.45	0.35	0.23
50%	0.42	0.42	0.46	0.39	0.30
<b>Absolute poverty line: \$44. (Weighted with the mean)</b>					
90%	0.38	0.37	0.47	0.31	0.16
66%	0.46	0.46	0.56	0.44	0.32
50%	0.51	0.52	0.61	0.52	0.43
Weighting Scheme (Weight Given to the Absolute Poverty Line)	Tajikistan (2009)	Thailand (2010)	Timor-Leste (2007)	Turkmenistan (1998)	Viet Nam (2008)
<b>Absolute poverty line: \$38. (Weighted with the median)</b>					
100%	0.06	0.00	0.37	0.25	0.17
90%	0.10	0.02	0.39	0.28	0.20
66%	0.21	0.11	0.42	0.34	0.29
50%	0.28	0.21	0.44	0.38	0.34
<b>Absolute poverty line: \$38. (Weighted with the mean)</b>					
90%	0.12	0.03	0.41	0.30	0.22
66%	0.26	0.22	0.49	0.42	0.36
50%	0.35	0.37	0.54	0.50	0.44
<b>Absolute poverty line: \$44. (Weighted with the median)</b>					
100%	0.12	0.01	0.49	0.32	0.24
90%	0.16	0.03	0.49	0.34	0.27
66%	0.24	0.13	0.49	0.39	0.33
50%	0.31	0.23	0.50	0.41	0.38
<b>Absolute poverty line: \$44. (Weighted with the mean)</b>					
90%	0.17	0.04	0.51	0.36	0.29
66%	0.29	0.24	0.56	0.46	0.40
50%	0.38	0.38	0.59	0.52	0.47

Note: The complete income distributions were derived on the basis of the Shorrocks and Wan (2009) proposal for “ungrouping income distributions”. The first column gives the weight (in percentage) given to the absolute poverty line (either \$38 or \$44), the complement (in percentage) giving the weight given to the median or the mean of the income distributions.

**Table 2: Number of Poor (in millions) in Each Country, Depending on the Weighting Scheme**

Country	\$38; Median; 100%	\$38; Median; 90%	\$38; Median; 66%	\$38; Median; 50%	\$38; Mean; 90%	\$38; Mean; 66%	\$38; Mean; 50%
Armenia (2010)	0.07	0.13	0.48	0.71	0.17	0.66	1.00
Azerbaijan (2008)	0.01	0.07	0.77	1.70	0.11	1.40	2.55
Bangladesh (2010)	65.43	66.49	68.99	70.63	69.65	79.10	84.95
Bhutan (2012)	0.01	0.03	0.13	0.19	0.04	0.19	0.28
Cambodia (2009)	2.72	3.13	4.26	4.99	3.55	5.53	6.75
Fiji (2008)	0.04	0.08	0.18	0.25	0.11	0.28	0.38
Georgia (2010)	0.81	0.94	1.31	1.54	1.04	1.62	1.98
Indonesia Rural (2011)	18.21	23.08	33.59	40.49	25.43	43.29	53.99
Indonesia Urban (2011)	21.81	26.00	37.07	43.89	30.62	50.06	60.97
Kazakhstan (2009)	0.00	0.04	0.80	2.61	0.06	1.61	3.80
Kyrgyz Republic (2011)	0.24	0.45	1.08	1.47	0.54	1.37	1.94
Lao PDR (2008)	2.10	2.20	2.44	2.60	2.36	2.94	3.29
Malaysia (2009)	0.12	0.75	4.75	7.26	1.32	7.64	11.13
Maldives (2004)	0.00	0.01	0.05	0.08	0.02	0.07	0.10
Micronesia Urban (2000)	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nepal (2010)	6.63	7.35	9.07	10.19	7.91	10.87	12.71
Pakistan (2008)	35.59	40.61	52.56	60.52	44.49	65.51	78.61
Papua New Guinea (1996)	1.73	1.81	1.99	2.10	2.00	2.54	2.83
Philippines (2009)	17.20	20.27	28.20	33.15	23.68	37.71	45.54
Sri Lanka (2009)	0.62	1.29	4.09	5.61	1.96	5.84	8.25
Tajikistan (2009)	0.45	0.76	1.54	2.07	0.87	1.90	2.62
Thailand (2010)	0.32	1.20	7.44	14.04	1.90	14.38	24.61
Timor-Leste (2007)	0.39	0.40	0.44	0.46	0.43	0.51	0.56
Turkmenistan (1998)	1.10	1.22	1.50	1.68	1.33	1.86	2.18
Viet Nam (2008)	14.79	17.30	24.36	28.99	19.12	30.48	37.70
Country	\$44; Median; 100%	\$44; Median; 90%	\$44; Median; 66%	\$44; Median; 50%	\$44; Mean; 90%	\$44; Mean; 66%	\$44; Mean; 50%
Armenia (2010)	0.14	0.26	0.59	0.80	0.32	0.77	1.09
Azerbaijan (2008)	0.03	0.13	0.95	1.80	0.18	1.58	2.66
Bangladesh (2010)	82.77	82.07	80.37	79.22	84.78	89.39	92.30
Bhutan (2012)	0.02	0.05	0.15	0.20	0.07	0.21	0.29
Cambodia (2009)	3.90	4.24	5.04	5.57	4.61	6.26	7.23
Fiji (2008)	0.08	0.12	0.21	0.27	0.15	0.30	0.39
Georgia (2010)	1.00	1.13	1.44	1.64	1.23	1.75	2.07
Indonesia Rural (2011)	27.95	31.63	39.79	45.14	34.62	49.16	58.02
Indonesia Urban (2011)	30.16	33.90	42.33	47.55	37.95	54.52	63.94
Kazakhstan (2009)	0.01	0.09	1.09	2.87	0.12	1.98	4.06
Kyrgyz Republic (2011)	0.46	0.70	1.23	1.61	0.80	1.55	2.08
Lao PDR (2008)	2.70	2.74	2.83	2.89	2.88	3.29	3.54
Malaysia (2009)	0.23	0.96	5.04	7.46	1.70	7.90	11.29
Maldives (2004)	0.01	0.02	0.06	0.08	0.03	0.08	0.11
Micronesia Urban (2000)	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nepal (2010)	9.16	9.62	10.69	11.37	10.15	12.39	13.78
Pakistan (2008)	54.73	57.81	65.02	69.67	61.61	77.24	86.80
Papua New Guinea (1996)	2.06	2.09	2.19	2.24	2.26	2.69	2.93
Philippines (2009)	23.12	25.83	31.93	35.69	28.77	40.81	47.55
Sri Lanka (2009)	1.47	2.57	4.75	6.20	3.22	6.60	8.79
Tajikistan (2009)	0.86	1.17	1.82	2.29	1.28	2.19	2.84
Thailand (2010)	0.67	1.82	8.66	15.11	2.67	15.80	25.55
Timor-Leste (2007)	0.51	0.51	0.52	0.52	0.53	0.58	0.61
Turkmenistan (1998)	1.41	1.49	1.69	1.82	1.60	2.04	2.30
Viet Nam (2008)	20.39	22.74	28.29	31.96	24.57	34.33	40.40

Note: The heading of each column indicates which poverty line is used (\$38 or \$44), which other indicator is weighted (median or mean) and which weight is given to the absolute poverty line. The computations were based on the Shorrocks and Wan (2009) approach.

**Table 3: Poverty Gap Ratio in Each Country,  
Depending on the Weighting Scheme**

<b>Country</b>	<b>\$38; Median; 100%</b>	<b>\$38; Median; 90%</b>	<b>\$38; Median; 66%</b>	<b>\$38; Median; 50%</b>	<b>\$38; Mean; 90%</b>	<b>\$38; Mean; 66%</b>	<b>\$38; Mean; 50%</b>
Armenia (2010)	0.00	0.01	0.03	0.05	0.01	0.05	0.08
Azerbaijan (2008)	0.00	0.00	0.01	0.04	0.00	0.03	0.07
Bangladesh (2010)	0.11	0.11	0.12	0.13	0.12	0.15	0.17
Bhutan (2012)	0.00	0.01	0.04	0.07	0.01	0.07	0.12
Cambodia (2009)	0.03	0.04	0.07	0.09	0.05	0.10	0.14
Fiji (2008)	0.01	0.02	0.05	0.08	0.02	0.09	0.15
Georgia (2010)	0.06	0.07	0.11	0.13	0.08	0.14	0.18
Indonesia Rural (2011)	0.02	0.03	0.06	0.08	0.04	0.09	0.13
Indonesia Urban (2011)	0.03	0.04	0.08	0.10	0.06	0.13	0.17
Kazakhstan (2009)	0.00	0.00	0.01	0.03	0.00	0.01	0.05
Kyrgyz Republic (2011)	0.01	0.02	0.04	0.07	0.02	0.06	0.10
Lao PDR (2008)	0.09	0.10	0.11	0.12	0.11	0.15	0.18
Malaysia (2009)	0.00	0.01	0.05	0.09	0.01	0.09	0.16
Maldives (2004)	0.00	0.01	0.04	0.07	0.01	0.07	0.12
Micronesia Urban (2000)	0.16	0.18	0.21	0.23	0.20	0.29	0.33
Nepal (2010)	0.05	0.06	0.09	0.10	0.07	0.11	0.14
Pakistan (2008)	0.03	0.04	0.06	0.08	0.05	0.09	0.12
Papua New Guinea (1996)	0.12	0.13	0.15	0.16	0.15	0.22	0.26
Philippines (2009)	0.04	0.05	0.09	0.11	0.06	0.14	0.18
Sri Lanka (2009)	0.00	0.01	0.04	0.06	0.01	0.07	0.11
Tajikistan (2009)	0.01	0.02	0.05	0.07	0.02	0.06	0.10
Thailand (2010)	0.00	0.00	0.02	0.05	0.01	0.05	0.11
Timor-Leste (2007)	0.09	0.09	0.11	0.11	0.10	0.13	0.16
Turkmenistan (1998)	0.07	0.08	0.11	0.13	0.09	0.15	0.18
Viet Nam (2008)	0.03	0.05	0.07	0.10	0.05	0.10	0.14
<b>Country</b>	<b>\$44; Median; 100%</b>	<b>\$44; Median; 90%</b>	<b>\$44; Median; 66%</b>	<b>\$44; Median; 50%</b>	<b>\$44; Mean; 90%</b>	<b>\$44; Mean; 66%</b>	<b>\$44; Mean; 50%</b>
Armenia (2010)	0.14	0.11	0.09	0.09	0.11	0.10	0.12
Azerbaijan (2008)	0.14	0.10	0.06	0.07	0.09	0.07	0.09
Bangladesh (2010)	0.23	0.22	0.20	0.19	0.22	0.22	0.22
Bhutan (2012)	0.14	0.11	0.09	0.10	0.10	0.11	0.14
Cambodia (2009)	0.16	0.15	0.14	0.14	0.15	0.16	0.18
Fiji (2008)	0.14	0.12	0.11	0.12	0.12	0.14	0.18
Georgia (2010)	0.18	0.17	0.17	0.17	0.18	0.19	0.21
Indonesia Rural (2011)	0.15	0.14	0.13	0.13	0.14	0.15	0.17
Indonesia Urban (2011)	0.16	0.15	0.15	0.15	0.16	0.18	0.21
Kazakhstan (2009)	0.14	0.10	0.05	0.05	0.09	0.05	0.07
Kyrgyz Republic (2011)	0.14	0.12	0.11	0.11	0.12	0.12	0.14
Lao PDR (2008)	0.21	0.20	0.19	0.18	0.21	0.21	0.22
Malaysia (2009)	0.14	0.09	0.08	0.11	0.08	0.12	0.17
Maldives (2004)	0.14	0.11	0.09	0.10	0.10	0.11	0.14
Micronesia Urban (2000)	0.27	0.27	0.26	0.26	0.28	0.32	0.35
Nepal (2010)	0.18	0.17	0.16	0.15	0.17	0.18	0.19
Pakistan (2008)	0.16	0.15	0.14	0.13	0.15	0.16	0.16
Papua New Guinea (1996)	0.24	0.23	0.22	0.22	0.24	0.27	0.30
Philippines (2009)	0.16	0.16	0.15	0.16	0.16	0.19	0.22
Sri Lanka (2009)	0.14	0.12	0.10	0.10	0.11	0.12	0.14
Tajikistan (2009)	0.14	0.12	0.11	0.11	0.12	0.12	0.13
Thailand (2010)	0.14	0.10	0.07	0.08	0.09	0.09	0.13
Timor-Leste (2007)	0.20	0.20	0.18	0.17	0.20	0.20	0.21
Turkmenistan (1998)	0.19	0.18	0.18	0.17	0.19	0.20	0.22
Viet Nam (2008)	0.16	0.15	0.14	0.14	0.16		

Note: The heading of each column indicates which poverty line is used (\$38 or \$44), which other indicator is weighted (median or mean) and which weight is given to the absolute poverty line. The computations were based on the Shorrocks and Wan (2009) approach.



## 5. CONCLUSIONS

This paper builds on the previous work of Chakravarty et al. (2015) and estimates measures of poverty such as the headcount ratio and the poverty gap index when an absolute poverty line is adjusted to take account of the existence of reference groups. Given the scarcity of available data on reference groups it was assumed that either the median or the mean income would be the reference income but several scenarios are considered with different weights for the absolute poverty line (\$1.25 or \$1.45 per day) and the reference income (either the mean or the median). This empirical analysis covered many Asian countries, generally around the year 2010. Given the well-known asymmetry of an income distribution, the adjustment of the poverty line was evidently higher when the reference income was the mean rather than the median and the adjusted headcount ratios were clearly higher when the absolute poverty line was \$44 rather than \$38 a month. This paper presented the results of only four weighting schemes (giving weights of 100%, 90%, 66%, and 50% to the absolute poverty line); other weights can easily be introduced. The choice of these weights should clearly be guided by the empirical evidence about the importance individuals give to the incomes of others, and by budgetary and political constraints that are faced by policy makers because increasing the number of poor has financial as well as political consequences.

## REFERENCES

- Aristotle, *Politics*, Batoche Books, Kitchener, Ontario, Canada, Book 4, Part XI, p. 96.
- Atkinson, A. B. and F. Bourguignon. 2001. Poverty and Inclusion from a World Perspective. in J. Stiglitz and P.-A. Muet (eds) *Governance, Equity and Global Markets*, Oxford: Oxford University Press.
- Chakravarty, S. R. 2015. *Inequality, Polarization and Conflict: An Analytical Study*, Economic Studies in Inequality, Social Exclusion and Well-Being, New York: Springer.
- Chakravarty, S. R., N. Chattopadhyay, Z. Nissanov and J. Silber. 2015. Reference Groups and the Poverty Line: An Axiomatic Approach with an Empirical Illustration. UNU-WIDER Working Paper 2015/002.
- Clark, A. E. and A. J. Oswald. 1996. Satisfaction and Comparison Income. *Journal of Public Economics* 61(3): 359–381.
- Clark, A. E., P. Frijters and M. A. Shields. 2008. Relative Income, Happiness and Utility: An Explanation for the Easterlin Paradox and Other Puzzles. *Journal of Economic Literature* 46(1): 95–144.
- Clark, A. E. and C. Senik. 2009. Who Compares to Whom? The Anatomy of Income Comparisons in Europe. *Economic Journal* 120(544): 573–594.
- Clark, A., C. Senik and K. Yamada. 2013. The Joneses in Japan: Income Comparisons and Financial Satisfaction. Discussion Paper No. 866, the Institute of Social and Economic Research, Osaka University, Japan.
- Deaton, A. 2001. Counting the World's Poor: Problems and Possible Solutions, *World Bank Research Observer* 16(2): 125–148.
- . 2010. Price Indexes, Inequality, and the Measurement of World Poverty. *American Economic Review* 100(1): 3–34.
- Duesenberry, J. S. 1949. *Income, Saving and the Theory of Consumer Behavior*, Cambridge, MA: Harvard University Press.
- Fafchamps, M. and F. Shilpi. 2008. Subjective Welfare, Isolation and Relative Consumption. *Journal of Development Economics* 86(1): 43–60.
- Ferrer-i-Carbonell, A. 2005. Income and Well-Being: An Empirical Analysis of the Comparison Income Effect. *Journal of Public Economics* 89(5–6): 997–1019.
- Han, X. 2014. Estimating an Asian Poverty Line, mimeo, Asian Development Bank.
- Hirschman, A. O. and M. Rothschild. 1973. The Changing Tolerance for Income Inequality in the Course of Economic Development. *Quarterly Journal of Economics* 87(4): 544–566. Reproduced in J. Adelman, *The Essential Hirschman*, Princeton, New Jersey: Princeton University Press, pp. 74–101.
- Kingdon, G. and J. Knight. 2007. Community Comparisons and Subjective Well-being in a Divided Society. *Journal of Economic Behavior and Organization* 64(1): 69–90.
- Knight, J., L. Song and R. Gunatilaka. 2009. Subjective Well-Being and its Determinants in Rural China. *China Economic Review* 20(4): 635–649.

- Lelkes, O. and K. Gasior. 2011. Income Poverty in the EU Situation in 2007 and Trends (based on EU-SILC 2005–2008). Policy Brief, European Centre for Social Welfare Policy and Research, Vienna.
- Powdthavee, N. 2009. How Important is Rank to Individual Perception of Economic Standing? A Within-Community Analysis. *Journal of Economic Inequality* 7(3): 225–248.
- Ravallion, M., S. Chen and P. Sangraula. 2009. Dollar a Day Revisited. *The World Bank Economic Review*, 23(2): 163–184.
- Ravallion, M. and S. Chen. 2011. Weakly Relative Poverty. *The Review of Economics and Statistics* 93(4): 1251–1261.
- . 2012. More Relatively-Poor People in a Less Absolutely-Poor World. The World Bank, Policy Research Working Paper 6114.
- Runciman, W. G. 1966. *Relative Deprivation and Social Justice*, Berkeley: University of California Press.
- Ryu, H. K. and D. J. Slottje. 1999. Parametric Approximations of the Lorenz Curve. in J. Silber, editor, *Handbook on Income Inequality Measurement*, Kluwer Academic Publishers, pp. 291–314.
- Sen, A. 2000. Social Exclusion: Concept, Application, and Scrutiny. Social Development Papers No. 1, Office of Environment and Social Development, Asian Development Bank.
- Senik, C. 2004. When Information Dominates Comparison. Learning from Russian Subjective Panel Data. *Journal of Public Economics* 88(9–10): 2009–2133.
- . 2008. Ambition and Jealousy. Income Interactions in the “Old Europe” versus the “New Europe” and the United States. *Economica* 75(299): 495–513.
- . 2009. Income Distribution and Subjective Happiness: A Survey. OECD Social, Employment and Migration Working Papers, No.96, OECD Publishing.
- Shorrocks, A. and G. Wan. 2009. Ungrouping Income Distributions. Synthesizing Samples for Inequality and Poverty Analysis. in K. Basu and R. Kanbur eds, *Arguments for a Better World. Essays in Honor of Amartya Sen, Volume 1, Ethics, Welfare and Measurement*, Chapter 22, pp. 414–434, Oxford: Oxford University Press.
- Smith, A. *An Inquiry into the Nature and Causes of the Wealth of Nations* New York, Modern Library, 1937, pp. 821–822 (Book V, Chapter II, Part II, Article 4<sup>th</sup>).
- van Praag, B. 2011. Well-being Inequality and Reference Groups: An Agenda for New Research. *Journal of Economic Inequality* 9(1): 111–127.