Poverty in Asia: A Deeper Look
Key Indicators for Asia and the Pacific Special Chapter

The special chapter of Key Indicators for Asia and the Pacific 2014 entitled “Poverty in Asia: A Deeper Look” finds that despite Asia’s remarkable achievements in poverty reduction, poverty will continue to be a feature in the region beyond 2030. This finding is based on methodologies that take into account: a consumption basket representative of Asia; rising food insecurity; and rising vulnerability to natural and man-made shocks.

About the Asian Development Bank

ADB’s vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region’s many successes, it remains home to approximately two-thirds of the world’s poor: 1.6 billion people who live on less than $2 a day, with 733 million struggling on less than $1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.
Section 1: Introduction

Asia and the Pacific continues to lead the world in reducing extreme poverty. The early attainment of the global Millennium Development Goal (MDG) target of cutting extreme poverty in half could not have happened if Asia had been excluded. Should Asia’s growth and poverty trends continue, the region will be free of extreme poverty by 2025. Yet many will argue that, for Asia and the Pacific, the $1.25 poverty line is inadequate; it underestimates the minimal costs actually faced by the poor. This special chapter examines several critical aspects that are not captured by the $1.25 poverty line and that could have significant implications for poverty assessment in the region.

In 1981, 1.59 billion Asians were poor—a poverty rate of 69.8% (Figure 1.1). In 1990, the number of poor had fallen to 1.48 billion people—or a 54.7% poverty rate. By 2005, Asia had succeeded in halving extreme poverty—its 26.9% rate just below half the 1990 level. That beats the 2015 MDG target deadline by a decade.

For the developing world as a whole, the poverty rate fell from 43.1% in 1990 to 25.1% in 2005 and to 20.6% in 2010. This met the MDG global target (Figure 1.2). However, excluding Asia, the extreme poverty rate would have been 24.9% in 1990 and 20.5% in 2010; meaning the rest of the developing world would not be able to halve its 1990 poverty rate until after 2030.

By magnitude, from 1990 to 2010 the number of extremely poor declined by 745.42 million in Asia—as against 693.47 million globally. This means the number of extremely poor actually increased across the rest of the developing world (by 51.95 million), partly due to population growth. Asia also stands out if the “moderate poverty” line of $2/day/person is used. Between 1990 and 2010, the number of moderately poor declined by 566.31 million in Asia, while increasing by 97.31 million in other regions.

Within Asia, poverty reduction has varied across subregions and by economy. It has done best by far in East Asia—led by the People’s Republic of China (PRC), the world’s most populous country. Over a 20-year period, extreme poverty in East Asia fell from about 60.2% in 1990 to 11.6% in 2010—with the PRC reducing the number of extremely poor by 527.64 million. By contrast, India, the second most populous country, reduced its extremely poor by 48.26 million.

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1 Asia and the Pacific (or “Asia” in this chapter) includes the 48 regional members of the Asian Development Bank (ADB). Developing Asia refers to ADB’s 45 developing members. Not all countries are covered in this chapter due to unavailable data.

2 “Extreme poverty” is the number or proportion of people living below the extreme poverty line as set by the World Bank—$1.25/day/person adjusted by 2005 purchasing power parity exchange rates (PPPs). This contrasts with a “moderate poverty” line of $2.00/day/person. PPPs for 2011 were released in May 2014, but cannot be applied to poverty assessments until national poverty lines are updated (Box 1.1). Thus, all poverty lines used here are expressed in terms of 2005 PPPs.

3 The World Bank considers poverty “eradicated” when the proportion of the poor is 3% or less.

4 The poverty rate is the percentage of the total population below a given poverty line.
The level of extreme poverty in developing Asia will very likely continue to decline significantly. As presented in Section 5, the extreme poverty rate for the region is projected to decline from 20.7% in 2010 to 12.7% in 2015, 5.8% in 2020 and about 2.5% in 2025. Using World Bank criterion, this means extreme poverty will be technically “eradicated” by 2025. These projections support other studies. But this is not the whole story by any means. There is an untold side of Asia’s poverty. This special chapter looks deeper into this story by examining three major issues in determining more appropriate poverty lines. The household expenditure data used here are from PovcalNet of the World Bank.6

5 For example, the United Nations (2010) projected poverty rates in 2015 would fall to around 5% in the PRC and 24% in India. Chandy and Gertz (2011) were more optimistic, asserting that the PRC poverty rate would drop below 1% by 2015; for India, the drop could be as dramatic as 34.6% points—from 41.6% in 2005 to 7.0% in 2015.

6 These data are in grouped form and available from the PovcalNet website of the World Bank; at http://iresearch.worldbank.org/PovcalNet/index.htm?0,0 (accessed 28 April 2014).
To start with, the extreme poverty line of $1.25 no longer works for Asia. It was largely based on African data and is also outdated. More recent data is needed. Section 2 explains why the Asian poverty line should be estimated at $1.51/day/person (in 2005 PPPs), an increase of 20.8% from $1.25. Using this poverty line, the extreme poverty rate in Asia rises by 9.8 percentage points or to 30.5% in 2010, compared with 20.7% at $1.25.

Second, when a region or society undergoes significant economic transformation, as in Asia, household or individual quality of life (Box 1.3) may change, even when income or expenditure levels remain constant. It is critical to ensure that the poor maintain a certain level of well-being or quality of life, not just the same level of income or expenditure. From this perspective, food insecurity—an increasingly serious challenge for Asia—should be brought into the poverty equation. The poverty line may be adjusted to allow the poor to preserve their welfare when faced with a rapid rise in food prices. Section 3 examines food insecurity, demonstrating an increase in the 2010 extreme poverty rate of 4.0 percentage points, or from 20.7% to 24.7%.

And third, vulnerability to natural disasters, the increasing impact of climate change, economic crises and other shocks should be considered. It is commonly accepted that many people are forced below a given poverty line in the aftermath of unexpected shocks such as earthquakes, extreme weather events, job loss, or illness, for example. Yet conventional poverty assessments overlook these vulnerabilities. In Asia, where formal insurance is generally lacking, poverty reduction policies, projects or programs should take the vulnerable into account. Section 4 proposes methodologies to incorporate shocks or risks into setting poverty lines and estimates “vulnerability” to poverty in Asia. For example, the estimation results indicate that 417.99 million people—or an additional 11.8% of Asians—were vulnerable to poverty in 2010.

Thus, Asia’s exceptional track record in poverty reduction overlooks the inadequacy of the $1.25 conventional poverty line. It does not account for food insecurity and rising vulnerability. These issues all affect welfare, particularly for Asia’s poor. While

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**Box 1.2 On Shorrocks and Wan’s (2009) “Ungrouping Income Distributions”**

The algorithm for ungrouping household expenditure data works like this.

Assume a Lorenz curve with \((m+1)\) coordinates \((p_k^*, L_k^*)\) where \(p_k^*\) and \(L_k^*\) \((k=1,2,\ldots,m)\) refer respectively to the cumulative shares in total population and in total income of income classes 1 to \(k\). And \(p_m^* = L_m^* = 0\). Once all observations are normalized by the overall mean of the distribution, the actual mean \(\mu_k^*\) of class \(k\) becomes

\[
\mu_k^* = \frac{L_k^* - L_{k-1}^*}{p_k^* - p_{k-1}^*} \quad k = 1 \text{ to } m \quad (1)
\]

The goal is to obtain a synthetic sample of \(n\) equally weighted observations whose overall mean is 1. These \(n\) observations are partitioned into \(m\) non-overlapping and ordered groups, each having \(n_k = n(p_k^* - p_{k-1}^*)\) observations. Call \(x_i\) the \(i\)th observation in class \(k\), the mean of this class based on the synthetic data is \(\mu_k\).

This algorithm involves two stages. The first is to generate an initial sample with unitary mean based on a parametric model fitted to the grouped data. Ryu and Slottje (1999) conducted a survey of various parametrizations of the Lorenz curve. In the second stage the algorithm adjusts the initial synthetic observations to ensure \(\mu_k^* = \mu_k\).

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**Box 1.3: Quality of Life, Wellbeing, Utility and Welfare**

Quality of life and well-being are used interchangeably in this chapter. They can be measured by the level of welfare or utility. Utility theory analyzes the laws of the values and choices of an individual; welfare theory discusses the relationship between the values of many individuals and the consequent possibilities of a scientific conclusion on the “social” desirability of various alternatives (Rothbard 1956). Welfare analysis uses microeconomic techniques to evaluate well-being at the aggregate (economy-wide) level (Deardorff 2014). When the focus is at the individual level, the terminology of utility is used to describe quality of life or well-being.

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1 Shorrocks and Wan (2009) chose to generate the initial sample on the basis of a lognormal distribution.
the $1.25 poverty line is simply based on observed expenditure, welfare is a more fundamental gauge that should be used when digging deeper into Asia’s untold poverty story.

Section 5 incorporates all these considerations simultaneously, resulting in an estimated 2010 poverty rate for Asia of 49.5%. In other words, there were almost 1.75 billion extremely poor in Asia in 2010, not the 733.06 million commonly reported using the $1.25 poverty line. Thus, accomplishing the mission of an Asia and the Pacific free of poverty will be challenging, to say the least. In 2030, the number of extremely poor could still be 708.43 million, or 17.1% of the region’s population. It is clear that poverty reduction will remain a major Asian development challenge for decades to come.

Section 6 summarizes the chapter and offers policy recommendations specifically aiming at reducing the impact of food insecurity and vulnerability on the poor. It also briefly discusses several evolving issues that are related to poverty in Asia.
Section 2: Establishing an Appropriate Extreme Poverty Line for Asia

2.1. Introduction

In essence, measuring poverty boils down to the choice or estimation of poverty line(s) and poverty indicators, given available household expenditure data. There are many poverty indexes. But the most popular and most publicized is the poverty rate (used throughout this chapter). The extreme poverty line of $1.25/day/person continues to be widely used. And Asia’s outstanding record in reducing poverty has been based on the $1.25 poverty line.

However, the adequacy of the conventional or convenient $1.25 poverty line for Asia should be questioned. This section discusses its deficiencies and examines different ways of setting a more appropriate poverty line for Asia. It then derives a regional extreme poverty line for Asia and reports corresponding poverty estimates.

2.2. The inadequacy of the $1.25 poverty line

In general, developing countries use “absolute” poverty lines, as opposed to the relative poverty lines in advanced economies. An absolute poverty line, $1.25 for example, represents the absolute minimum standard of living needed to avoid deprivation. Using World Bank criterion, extreme poverty is considered eradicated when the $1.25 poverty rate falls below 3%. By contrast, a relative poverty line usually equals a proportion—say 50%—of a country’s median per capita income or expenditure. Clearly, eradicating relative poverty is impossible. Hybrids of the absolute and relative poverty lines have been gaining research attention and are discussed in the Section 2.3.

An absolute poverty line is usually derived using a cost of basic needs (CBN) method. This method—used by many developing countries in defining national poverty lines—begins by identifying a reference group of households close to the poverty line. Their consumption data are used to derive expenditure shares on a basket of goods and services. Food items in the basket are assessed by caloric intake, with the basket then scaled up (or down) to reach the required caloric norm—for example, 2100 calories per capita. The cost of the food basket is one component of the poverty line. The non-food component is sometimes estimated by multiplying the food cost by the ratio of the poor’s non-food budget over their food budget. Adding food and non-food costs yields the absolute poverty line.

To derive the $1.25 poverty line, national poverty lines are plotted against per capita consumption expenditure (PCE), or its logarithm (log). The World Bank used this method to generate the $1.25 poverty line.

For Asia, however, the $1.25 poverty line is questionable on several grounds. First, it represents the average value of national poverty lines of the 15 poorest countries globally, most of which are from Africa—Tajikistan and Nepal are the only two from Asia. In fact, the $1.25 poverty line is below most of developing Asia’s national poverty lines, in 2005 PPPs (Table 2.1). Among 28 Asian developing countries studied, only Afghanistan has a lower poverty line—a mere one cent below ($1.24). Nineteen countries set poverty lines at or above $1.50, while 12 have poverty lines at or above $2.00.

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7 “Relative” means that an individual’s status is compared with other members of a society.
8 India, for example, has used a minimum dietary energy requirement of 2400 kcal/person/day for the rural population and 2100 kcal/person/day for urban residents.
Second, basic needs differ from region to region. And they change over time even within the same region, particularly for fast growing Asia. For example, a mobile phone was not a necessity in developing countries in the 1990s. But it is becoming a necessity even for the poor in the 2000s. Similar items include essential travel, and access to electricity, telecommunications and the internet. Unfortunately, the consumption or expenditure data used to calculate the $1.25 poverty line date back to 1988-2005. Updated data reflecting changes in Asia’s consumption profile would likely lead to a higher poverty line.

Finally, technological progress and changes in consumer preferences, among other determinants, can significantly change relative prices of goods and services over time. Consumers tend to substitute for those basic goods and services whose relative prices rose faster than others. Even for the same basket, then, the quantities of items used to estimate the $1.25 poverty line may no longer correspond to what the poor actually consume.

### 2.3. Approaches to estimating a regional poverty line for Asia

There are three possible ways to develop a regional absolute poverty line for Asia and the Pacific. The first is to follow the method the World Bank used to generate its $1.25 poverty line, exclusively using updated Asian data. The second uses the same set of updated data to produce a “weakly relative” poverty line (see below for details). The third grounds Asia’s poverty lines through national poverty measurements.

#### The World Bank approach

The World Bank derives its absolute poverty line in three steps (Ravallion, Chen, and Sangraula 2009). First, available national poverty lines for 74 countries are adjusted using 2005 PPPs. Second, they are plotted against each country’s PCE (also in 2005 PPP). Finally, a point is located where the estimated line begins to increase (for an illustration, see Figure 2.1)\(^9\)—to the left of this point, the estimated line is more or less flat, while to the right the line rises with per capita consumption expenditure. The national poverty lines left of this point were then averaged to

![Figure 2.1: Relationship Between Log Per Capita Consumption Expenditure and the National Poverty Lines](image)
arrive at the $1.25 poverty line. The reasoning behind only using the flat part of the plot is that to this point, poverty lines do not change significantly with per capita consumption—consistent with the concept of an absolute poverty line. Beyond this point, poverty lines rise with living standards, and are thus more consistent with the concept of relative poverty.

This approach has been criticized (see, for example, Reddy and Pogge 2010, Klasen 2009, 2013, 2014, Deaton 2010, Dotter 2013). One major concern is that it is highly dependent on the sample countries included and PPP exchange rates used. When the World Bank repeated the exercise in 2008 using 2005 PPPs instead of 1993 PPPs, it raised the conventional poverty line from $1.08 to $1.25. This implied a massive upward shift each year in global poverty—for example, the 1990 poverty rate increased from about 29% to about 41%. Also, the updated PPPs created a different reference group of countries whose poverty lines were averaged to yield the global figure (Deaton 2010, Greb et al. 2011). The change in the reference group led to some perverse effects. In particular, while India was included using 1993 PPPs, it was left out using 2005 PPPs, due to its high economic growth between those years. Because India’s poverty line was rather low, its exclusion from the reference group led to an overall rise in the global poverty line. In turn, using the new line led to an increase in India’s measured poverty. Could India’s rapidly rising incomes lead to higher observed poverty? In short, changing PPPs creates problems and uncertainties—and the same could happen if 2005 PPPs are replaced by 2011 PPPs.10

A second line of criticism is that PPPs are generated to compare overall price levels, not prices specifically applicable to the poor. Moreover, they can be sensitive to changes in price levels of goods and services unrelated to the poor (Reddy and Pogge 2010). In addition, PPPs only relate to a particular

10 An interesting analysis is available at http://www.ft.com/cms/s/0/091808e0-d66a-11e3-b95e-00144feabdc0.html#axzz237V一号THU.

benchmark year—they do not hold over time. Should only one PPP benchmark year be used, or several benchmark years (for example, as done with the University of Pennsylvania’s Penn World Tables—which also uses PPP-adjusted income data)?

The third concern is also basic. The conventional poverty line has little relevance for country-level poverty assessments when it differs considerably from the national poverty line (Dotter 2013). For Asia, the difference between country-level poverty lines and $1.25 is substantial (see Table 2.1). In Kazakhstan, for example, extreme poverty (using $1.25/person/day) is far below that indicated by the national poverty line; while in Afghanistan it is higher. In fact, there is a clear subregional pattern in national poverty lines—South Asian countries tend to have lower poverty lines; Central and West Asia tends to have higher ones.

This leads to the fourth criticism, that for Asia as a region—and for many individual economies—the $1.25 poverty line is simply too low to be relevant for policymakers. In fact, several Asian countries, including the PRC and India, have recently raised their national poverty lines to make them more relevant for national policymaking. So the question arises whether one should adjust poverty lines in step with rising prosperity—developing a “weakly relative” poverty line (Ravallion and Chen 2011).

**A hybrid or “weakly relative” poverty line**

The cost of a basket of goods satisfying nutritional requirements grows with per capita GDP for several reasons (Thorbecke 2004). These include changes in the range of goods consumed, rising prices of basic foodstuffs relative to prices of other goods, the increasing proportion of the urban population—where food may be more expensive—and a gradual disappearance of subsistence farming. The potential link between basic needs and development appeals for a flexible or adjustable poverty line.
The argument is that for countries on the flat portion of the estimated line (see Figure 2.1 for an illustration), the $1.25 poverty line should be used. But for those on the ascending portion of the line, the poverty line should rise with the increase in PCE. According to Ravallion and Chen (2011), this increases the poverty line by about $0.33 for every $1.00 rise in PCE for countries on the ascending portion of the line.

For Asia, this approach “automatically” adjusts the poverty line to rising prosperity, maintaining its relevance. Chen and Ravallion (2013) show that the weakly relative poverty line, for example, would be $2.34 for East Asia and $1.94 for South Asia in 2008. This poverty line rises at a pace slower than the increase in mean income.

However, a weakly relative poverty line still holds all the other disadvantages of the World Bank method. More importantly, the fact that it is relative makes poverty from different countries incomparable, making aggregation problematic.

Using national poverty lines to measure poverty in Asia

Another alternative is to develop comparable national poverty lines. This approach requires a standardized methodology (Reddy, Visaria, and Asali 2008; Klasen 2009, 2014). These national poverty lines would be expressed in national currency. But one can still aggregate the poor across countries. This also avoids the problems associated with PPP exchange rates. Another advantage is that these poverty lines are closely linked to national poverty measurement and thus would be more relevant.

Besides designing similar questionnaires across countries, a well-coordinated process of standardized methods is needed—much like the System of National Accounts. With sufficient data, the CBN method previously discussed can be adopted. Over longer periods, the basket can be adjusted to reflect changing expenditure patterns. However, with the longer-term process required, this approach is currently not feasible.

2.4. A regional poverty line for Asia

Given the array of methods, the best solution for the moment is to follow the World Bank approach using the latest national poverty lines from Asia. As these are updated and exclusive to Asia, some of the criticisms no longer apply. The relationship between the logarithm of per capita consumption expenditure per day (log PCE) and national poverty lines is non-linear, with a relatively flat portion below a certain threshold of PCE and a rising portion above the threshold (see Figure 2.1). The threshold point\(^\text{11}\) is where log PCE equals 1.44.\(^\text{12}\) The national poverty lines to the left of this threshold can be averaged to yield the regional poverty line, which is calculated at $1.51. This is simply the average of national poverty lines of the nine least developed countries in Asia and the Pacific: Afghanistan, Bangladesh, Bhutan, Cambodia, the Lao People’s Democratic Republic (Lao PDR), Nepal, Pakistan, the Solomon Islands, and Tajikistan.

Using $1.51/person/day as the extreme poverty line, poverty in Asia can be estimated using the household survey data from the World Bank’s PovcalNet. The data are reported in deciles for each country and year. And they are entered into an algorithm to generate expenditures for 100,000 hypothetical individuals (see Box 1.2).\(^\text{13}\) The mean expenditure for each country/year is also available from PovcalNet. Using the $1.51 poverty line, regional and per country poverty rates and numbers of poor

\(^{11}\) To get the threshold point, a segmented regression method is used, which involves estimating a model with a broken-line linear relationship defined by the slope parameters and a break-point where the linear relation changes.

\(^{12}\) Greb et al. (2011) asserts that the original World Bank approach uses PCE, not log PCE. But a threshold point cannot be identified using PCE.

\(^{13}\) Shorrocks and Wan (2009) show that generating a sample for 3,000 individuals is sufficient for inequality and poverty measurement. But these data will be used later to estimate vulnerability to poverty. Thus, 100,000 observations are generated to ensure accuracy and reliability.
can be calculated for 2005, 2008, and 2010 (Table 2.2, Figures 2.2 and 2.3). For Asia as a whole, the estimated poverty rate rose by 9.8 percentage points—implying a new 2010 poverty rate of 30.5% instead of 20.7%. This increases the number of poor by 343.20 million. For the large economies in the region, India's poverty rate rises by 15.0 percentage points, Indonesia's by 9.9 percentage points and the PRC by 4.9 percentage points. The differences in the change of the poverty rate across countries are positively correlated with the initial poverty rate.

Altering the poverty line did not change poverty trends for the region or individual countries, nor did it signify any change in people's actual living standards. It just raises recognition of how many people in the region remain impoverished.

### Table 2.2: Poverty Estimates Using the $1.51 Regional Poverty Line

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<td>44.3</td>
<td>4.16</td>
<td>4.00</td>
<td>3.93</td>
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<tr>
<td>Fiji</td>
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<td>18.8</td>
<td>13.3</td>
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<td>0.09</td>
<td>0.11</td>
</tr>
<tr>
<td>Micronesia, Fed. States of (Urban)</td>
<td>35.8</td>
<td>37.4</td>
<td>37.3</td>
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<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Papua New Guinea</td>
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<td>47.3</td>
<td>3.38</td>
<td>3.36</td>
<td>3.25</td>
</tr>
<tr>
<td>Timor-Leste</td>
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<td>49.8</td>
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<tr>
<td>Developing Asia</td>
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<td>34.0</td>
<td>30.5</td>
<td>1,251.95</td>
<td>1,176.07</td>
<td>1,076.26</td>
</tr>
</tbody>
</table>

Source: ADB estimates.

### Source
ADB estimates.
### Section 3: Food Insecurity and Poverty

#### 3.1. Introduction

In the early days, poverty was defined by calorie intake. And food poverty lines remain an important gauge for several Asian countries. As mentioned, the CBN approach to establishing poverty lines contains a food component. Clearly, food security is an integral part of poverty reduction. And its counterpart—food insecurity—has become a serious threat for many countries in the region. According to the Economist Intelligence Unit’s 2014 Global Food Security Index, the vast majority of Asian countries included among the 109 countries ranked have an overall score below 50 (out of a possible 100)—only Singapore (84.3), Japan (77.8), the Republic of Korea (73.2), Malaysia (68.0), the PRC (62.2) and Thailand (59.9) are above 50. The global average was 56.1, while Asia’s average was 55.1—below the Middle East and North Africa, but above Sub-Saharan Africa.

According to the Food and Agriculture Organization of the United Nations (FAO), food security exists when all people have physical, social, and economic access to sufficient, safe, and nutritious food—food that meets their dietary needs and food preferences for an active and healthy life. A more elaborate definition divides food security into four dimensions: availability, stability, access, and utilization (Schmidhuber and Tubiello 2007).

Availability is the ability to satisfy food demand. Stability ensures individuals retain access to adequate food. Access means there are enough resources to acquire appropriate food for a nutritious diet. And utilization involves both food safety and its nutrients.

It is clear that food self-sufficiency does not mean food security. There are economies like Hong Kong, China and Singapore that are not self-sufficient, but their people are food-secure. In contrast, countries like India are basically food self-sufficient, but a significant portion of their population remains food-insecure. As food insecurity largely means insufficient supply or inadequate access, it reflects rising food costs and threatens the lives of the poor. Food security is the very foundation of poverty eradication.

#### 3.2. Food insecurity and rising food prices in Asia

Food insecurity hits the poor hard—despite the possible gains accruing to food producers. This is because a large share of the poor’s household budget is allocated to food—its share is inversely related to income (Table 3.1). Following the 2008 food and energy crises, the future of Asia’s food security was particularly questioned. The outlook is

<table>
<thead>
<tr>
<th>Income decile</th>
<th>Bangladesh</th>
<th>India-Rural</th>
<th>India-Urban</th>
<th>Indonesia-Rural</th>
<th>Indonesia-Urban</th>
<th>Thailand</th>
<th>Cambodia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>69</td>
<td>62</td>
<td>59</td>
<td>69</td>
<td>65</td>
<td>54</td>
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<td>58</td>
<td>49</td>
<td>66</td>
<td>57</td>
<td>45</td>
<td>65</td>
</tr>
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<td>61</td>
<td>57</td>
<td>46</td>
<td>65</td>
<td>55</td>
<td>42</td>
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<td>54</td>
<td>41</td>
<td>64</td>
<td>52</td>
<td>35</td>
<td>60</td>
</tr>
<tr>
<td>9</td>
<td>51</td>
<td>51</td>
<td>37</td>
<td>62</td>
<td>49</td>
<td>31</td>
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<td>10</td>
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<td>29</td>
<td>56</td>
<td>41</td>
<td>24</td>
<td>49</td>
</tr>
</tbody>
</table>

Source: ADB estimates using 2010/11 household survey data.
increasingly worrisome as demand and supply waver due to the effects of climate change, unprecedented urbanization, land degradation, water shortages and population growth across the region.

Food supply has become a major concern, not solely due to climate change. Unprecedented urbanization consumes large tracts of often fertile land—across expanding city boundaries, in suburban and industrial developments, and due to construction of roads and other infrastructure. Emigration of capable, young and better educated labor from rural farms also affects supply. In addition, farming land has been degraded through erosion, pollution, nutrition depletion and salinization (ADB 2011b). Meanwhile, the increasing use of ethanol as a substitute for oil decreases the global supply of grain and sugar. Finally, water shortages are a growing threat to food production across Asia. By 2030, developing Asia may face a 40% shortfall of water supply (ADB 2008, 2012a). These will all place tremendous pressure on food supply without major breakthroughs in farming technology.

The other side of the ledger sees demand for food continuing to rise. From now till 2030, developing Asia must feed an additional 480 million people as its population is projected to grow—from 3.86 billion in 2014 to 4.34 billion in 2030 (United Nations 2014a). At the same time, rapid economic growth brings higher living standards, particularly in emerging economies like India and the PRC. These imply a dramatic increase in demand for food and substantial change in dietary preferences. Consumption of non-staple food such as meat and dairy products requires more land and other inputs, often including grains and pulses that could otherwise go directly toward human consumption.

As a consequence, keeping food costs low is difficult. In fact, fast rising food prices have been a global phenomenon since the late 1960s, and particularly since the mid-1980s (Figure 3.1). In Asia, despite of some variations in trends, the food CPI tends to increase faster than the general CPI for most countries in most years, both before and after the 2008 food crisis (Figure 3.2). For Cambodia and the Philippines, for example, food CPI dropped

![Figure 3.1: Global Food Price Index](http://faostat.fao.org/) (accessed 25 May 2014).
considerably in 2008 and in subsequent years. Heavy government intervention through export bans, food price controls and price subsidies for rice or wheat likely played a role. But such interventions may not be sustainable and cannot alter the long-term trend of rising food insecurity in Asia.

It is not entirely surprising that food prices reached crisis levels in 2008, when both structural and cyclical factors combined. Structural factors included a depletion of world stocks of rice and other cereals, while cyclical factors came by way of weather (floods or drought) and financial instability, among others. High oil prices also contributed (Baffes and Dennis 2013).

Rising food prices have important distributional effects. Net consumers—especially the urban poor—lose, while net producers often gain. However, those likely to benefit most are large farmers. They are relatively prosperous to begin with. ADB (2008) found that every 10% increase in food prices boosts

Figure 3.2: General Consumer Price Index (CPI) and Food CPI: Selected Asian Economies

the Gini coefficient\textsuperscript{14} by 0.6 of a percentage point for the Philippines and 0.4 percentage point for Pakistan. This increase also lowers real per capita expenditure in the Philippines and Pakistan by 4.2\% and 4.8\% respectively. More importantly, and as expected, rising food prices reduce real per capita expenditure of the poorest 10\% of the population more than that of the richest 10\% in both countries.

Also, the majority of poor households tend to allocate a much higher share of their consumption expenditures to food during periods of price escalation (Figure 3.3). From 2007 to 2010,\textsuperscript{15} the distribution of the share of food in the total consumption budget shifted to the right in rural Thailand and Viet Nam—meaning the majority of rural households had to allocate a much higher share of their consumption expenditures to food. The effect of the 2008 food crisis was stronger in Viet Nam, where the food share increased to about 80\% for most households, while it rose to above 60\% in Thailand.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure3_3.png}
\caption{Food Crisis and Household Food Budget Share}
\end{figure}

\textsuperscript{14} The Gini coefficient, a measure of inequality, ranges from zero to 1—zero indicating complete equality with 1 denoting perfect inequality where one person holds all the income.

\textsuperscript{15} Data for 2008 and 2009 are unavailable.
3.3. Food insecurity and poverty

One way to incorporate food insecurity or food price changes into poverty analysis is to use food budget share as an indicator of an individual’s or household’s welfare level: the higher the food share, the lower the welfare level (Deaton 1997, De Hoyos and Lessem 2008). Maintaining a constant welfare level implies keeping the food budget share constant over time. For those living at the poverty line—with total consumption expenditures \( z_0 \) in the base period—the new total expenditure \( z_1 \) that would keep welfare constant can be expressed as 
\[
z_1 = z_0 \left(1 + \frac{\Delta P}{P} \right),
\]
where \( \Delta P/P \) refers to the percentage increase in food prices (Box 3.1). This is equivalent to inflating/deflating the benchmark poverty line by the food price index.

**Box 3.1: Updating the Poverty Line Using a Food Price Index**

Food insecurity adjusted poverty line can be derived as follows: Let \( z_i \) denote the poverty line and \( \alpha_i^F \) the budget share of food in total expenditure in period \( t \). For those living exactly on the poverty line, expenditure \( z_i = \text{food cost (FC)} + \text{non-food cost (NF)} \). Because \( FC_1/z_1 = FC_0/z_0 \), to keep welfare constant, the food share \( \alpha_i^F \) should remain constant over time (Deaton 1997, among others). That is
\[
FC_1/z_1 = FC_0/z_0 \quad \text{or} \quad z_1 = z_0 \cdot FC_1/FC_0.
\]

So long as the food basket does not change over time, \( FC_1/FC_0 \) is simply the food price index. In other words, to maintain the welfare level for the poor, it is necessary to update poverty lines using food CPI rather than the general CPI.

When food prices rise faster than other commodities, using general CPI to inflate a poverty line implies that the poor cannot maintain purchasing power. This is because items in the CPI basket are based on the consumption profile of a representative consumer, not the poor. The poor typically consume different items with different prices. Most notably, the poor spend much more on food than the non-poor. Consequently, in the case of fast rising food prices, the poor are unable to afford the same basket as before—if the poverty line is indexed by general CPI. Thus, it is more appropriate to use the food price index.

Empirical evidence supporting the use of a food price index can be gleaned from the food budget share of households in developing Asia (see Table 3.1). Most of these economies form the reference group for constructing the regional poverty line. For example, food shares for the bottom two deciles are 60% or higher in Bangladesh, rural India, rural and urban Indonesia, and Cambodia. It is also clear that the non-poor have much lower food budget shares. Therefore, it is justified to adjust the poverty line over time with the food price index.

Consequently, inflating poverty lines by food CPI—not the conventionally used general CPI—represents a way of incorporating food insecurity into poverty analysis. But when food CPI rises less than the general CPI, applying food CPI implies that the poor cannot afford the same non-food items as before. To ensure the poor maintain their purchasing power for both food and non-food items, it is ideal to inflate the food component of the poverty line by food CPI and the non-food component by non-food CPI. Unfortunately, non-food CPIs are seldom published and information on the breakdown of poverty lines into food and non-food components is usually unavailable. In this case, using the general CPI when it rises faster than food CPI is appropriate.
Table 3.2 presents the poverty lines incorporating food security considerations, using 2005 as base year. For most countries, incorporating food insecurity increases the poverty lines by about 10% in the post-2005 period. The updated poverty lines for the PRC and Indonesia rose respectively by 23.2% (from $1.25 to $1.54) and 20.8% (from $1.25 to $1.51). Thailand and Viet Nam saw respective increases of 16.0% (from $1.25 to $1.45) and 17.6% (from $1.25 to $1.47). For the Philippines, there was a slight rise between 2005 and 2010. Interestingly, there was little change in the poverty line for India.

Table 3.2: Food Insecurity Adjusted Poverty Lines ($ per day in 2005 PPP)

<table>
<thead>
<tr>
<th>Subregion/Country</th>
<th>2005</th>
<th>2008</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central and West Asia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Armenia</td>
<td>1.25</td>
<td>1.32</td>
<td>1.28</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>1.25</td>
<td>1.37</td>
<td>1.34</td>
</tr>
<tr>
<td>Georgia</td>
<td>1.25</td>
<td>1.30</td>
<td>1.53</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>1.25</td>
<td>1.34</td>
<td>1.31</td>
</tr>
<tr>
<td>Kyrgyz Republic</td>
<td>1.25</td>
<td>1.37</td>
<td>1.29</td>
</tr>
<tr>
<td>Pakistan</td>
<td>1.25</td>
<td>1.37</td>
<td>1.40</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>1.25</td>
<td>1.35</td>
<td>1.38</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>East Asia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China, People’s Rep. of</td>
<td>1.25</td>
<td>1.46</td>
<td>1.54</td>
</tr>
<tr>
<td>South Asia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangladesh</td>
<td>1.25</td>
<td>1.30</td>
<td>1.32</td>
</tr>
<tr>
<td>Bhutan</td>
<td>1.25</td>
<td>1.33</td>
<td>1.41</td>
</tr>
<tr>
<td>India</td>
<td>1.25</td>
<td>1.28</td>
<td>1.27</td>
</tr>
<tr>
<td>Maldives</td>
<td>1.25</td>
<td>1.44</td>
<td>1.41</td>
</tr>
<tr>
<td>Nepal</td>
<td>1.25</td>
<td>1.30</td>
<td>1.41</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cambodia</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1.25</td>
<td>1.42</td>
<td>1.51</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>1.25</td>
<td>1.37</td>
<td>1.42</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1.25</td>
<td>1.30</td>
<td>1.36</td>
</tr>
<tr>
<td>Philippines</td>
<td>1.25</td>
<td>1.31</td>
<td>1.32</td>
</tr>
<tr>
<td>Thailand</td>
<td>1.25</td>
<td>1.34</td>
<td>1.45</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>1.25</td>
<td>1.42</td>
<td>1.47</td>
</tr>
<tr>
<td>Pacific</td>
<td></td>
<td></td>
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<tr>
<td>Fiji</td>
<td>1.25</td>
<td>1.34</td>
<td>1.36</td>
</tr>
<tr>
<td>Micronesia, Fed. States of (Urban)</td>
<td>1.25</td>
<td>1.27</td>
<td>1.32</td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>1.25</td>
<td>1.35</td>
<td>1.35</td>
</tr>
<tr>
<td>Timor-Leste</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
</tr>
</tbody>
</table>

Source: ADB estimates.

3.4. Poverty estimates considering food insecurity

When adjusted for food insecurity (rising food prices), Asia’s extreme poverty rate rose to 27.5% in 2008 and 24.7% in 2010, above the conventionally estimated 23.9% in 2008 and 20.7% in 2010 (Table 3.3, Figure 3.4). This means the number of poor in developing Asia was underestimated by 124.38 million in 2008 (from 827.57 to 951.96 million) and 140.52 million in 2010 (from 733.06 to 873.58 million). The results also show that, once food insecurity is considered, poverty trends do not always decline, or are linear. The hike in food prices in 2008 created an inverted “V” pattern.

By subregion, poverty was underestimated in South Asia by a margin of 2.1 percentage points in 2008 and 1.6 percentage points in 2010, corresponding respectively to an underestimation of the number of poor by 29.56 million and 22.84 million (See Table 3.3).
and benchmark estimates in Tables 5.2 and 5.3). It was even more pronounced in East Asia: 57.12 million in 2008 and 71.38 million in 2010.

The picture at the country level is mixed, in part reflecting differing policy interventions. While the increase in the percentage of poor—when accounting for the rise in food prices—is relatively small for India (from 32.7% to 33.8% in 2010), it is quite large for the PRC (from 11.6% to 17.0%) and Indonesia (from 18.1% to 28.0%). In terms of the number of additional poor, the increase is 13.68 million for India, 71.38 million for the PRC and 23.86 million for Indonesia. Naturally, for countries that intervened heavily in

<table>
<thead>
<tr>
<th>Subregion/Country</th>
<th>Poverty rate (%)</th>
<th>Number of poor (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central and West Asia</td>
<td>18.8</td>
<td>22.8</td>
</tr>
<tr>
<td>Armenia</td>
<td>4.0</td>
<td>1.7</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>1.5</td>
<td>0.6</td>
</tr>
<tr>
<td>Georgia</td>
<td>16.0</td>
<td>16.4</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>0.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Kyrgyz Republic</td>
<td>22.9</td>
<td>8.4</td>
</tr>
<tr>
<td>Pakistan</td>
<td>22.3</td>
<td>28.2</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>17.7</td>
<td>12.6</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>0.5</td>
<td>0.1</td>
</tr>
</tbody>
</table>

East Asia: 16.3 | 17.4 | 17.0 | 211.85 | 230.12 | 226.90 |
China, People's Rep. of: 16.3 | 17.4 | 17.0 | 211.85 | 230.12 | 226.90 |

South Asia: 41.5 | 39.9 | 34.8 | 552.03 | 553.41 | 495.56 |
Bangladesh        | 50.5  | 49.7  | 47.8  | 70.96 | 72.30 | 71.11 |
Bhutan            | 18.9  | 11.7  | 7.0   | 0.12  | 0.08  | 0.05  |
India             | 40.8  | 39.4  | 33.8  | 466.30 | 469.28 | 413.76 |
Maldives          | 2.3   | 0.9   | 0.7   | 0.01  | 0.00  | 0.00  |
Nepal             | 46.3  | 36.7  | 32.6  | 12.64 | 10.60 | 9.78  |
Sri Lanka         | 10.1  | 5.6   | 4.1   | 2.00  | 1.14  | 0.86  |

Southeast Asia: 18.9 | 22.0 | 20.3 | 95.87 | 115.65 | 109.20 |
Cambodia          | 33.8  | 22.8  | 14.7  | 4.51  | 3.14  | 2.08  |
Indonesia         | 21.4  | 30.5  | 28.0  | 48.73 | 71.74 | 67.18 |
Lao PDR           | 39.5  | 39.8  | 33.9  | 2.27  | 2.40  | 2.10  |
Malaysia          | 0.4   | 0.1   | 0.2   | 0.11  | 0.02  | 0.04  |
Philippines       | 22.2  | 20.9  | 20.3  | 19.02 | 18.85 | 18.93 |
Thailand          | 1.0   | 0.6   | 0.9   | 0.68  | 0.43  | 0.62  |
Viet Nam          | 24.9  | 22.4  | 21.0  | 20.35 | 19.07 | 18.25 |

Pacific: 43.0 | 40.7 | 37.8 | 3.42 | 3.45 | 3.35 |
Fij               | 17.9  | 6.3   | 8.9   | 0.15  | 0.05  | 0.08  |
Micronesia, Fed. States of (Urban) | 30.6  | 32.4  | 33.5  | 0.01  | 0.01  | 0.01  |
Papua New Guinea  | 46.6  | 46.1  | 42.0  | 2.84  | 3.02  | 2.88  |
Timor-Leste       | 42.0  | 34.7  | 34.7  | 0.42  | 0.37  | 0.39  |

Developing Asia: 26.9 | 27.5 | 24.7 | 901.96 | 951.96 | 873.58 |

Source: ADB estimates.
food markets during the crisis, the underestimation is small (Figures 3.5 and 3.6). And not surprisingly, the magnitude broadly correlates with population size—thus only large or very poor countries appear in Figures 3.5 and 3.6. For example, some quite small countries (such as the Lao PDR) feature prominently in terms of poverty rate. Thus, food insecurity is a poverty-related challenge for both large and small countries in Asia.

Source: ADB estimates.
Section 4: Poverty and Vulnerability

4.1. Introduction

It is a cruel fact of life that anyone at any time can be hit by an unexpected shock or tragedy. Households or individuals with a reasonable standard of living can be pulled into poverty by shocks such as bad harvests, job losses, illness, or natural disasters. People exposed to these possible events are considered vulnerable. The challenge of development includes not just the elimination of persistent and endemic deprivation, but also the removal of vulnerability (Sen 1999). Unfortunately, conventional approaches to poverty measurement rarely account for these shocks or risks. Consequently, policies based on usual poverty profiles are inadequate for the vulnerable.

The importance of measuring vulnerability is that it identifies those who are not poor but may easily fall into poverty later. This makes it possible to design and implement preventive interventions. Benjamin Franklin’s axiom—“an ounce of prevention is worth a pound of cure”—is as prescient as ever.

4.2. The concept of vulnerability and previous studies for Asia

In general, vulnerability can be defined relative to entities such as states, companies or individuals, and with respect to types of shocks or risks—such as natural disasters, economic crises, health deterioration and sociopolitical setbacks (World Bank 2014b). Vulnerability to poverty also has alternative definitions (Box 4.1).

The key difference between poverty and vulnerability to poverty is that vulnerability involves future risks, is a forward-looking concept, and cannot be observed. Following several studies, the concept of vulnerability to poverty can be viewed differently (Hoddinott and Quisumbing 2003, Hoogeven et al. 2004, Klasen and Povel 2013, Fujii 2013).

Vulnerability as uninsured exposure to risk
In general, people face various risks such as natural disasters, illness, death of work animals, and crop diseases, among others. Risk in developing countries raises three related questions (Townsend 1994). First, are these risks insurable? If shocks are idiosyncratic, that is, specific to a particular individual or household, it becomes possible to pool risks and hence insure them. But if these are aggregate shocks affecting the entire population—as is the case of natural disasters—insurance becomes far more difficult to implement. Second, are markets or technologies available to overcome such risks? For example, grain storage has been used for centuries to deal with some of these risks. Networks of family and friends are also useful when facing these shocks (Rosenzweig 1988). Third, are there financial institutions—or more generally institutional arrangements—at the local or national level that provide implicit and explicit insurance?

Vulnerability as low expected utility
Ligon and Schechter (2003) were the first to define vulnerability as the difference between a household’s utility derived from certainty-equivalent consumption and its expected utility derived from actual consumption. They propose breaking down vulnerability into four components: poverty, aggregate, idiosyncratic and unexplained risks.

Vulnerability as the probability of being or becoming poor in the future
Kühl (2003) defines vulnerability to poverty as the propensity of a household to suffer a significant shock that brings its welfare below a socially accepted level. Others conceptualize vulnerability to poverty as the probability that a household would experience at least one episode of poverty in the near future or over a given number of time periods (Pritchett, Suryahadi, and Sumarto 2000, Mansuri and Healy 2001). This approach was formalized by defining vulnerability as the probability that a household’s future consumption will fall in the future below some predetermined poverty line (Chaudhuri, Jalan, and Suryahadi 2002).

Defining vulnerability on the basis of axioms
Calvo and Dercon (2005, 2007) viewed vulnerability as a probability-weighted average of future states of deprivation. They postulate several desirable axioms that a measure of vulnerability should possess. Among these axioms is risk sensitivity, which implies that higher uncertainty should be reflected as a higher degree of vulnerability.
Irrespective of how it is defined, vulnerability damages household welfare (Klasen and Povel 2013). Being vulnerable creates great hardship for a household—whether identified as poor or not—as it must prepare for a possible shock. Vulnerability can be a major cause of long-term deprivation because, at lower incomes, risks are relatively more important than returns. Vulnerable households are likely to choose stable investments with a low rate of return. While this behavior is rational, it is also an important reason why vulnerable households are more likely to become trapped in poverty.

For example, microcredit is found to successfully reach the poor in Bangladesh, but it is much less effective in reaching the vulnerable (Amin, Rai, and Topa 2003). This is probably because factors underlying vulnerability also count as risks for microcredit providers. McCulloch and Calandrino (2003) used panel data from rural Sichuan in the PRC (covering 1991-1995) and found that demographic characteristics, education, asset stock, and location were the most important determinants of vulnerability. And when examining vulnerability in six rural districts in the PRC between 2000 and 2004, Zhang and Wan (2006) discovered that households with low-education were much more vulnerable than those more educated.

In a study focusing on rural South India in 1975-1984, Gaiha and Imai (2004) concluded that even relatively rich households were highly vulnerable to long spells of poverty when severe shocks damaged harvests. Rural households in Tajikistan are poorer and more vulnerable than urban households (Jha, Dang, and Tashrifov 2010). And in Viet Nam, households belonging to ethnic minorities are more vulnerable than households from ethnic majorities (Imai, Gaiha, and Thapa 2012).

According to research results of Sulaiman, Azman, and Abdelhak (2013), Hamzah (2005), and Siwar et al. (2009) most poor people in Malaysia are vulnerable to a variety of risks. The most common risks Malaysian farmers face include floods, drought, heavy rain, strong winds, injuries, weeds, insects and disease (Alam et al. 2012, Begum et al. 2011, Siwar et al. 2009). Using data collected from a three-round panel survey, Sulaiman, Azman, and Abdelhak (2013) found that any assistance that helped farmers boost their productive assets led to reductions in vulnerability. For example, applying mechanization, modern technology and irrigation decreases vulnerability. These farmers also manage to save and invest more in productive assets and livestock, which allow them to better face negative shocks.

### 4.3. Increasing vulnerability in Asia

Different types of shocks underlie vulnerability. And they can occur at the country, community or individual/household level. Over the last 20 years, vulnerability to natural calamities and their severity have been rising in Asia (Figure 4.1). They include drought, floods, earthquakes, epidemics, landslides, storms, volcanic eruptions, wildfires and tsunamis. Natural calamities tend to be more prevalent in East, South, and Southeast Asia relative to other subregions, causing more damage in East and South Asia by way of death, injury, and damage to housing. They have also become more frequent over time, particularly when comparing 1980–1995 with 2000–2013.

**Figure 4.1: Natural Calamities in Asia by Subregion (1980–2013)**

![Figure 4.1: Natural Calamities in Asia by Subregion (1980–2013)](image-url)
Floods and storms are more common than other calamities (Figure 4.2). And they have been increasing. Since 1990, the number of people affected by natural calamities has been rising, particularly for East Asia and—to a lesser extent—Southeast Asia (Figure 4.3). Those affected by natural calamities in South Asia are in general far below those in East Asia. These observations help substantiate the analytical results of Section 4.4.

**Natural shocks**

Natural shocks are disasters such as volcanic eruptions and tsunamis, along with damage caused by environmental change such as erosion or salinization. They also include other kinds of natural events, such as epidemics. Seven of the 10 most vulnerable countries in the world are in Asia (World Bank 2014b). The region accounted for 38% of global disaster-related economic losses between 1980 and 2009. Since 2000, more than 1.6 billion people in East Asia and the Pacific (as classified by the World Bank) have been affected by disasters. Over the past 30 years, these two subregions accounted for about 40% of the total number of floods worldwide (Jha and Stanton-Geddes 2013). In particular, the Pacific island countries (PICs) are prone to natural disasters. Between 1980 and 2009, 2.3% of the world’s reported natural disasters occurred in PICs, which represent only about 0.1% of the global population.

These disasters brought death, injuries, asset damage or destruction and, more generally, economic disruption. In fact, eight of the top 20 countries by annualized relative losses from natural disasters are PICs (World Bank 2014b). Average annual economic losses from cyclones, earthquakes and tsunamis reached 6.5% of GDP in Vanuatu and 4.2% in Tonga.

Over the past several years, Asia has seen several extreme natural catastrophes—such as Japan’s 2011 Tohoku earthquake and tsunami, earthquakes in Padang, Indonesia (2009) and Wenchuan, PRC (2008), typhoons in Lao PDR (2009), the Philippines (2009, 2013, 2014), and Viet Nam (2009), the devastating 2008 cyclone in Myanmar, and large-scale floods in Cambodia, Thailand, and the Philippines in 2011. Ho Chi Minh City, Jakarta and Manila have been repeatedly struck by serious flooding over the past dozen years.

In South Asia, Cyclone Gorky devastated the Bangladesh coast in 1991, killing 140,000 people and leaving 10 million people homeless. Monsoons frequently bring extensive flooding to the Ganges-Brahmaputra river basin, causing enormous damage (Mirza 2011). Roughly 30% of total flood-related damage in Bangladesh is crop losses, which hit the poor particularly hard (Gain and Dasgupta forthcoming).
Not surprisingly, disasters tend to impact the poor and marginalized more (Box 4.2). For example, two years after cyclone Nargis hit Myanmar, the average maximum debt of laborers and fishermen had more than doubled, and that of small farmers was almost twice as high. Women are more likely to die during natural disasters if their socioeconomic status is low—they accounted for almost 70% of the casualties after the 2004 Indian Ocean tsunami in Banda Aceh, Indonesia (Neumayer and Plümper 2007). This can be attributed to three major causes. First, biological and physiological differences between the sexes leave women more vulnerable to physical harm. Second, social norms may leave women more vulnerable to disasters. For instance, women will often jump to protect children, the elderly and even domestic property. And third, in the disaster aftermath, basic resources tend to be allocated first to males or the non-poor.

### Box 4.2: Poverty Impact of Typhoon Haiyan

On 8 November 2013, super-typhoon Haiyan (named Yolanda in the Philippines) killed over 6,000 people and displaced millions of others. It destroyed key infrastructure such as schools, hospitals and government offices, causing widespread destruction. The damage to infrastructure, agriculture, fisheries, tourism, and other sectors disrupted economic activity and led to lost jobs. Investors and tourists stayed away, resulting in a further reduction in output and employment. The disruptions also caused harvest losses resulting in an increase in the price of basic commodities—directly affecting poverty, particularly as agriculture accounts for about a third of total employment and food accounts for a significant share of the poor’s budget.

The typhoon hit the poor hardest. To cope with the loss of durable assets, jobs, and incomes, the poor likely reduced expenditures on food, health, and education. The typhoon was estimated to drive 0.6 – 1.5 million people into poverty, depending on the efficacy of post-disaster policy interventions. Also, the vulnerability to poverty likely increased due to the typhoon. About 4 million people who were displaced remain at high risk of easily falling into poverty—or deeper into poverty.

**Climate Change**

Climate change-induced shocks and risks are well-known. For example, the impact from floods has been rising (Table 4.1) and is expected to worsen in the future (Figure 4.4). Again, the impacts are much more serious in East Asia than elsewhere. Vulnerability from climate change is a long-term concern. But the damage is already being felt. Highly climate-sensitive farms, forests, and fisheries provide livelihoods for 60% of the region’s population (Lohani 2012). In particular, low-lying coastal areas, including small island states, are more sensitive to rises in sea-level and storm surges. They have more to lose from climate change than landlocked nations.

**Table 4.1: Economic Exposures of Asia-Pacific Subregions to Floods**

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>East and North-East Asia</td>
<td>4.6</td>
<td>8.3</td>
<td>14.4</td>
<td>27</td>
</tr>
<tr>
<td>South-East Asia</td>
<td>2.4</td>
<td>3.9</td>
<td>6.4</td>
<td>10.7</td>
</tr>
<tr>
<td>South and South-West Asia</td>
<td>4.5</td>
<td>6.9</td>
<td>11.2</td>
<td>20.6</td>
</tr>
<tr>
<td>North and Central Asia</td>
<td>1.2</td>
<td>1.4</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>Pacific</td>
<td>0.4</td>
<td>0.5</td>
<td>0.7</td>
<td>0.9</td>
</tr>
<tr>
<td>Total</td>
<td>13.1</td>
<td>21</td>
<td>33.7</td>
<td>60.8</td>
</tr>
</tbody>
</table>


South Asia and the PICs are particularly vulnerable to rising sea levels, which encroaches on freshwater lenses on some islands. Coral erosion from ocean warming and acidifying seawater threatens many food sources for Pacific island populations. PICs are forecasted to experience unprecedented temperature extremes (Jha and Stanton-Geddies 2013). Peculiar climate characteristics in South Asia—snow melts in the Himalayas, monsoon climate fluctuations, and sea level rises — cause much of the floods, droughts and cyclones that pummel the subregion (Gain and Dasgupta forthcoming).

Climate change may directly affect poverty. For example, poverty in India is affected by the impact of climate change on net agriculture revenue and private consumption—a 7% rise in rainfall has, *ceteris paribus*, a statistically significant negative impact on consumption during the months of January, April and July (Kar and Das forthcoming).

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16 A freshwater lens is a source of local water supply, particularly for many island residents. It appears when lower density fresh water infiltrates the subsurface and floats atop denser saltwater. This fresh groundwater does not mix with seawater and is regularly replenished by rain.
Economic shocks can disrupt household income, for example through price fluctuations or loss of employment. Economies with open trade regimes and capital accounts are more exposed to the impact of economic shocks. The PICs are particularly exposed to price shocks, especially small atolls that have little diversification and depend on imports for food and fuel. The best example of cross-border risk transmission—or contagion—is through economic and financial crises. They deepen poverty through higher unemployment, reduced working hours and salaries, lower demand for informal services, price hikes due to currency depreciation, and cuts in public spending, among others.

Financial crises have lasting effects on output and employment (Reinhart and Rogoff 2008, Reinhart 2009). On average, they lead to a 2-year decline in real GDP per capita of over 9% and a 7 percentage point increase in unemployment over several years. According to Baldacci, de Mello, and Inchauste (2002), financial crises between 1960 and 1998 around the world resulted in (i) inflation increasing by an annual average of 62% relative to the pre-crisis year; (ii) the rate of formal unemployment rising by 1.1%; and (iii) a higher poverty rate, with the second lowest income quintile suffering the greatest loss (rather than the poorest quintile).

During the 1997/98 Asian financial crisis, poverty incidence in Indonesia increased by 8.9 percentage points in 1998 (from 11% to 19.9%) and by 9 percentage points in the Philippines (Thomas et al. 1999, Datt and Hoogeveen 2003). The crisis had different impacts on male and female workers and led to significantly reduced household consumption (Wan and Francisco 2009).

Wan and Francisco (2009) model the impact of the 2008 global crisis on Asia and found that East and Southeast Asian economies suffered most in terms of unemployment and wage cuts. There was also a rise in the absolute number of poor in Indonesia, Pakistan, Malaysia, the Philippines, and Thailand. Indonesia’s foregone 2.7% decrease in the poverty rate implied that 6.54 million people who could have escaped poverty remained or became poor due to the crisis. The total was almost 18 million in India. The foregone poverty reduction was even higher in Viet Nam (2.9%) and still above 2% for both Pakistan and the Philippines.
Habib et al. (2010) estimated that the slowdown in GDP growth caused by the global financial crisis raised the 2010 poverty rate by 1.2 percentage points in Bangladesh and 1.5 percentage points in the Philippines. The impact on the middle class was relatively large—15%-20% of households in the fourth to seventh income deciles in the Philippines and 10% in Bangladesh were pushed into a lower income decile. Furthermore, the newly poor caused by the financial crisis were more likely to be the working poor in urban Philippines. In Bangladesh, they became more dependent on inward remittances for income.

Importantly, those who suffer from economic shocks are often more vulnerable to natural disasters as well. They usually live in informal settlements around urban centers, areas particularly subject to flooding. And, when a disaster affects less-developed and remote regions, rescues or assistance are logistically more difficult.

Other Shocks

Other forms of shocks are socio-political, such as violence and ethnic conflicts, or aggregate health issues such as non-communicable diseases.\(^{17}\) In addition to aggregate shocks, individuals face idiosyncratic shocks like personal illness, injury, domestic violence or unwanted pregnancies. A UNAIDS (2013) study of 28,139 married women in India showed that physical and sexual violence from husbands was associated with a nearly four-fold increase in HIV prevalence. Similarly, UNICEF (2012) reported that children in South Asia experience violence at home and in the family, in schools and educational settings, in care and justice systems, in workplaces and in their communities. This violence can have profound poverty ramifications for the affected families or individuals. Unfortunately, existing household surveys seldom provide information on this kind of shocks.

Asia’s unprecedented urbanization adds vulnerability—as disaster and communicable diseases claim more victims in more densely populated areas. Worse still, Asia’s cities have extremely high population densities (Figure 4.5). According to United Nations (2014b), Asia is home to over half the world’s slum dwellers. The slum areas usually face high risks. In metropolitan Manila, for example, 800,000 people live in high-risk areas (Jha and Stanton-Geddes 2013).

\(^{17}\) A non-communicable disease is a medical condition or disease that is neither infectious nor transmissible between people. It may refer to chronic diseases of long duration such as cancer or asthma.
Taken together, poor people in developing countries face many shocks. Whether from natural disasters, climate change, economic crises, or idiosyncratic shocks, they lead to a drop in the welfare of the poor and near-poor. Thus, it is necessary to incorporate vulnerability into poverty-related analyses and interventions.

4.4. Vulnerability-adjusted poverty line: methods and empirical results

As the welfare of a poor household depends on the risks or shocks it faces—aside from its level of income or consumption—vulnerability is inherently related to poverty. The principle for developing a vulnerability-adjusted poverty line is similar to that underlying food insecurity (see Section 3)—the welfare or utility associated with the benchmark poverty line and the adjusted poverty line must be equal. Again, the starting point is someone who lives exactly on the benchmark poverty line $z_0$. The person can receive $z_0$ without any uncertainty or risk. Alternatively, the person can earn $z_1$ which comes with shocks or risks, denoted by $\varepsilon$. As widely accepted, $z_1$ is generally greater than $z_0$ (to compensate for the risks); the magnitude of the difference depending on the risk attitude of the person in question and the amount of risk. Also common, the amount of risk is often indicated by the statistical measure of variance. And the risk attitude is indicated by a parameter representing the degree of risk aversion. In the calculations below, the shock to income or expenditure is denoted by $\varepsilon$, its variance indicating the risk, and the degree of risk aversion denoted by a parameter.

Unfortunately, there is little prior knowledge on how to adjust the poverty line in the presence of shocks or risks. For someone receiving risk-free $z_0$, the risky outcome which makes the person indifferent could be expressed as either $z_1 + \varepsilon$ or $z_2$ ($1+\varepsilon$). The former can be called additive risk and the latter multiplicative risk. Assuming multiplicative risk implies that risk and its impact are proportional to income and assuming additive risk does not. Vulnerability-adjusted poverty lines are derived in Boxes 4.3 and 4.4.

Implementing either the additive or multiplicative case requires knowledge on the relevant risk aversion parameter, which is generally unknown. In particular, under the assumption of additive risk, the parameter value depends on the unit of measurement of the income, consumption or other well-being variables being investigated. To the best of our knowledge, no prior estimates of this parameter have been obtained using consumption or income in 2005 PPPs. Thus, it is not feasible to implement the framework with additive risks.

By contrast, numerous attempts have been made to estimate the risk aversion parameter corresponding to the case of multiplicative risk. This parameter, often called coefficient of constant relative risk aversion (CRRA), does not depend on the unit of measurement. CRRA estimates stretch over a long range (Hartley, Lanot, and Walker 2013). As for low CRRA estimates, Gandelman and Hernández-Murillo (2013) used information on self-reports of subjective personal well-being from three datasets: the Gallup World Poll, the European Social Survey and the World Values Survey. They concluded that the CRRA varied between 0.79 and 1.44. Hartley, Lanot, and Walker (2013) analyzed data of the famous game show Who Wants to be a Millionaire and found that the CRRA was close to 1. Chetty (2006) derived estimates on the basis of labor supply elasticities, also finding a CRRA close to 1. Finally, data from the Hoosier Millionaire was used to find the CRRA: between 0.64 and 1.76 (Fullenkamp, Tenorio, and Battalio 2003).

Moderate estimates were obtained by Attanasio, Banks, and Tanner (2002) using a large sample survey from the United Kingdom, generating a CRRA estimate of 1.44. Estimates derived from time series data on insurance premia indicate that the CRRA was close to 2 (Szpiro 1986). Preferring panel data—because they can disentangle the impact of the
shape of individual preferences and the correlation between preferences and wealth—Chiappori and Païella (2011) found that the CRRA median was around 2.

Large estimates were obtained by Beetsma and Schotman (2001) using data from a Dutch game called Lingo (a CRRA range of 3 to 7). Jianakoplos and Bernasek (1998), examining US household portfolio data on risky assets, estimated that single women are more risk averse (a CRRA of 9) than single men (a CRRA of 6). Barsky et al. (1997) analyzed the US Health and Retirement Survey data and found that the mean CRRA was about 12. Hersch and McDougall (1997), using data from the Illinois Instant Riches television game show, estimated values for the CRRA as high as 15.

**Empirical results**

The literature cited shows a wide range of possible CRRA values. In general, the degree of risk aversion is negatively correlated with wealth status or income—the rich take more risks; the poorer are more risk-averse. For the poor in poor countries, it is reasonable to apply medium to large CRRA values to generate adjusted poverty lines (Table 4.2).

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**Box 4.3: Vulnerability-adjusted Poverty Line: The Case of Additive Risk**

Let $U$ denote a utility function, and assuming the shock $\varepsilon$ has a mean 0 and variance $\sigma_\varepsilon^2$, the mathematical expression to ensure the same utility with and without risks is simply $U(z_0) = E[U(z_1 + \varepsilon)]$, where $E$ stands for the expectation operator, $z_0$ is the poverty line without vulnerability and $z_1$ is the poverty line with vulnerability. This idea is similar in spirit to the notion of certainty equivalent in the theory of finance.

Expanding the right hand side of the expression $U(z_0) = E[U(z_1 + \varepsilon)]$ by Taylor’s series around $z_0$, we have

$$U(z_0) = E[U(z_1) + \varepsilon U'(z_0)(\varepsilon) + \frac{1}{2} \varepsilon^2 U''(z_0)(\varepsilon)^2 + \ldots]$$

Ignoring higher order terms greater than 2, we have

$$U(z_0) = U(z_1) + \frac{\sigma_\varepsilon^2}{2} U''(z_0)$$

(1)

As $U’ > 0$, $U’’ < 0$, the requirement that $z_1 > z_0$ because

$$\frac{\sigma_\varepsilon^2}{2} U''(z_0) < 0$$

This requirement is reasonably intuitively. Because $z_1$ is the poverty line in the presence of vulnerability, the value of $z_1$ should be higher than $z_0$, so with the additional income, the individual can cope with the disturbance in income generated by vulnerability and become equally well off as with $z_0$.

Let the utility function take the form $U(z) = A - Be^{-\alpha z}$, where $A$, $B$, and $\alpha$ are parameters.

Then $U(z) = -B(-\alpha)e^{-\alpha z} = Be^{\alpha z}$ and $U''(z) = \alpha B(-\alpha)e^{\alpha z} = -B\alpha^2 e^{\alpha z}$.

Inserting these into equation (1) produces

$$A - Be^{-\alpha z} = A - Be^{-\alpha z} + \left(\frac{\sigma_\varepsilon^2}{2}\right)(-B\alpha^2)e^{-\alpha z}$$

Solving for $z_1$ produces the vulnerability-adjusted poverty line:

$$z_1 = z_0 + \left(\frac{1}{\alpha}\right) \ln \left(1 + \left(\frac{\sigma_\varepsilon^2}{2}\alpha^2\right)\right)$$

(2)

**Estimating variance in the additive case**

Given some income distribution, which is subject to vulnerability, one needs to know the variance of shock $\varepsilon$ to estimate the adjusted poverty line $z_1$ from the existing poverty line $z_0$. This variance can be estimated as follows:

Call $X$ the distribution of income that would be observed if there was no vulnerability and $z_0$—the poverty line in such a case at, say, time 0. Now assume that at time 1 the distribution is $Y_1$. But this distribution is subject to vulnerability, in the sense that it is generated by adding a noise term $e_1$ over the existing distribution at time 0. That is, $Y_1 = X + e_1$, where $X$ and $e_1$ are assumed to be uncorrelated. Then the variance of $e_1$ is simply the difference between the variances of $Y_1$ and $X$.

$$\text{Var}(e_1) = \text{Var}(Y_1) - \text{Var}(X)$$

(3)

The hypothetical distribution $X$, however, is unknown. Now, given $T$ distributions $Y_1, ..., Y_T$ that were actually observed, for each year $t$ we can write

$$Y_t = X + e_t$$

(4)

where $\text{Var}(e_t) = \sigma^2_e$. The average distribution $\bar{Y}$ of the distributions $Y_t$ is simply

$$\bar{Y} = X + \varepsilon$$

(5)

where $\varepsilon$ is the average of all the shocks $e_t$.

Consequently, the variance of $\varepsilon$ can be expressed as

$$\text{Var}(\varepsilon) = \frac{\sigma^2_e}{T}$$

Note that $\text{Var}(\varepsilon) \rightarrow 0$ if $\sigma^2_e$ is small or $T \rightarrow \infty$.

The average distribution $\bar{Y}$ could be taken as a good approximation to the hypothetical distribution $X$.

Thus, expression (3) becomes

$$\sigma^2_e = \text{Var}(Y_1) - \text{Var}(\bar{Y})$$

(6)
Box 4.4: Vulnerability-adjusted Poverty Line: The Case of Multiplicative Risk

Referring to Box 4.3, the indifference in the utility here becomes

\[ U(z_0) = E[U(z_0 + \varepsilon)] \]  

Expanding the right hand side by Taylor’s series yields

\[ U(z_0) = E \left[ U(z_0) + \varepsilon U'(z_0) + \frac{\varepsilon^2}{2} U''(z_0) + ... \right] \]

Taking approximations leads to

\[ U(z_0) = U(z_0) + \frac{\sigma^2}{2} z^U''(z_0) \]  

where \( \sigma^2 \) denotes the variance of the shock \( \varepsilon \), \( z_0 \) is the poverty line under certainty and \( z_2 \) is the poverty line under vulnerability. As \( U' > 0, U'' < 0 \), we have

\[ U(z_0) - U(z_2) = \frac{\sigma^2}{2} z^U''(z_0) < 0 \]  

and hence \( z_2 > z_0 \).

Let the utility function take the form (which is homothetic but more general than the commonly used logarithmic form):

\[ U(z) = A_1 + B_1 z^\delta \]

where \( \delta, A_1 \) and \( B_1 \) are parameters.

It can be derived that

\[ U'(z) = B_1 \frac{1}{1-\delta} z^{\delta-1} \]

\[ U''(z) = B_1 (-\delta) z^{\delta-2} \]

Inserting these derivatives into (7), we have

\[ A_1 + B_1 z^\delta = A_1 + B_1 \frac{1}{1-\delta} z^{\delta-1} \]

\[ A_1 + B_1 z^\delta = A_1 + B_1 \frac{1}{1-\delta} z^{\delta-1} + \frac{\sigma^2}{2} R z^{U''(z_0)} \]

Solving for the vulnerability-adjusted poverty line \( z_2 \)

\[ z_2 = z_0 \left[ 1 - (1-\delta) \frac{\sigma^2}{2} \right] \]

A special case is where \( \delta = 1 \). In this case, \( U(z) = A_1 + B_1 \ln z \)

\[ U(z) = A_1 + B_1 \ln z \]

\[ U'(z) = B_1 \frac{1}{z} \]

\[ U''(z) = -B_1 \frac{1}{z^2} \]

Inserting these derivatives into (7), we have

\[ A_1 + B_1 \ln z_0 = A_1 + B_1 \ln z_2 + \frac{\sigma^2}{2} R \left( z_2 \right)^{\delta-1} \]

Solving for \( z_2 \)

\[ z_2 = z_0 e^{\frac{\sigma^2}{2}} \]

### Estimating variance in the multiplicative case

Using the notations in Box 5.3, one way of estimating the variance is to start with

\[ Y_i = X (1 + \epsilon_i) \]

or

\[ \log Y_i = \log X + \log (1 + \epsilon_i) \]

where \( E(\epsilon_i) = E(\epsilon_i, X) = 0 \). \( X \) and \( \epsilon_i \) are assumed to be uncorrelated.

With \( T \) distributions of \( Y_i \), we have

\[ \frac{1}{T} \sum_{t=1}^{T} \log Y_i = \frac{1}{T} \sum_{t=1}^{T} \log (1 + \epsilon_i) \]

(12)

\[ \frac{1}{T} \sum_{t=1}^{T} \log X = \log X \]

(13)

Taking variance on both sides of the above equation,

\[ \text{Var}(\log X) = \frac{1}{T} \sum_{t=1}^{T} \text{Var}(\log Y_i) \]

(14)

In the empirical application, for each period \( t \), the distribution \( Y_i \) has income \( Y_t \) with \( i \) varying from 1 to \( n \). We therefore also have the distributions \( \log Y_i \), whose typical element is \( \log Y_i \). The variance of \( \log Y_i \) can then be estimated for each time period \( t \).

Based on (13), we have

\[ E(\log X) = E\left( \frac{1}{T} \sum_{t=1}^{T} \log Y_i \right) = \frac{1}{T} \sum_{t=1}^{T} E(\log Y_i) = \frac{1}{T} \sum_{t=1}^{T} \text{Var}(\log Y_i) \]

(15)

\[ E(\log Y_i) \] can be estimated by \( \frac{1}{T} \sum_{t=1}^{T} \log Y_i \), the sample mean of the log observations for the \( t \)th period. The average of these sample means is the estimate of \( E(\log X) \).

Using the Taylor’s series expansion of \( \log X \) yields

\[ \text{Var}(\log X) = \frac{1}{E(X)^2} \text{Var}(X) \]

(16)

and

\[ E(\log X) = \log E(X) - \frac{1}{2E(X)^2} \text{Var}(X) \]

(17)

Combining (16) and (17) leads to

\[ \frac{1}{2} \text{Var}(\log X) = E(\log X) - \frac{1}{2E(X)^2} \text{Var}(X) \]

(18)

Given both \( \text{Var}(\log X) \) and \( E(\log X) \) derived earlier, \( \log E(X) \) can be obtained, which permit the estimation of \( E(X) \):

\[ E(X) = e^{\log E(X)} \]

(19)

Substituting into (16) yields

\[ \text{Var}(X) = \text{Var}(\log X) E(X)^2 \]

(20)

Using well-known formulas for the variance of a product of two variables, we then derive, using (10), that

\[ \text{Var}(Y_i) = \text{Var}(X) + \text{Var}(X_{e_i}) \]

(21)

The variance of shock \( \sigma^2 \) was estimated as the difference between the variance of the observed ungrouped expenditures (from Povcal of the World Bank) and the variance of the long-term distribution of the same data (simulated by the bootstrap method).
For 2005, using a CRRA of 3, large values for vulnerability-adjusted poverty lines are observed for the PRC ($1.88), Thailand ($1.56), Turkmenistan ($1.56), Georgia ($1.51), Malaysia ($1.51), and Viet Nam ($1.50). In 2010, the order did not change much—countries with high poverty lines include the PRC ($2.26), Malaysia ($1.82), Azerbaijan ($1.66), Viet Nam ($1.60), Thailand ($1.59), Tajikistan ($1.58), and Turkmenistan ($1.56).

Using vulnerability-adjusted poverty lines, the poverty rates and the number of poor can be calculated (Table 4.3). By comparing Table 4.3 with Table 5.3, the number of vulnerable is found to amount to 348.08 million people in 2005, 394.93 million in 2008, and 417.99 million in 2010 for the region as a whole. Clearly, the number of vulnerable individuals increases over time, corroborating with Figures 4.1 and 4.3. There is a large number of vulnerable in the PRC. Once vulnerability is incorporated (see Tables 4.3 and 5.2), its poverty rate increases from the 16.3% benchmark ($1.25 poverty line) to 31.8% in 2005 and from 11.6% to 28.7% in 2010. There are also large increases in Pakistan (from 22.3% to 30.6% in 2005 and from 13.5% to 24.5% in 2010), Tajikistan (from 6.6% to 16.4% in 2010), Bangladesh (from 50.5% to 56.4% in 2005 and from 43.3% to 50.9% in 2010), India (from 40.8% to 48.1% in 2005 and from 32.7% to 41.6% in 2010), Nepal (from 46.3% to 54.4% in 2005 and from 24.8% to 39.6% in 2010), Indonesia (from 21.4% to 29.6% in 2005 and from 18.1% to 27.1% in 2010), the Philippines (from 22.2% to 30.0% in 2005 and from 18.4% to 26.4% in 2010), and Viet Nam (from 24.9% to 35.1% in 2005 and from 14.0% to 25.4% in 2010).

Understandably, the number of vulnerable people is positively correlated with country size, although not perfectly. In 2010, the number of vulnerable totaled 228.54 million for the PRC, 109.87 million for India, 21.61 million for Indonesia, 19.10 million for Pakistan, 11.31 million for Bangladesh, 9.93 million for Viet Nam, and 7.45 million for the Philippines. The large number for East Asia corroborates well with anecdotal evidence presented in Figures 4.1, 4.3, 4.4 and Table 4.1.

Table 4.2: Vulnerability-adjusted Poverty Lines (CRRA = 3)

<table>
<thead>
<tr>
<th>Subregion/Country</th>
<th>2005</th>
<th>2008</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Central and West Asia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Armenia</td>
<td>1.39</td>
<td>1.45</td>
<td>1.39</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>1.46</td>
<td>1.60</td>
<td>1.66</td>
</tr>
<tr>
<td>Georgia</td>
<td>1.51</td>
<td>1.53</td>
<td>1.51</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>1.38</td>
<td>1.41</td>
<td>1.42</td>
</tr>
<tr>
<td>Kyrgyz Republic</td>
<td>1.36</td>
<td>1.56</td>
<td>1.49</td>
</tr>
<tr>
<td>Pakistan</td>
<td>1.40</td>
<td>1.39</td>
<td>1.47</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>1.46</td>
<td>1.57</td>
<td>1.58</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>1.56</td>
<td>1.56</td>
<td>1.56</td>
</tr>
<tr>
<td><strong>East Asia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China, People’s Rep. of</td>
<td>1.88</td>
<td>2.15</td>
<td>2.26</td>
</tr>
<tr>
<td><strong>South Asia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangladesh</td>
<td>1.35</td>
<td>1.37</td>
<td>1.38</td>
</tr>
<tr>
<td>Bhutan</td>
<td>1.36</td>
<td>1.44</td>
<td>1.50</td>
</tr>
<tr>
<td>India</td>
<td>1.37</td>
<td>1.39</td>
<td>1.40</td>
</tr>
<tr>
<td>Maldives</td>
<td>1.47</td>
<td>1.38</td>
<td>1.46</td>
</tr>
<tr>
<td>Nepal</td>
<td>1.43</td>
<td>1.50</td>
<td>1.56</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>1.42</td>
<td>1.45</td>
<td>1.45</td>
</tr>
<tr>
<td><strong>Southeast Asia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cambodia</td>
<td>1.37</td>
<td>1.43</td>
<td>1.46</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1.44</td>
<td>1.43</td>
<td>1.49</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>1.38</td>
<td>1.41</td>
<td>1.47</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1.51</td>
<td>1.81</td>
<td>1.82</td>
</tr>
<tr>
<td>Philippines</td>
<td>1.48</td>
<td>1.48</td>
<td>1.49</td>
</tr>
<tr>
<td>Thailand</td>
<td>1.56</td>
<td>1.55</td>
<td>1.59</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>1.50</td>
<td>1.56</td>
<td>1.60</td>
</tr>
<tr>
<td><strong>Pacific</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Fiji</td>
<td>1.41</td>
<td>1.46</td>
<td>1.48</td>
</tr>
<tr>
<td>Micronesia, Fed. States of (Urban)</td>
<td>1.38</td>
<td>1.40</td>
<td>1.41</td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>1.38</td>
<td>1.40</td>
<td>1.41</td>
</tr>
<tr>
<td>Timor-Leste</td>
<td>1.35</td>
<td>1.35</td>
<td>1.34</td>
</tr>
</tbody>
</table>

CRRA = coefficient of constant relative risk aversion.
Source: ADB estimates.
<table>
<thead>
<tr>
<th>Subregion/Country</th>
<th>Poverty rate (%)</th>
<th>Number of poor (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Central and West Asia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Armenia</td>
<td>6.6 2.8 4.1</td>
<td>0.20 0.09 0.13</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>2.8 1.0 0.6</td>
<td>0.23 0.09 0.06</td>
</tr>
<tr>
<td>Georgia</td>
<td>21.7 21.1 23.7</td>
<td>0.95 0.93 1.05</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>1.4 0.1 0.5</td>
<td>0.21 0.02 0.07</td>
</tr>
<tr>
<td>Kyrgyz Republic</td>
<td>26.5 12.2 12.1</td>
<td>1.36 0.64 0.65</td>
</tr>
<tr>
<td>Pakistan</td>
<td>30.6 29.0 24.5</td>
<td>48.48 48.57 42.48</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>25.0 18.3 16.4</td>
<td>1.61 1.22 1.13</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>1.6 0.4 0.2</td>
<td>0.08 0.02 0.01</td>
</tr>
<tr>
<td><strong>East Asia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China, People’s Rep. of</td>
<td>31.8 30.3 28.7</td>
<td>414.39 401.53 384.05</td>
</tr>
<tr>
<td><strong>South Asia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangladesh</td>
<td>56.4 53.6 50.9</td>
<td>79.24 77.92 75.62</td>
</tr>
<tr>
<td>Bhutan</td>
<td>22.8 15.2 9.1</td>
<td>0.15 0.11 0.07</td>
</tr>
<tr>
<td>India</td>
<td>48.1 45.6 41.6</td>
<td>549.20 543.56 509.96</td>
</tr>
<tr>
<td>Maldives</td>
<td>4.2 0.6 0.9</td>
<td>0.01 0.00 0.00</td>
</tr>
<tr>
<td>Nepal</td>
<td>54.4 46.5 39.6</td>
<td>14.83 13.43 11.87</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>17.0 11.6 8.5</td>
<td>3.38 2.37 1.77</td>
</tr>
<tr>
<td><strong>Southeast Asia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cambodia</td>
<td>39.4 30.8 23.3</td>
<td>5.27 4.25 3.29</td>
</tr>
<tr>
<td>Indonesia</td>
<td>29.6 30.9 27.1</td>
<td>67.18 72.49 64.94</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>47.2 42.0 36.5</td>
<td>2.71 2.53 2.26</td>
</tr>
<tr>
<td>Malaysia</td>
<td>0.9 1.2 1.2</td>
<td>0.23 0.32 0.35</td>
</tr>
<tr>
<td>Philippines</td>
<td>30.0 27.0 26.4</td>
<td>25.68 24.30 24.63</td>
</tr>
<tr>
<td>Thailand</td>
<td>2.9 1.4 1.5</td>
<td>1.91 0.96 1.01</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>35.1 27.6 25.4</td>
<td>28.95 23.51 22.06</td>
</tr>
<tr>
<td><strong>Pacific</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiji</td>
<td>21.6 9.2 12.3</td>
<td>0.18 0.08 0.11</td>
</tr>
<tr>
<td>Micronesia, Fed. States of (Urban)</td>
<td>33.2 35.1 35.2</td>
<td>0.01 0.01 0.01</td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>51.1 47.8 44.1</td>
<td>3.12 3.13 3.02</td>
</tr>
<tr>
<td>Timor-Leste</td>
<td>47.9 40.5 40.3</td>
<td>0.48 0.44 0.45</td>
</tr>
<tr>
<td><strong>Developing Asia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>37.3 35.3 32.6</td>
<td>1,250.04 1,222.50 1,151.05</td>
</tr>
</tbody>
</table>

Source: ADB estimates.
Section 5: Poverty in Asia: Reassessments and Projections

5.1. Introduction

Asia’s remarkable growth and success in reducing poverty means income or consumption poverty will continue to decline. Various projections using the $1.25 poverty line paint a very promising picture. Technically, extreme poverty in Asia under this poverty line may soon end.

However, a deeper look at poverty demonstrates that the $1.25 poverty line for Asia is inadequate. The threats of increased food insecurity and heightened vulnerability have been explored separately in earlier sections. Integrating them into an overall assessment of poverty in Asia will provide a more complete and appropriate basis for projecting future poverty levels.18

In this section, extreme poverty is re-estimated (Section 5.2) building on the regional poverty line for Asia and incorporating the effects of food insecurity and vulnerability. Then new poverty projections are offered, first using the conventional $1.25 poverty line, and then once the impact of the factors mentioned above are considered (Section 5.3).

5.2. A more comprehensive assessment of poverty in Asia

The preceding three sections explain why Asia’s poverty was underestimated. Using the regional poverty line for Asia alone (Section 2) adds about 10 percentage points to the regional poverty rate. Considering food insecurity (Section 3) adds 3-4 percentage points. And incorporating vulnerability adds about 10-12 percentage points. So taken together, what would Asia’s poverty profile look like? This can be obtained by building a combined poverty line (Box 5.1). The ranges of poverty lines for sub-regions are presented in Table 5.1.

Box 5.1: Constructing a Combined Poverty Line

The combined poverty line for each country i and year t can be expressed as

\[
\text{Poverty line}_{it} = \$1.51 \times \max(\text{food CPI}_{it}, \text{general CPI}_{it}) \times \text{Vulnerability adjustment}
\]

where $1.51 is the regional poverty line for Asia (Section 2) and the vulnerability adjustment is a function of \(\sigma_{R}^{2}\), which represents risk (see equation 8 in Box 4.4). The calculation begins by taking the regional poverty line of $1.51 as a starting point. To consider food insecurity, it is inflated by either the food CPI or general CPI (2005 = 100), whichever is larger. The result is \(P_{L1}^{1}\), which can be taken as the benchmark poverty line with food insecurity included. The impact of vulnerability and risk is included after adjusting \(P_{L1}^{1}\) for vulnerability.

Table 5.1: Combined Poverty Lines ($ in 2005 PPPs)

<table>
<thead>
<tr>
<th>Subregion/Country</th>
<th>Benchmark</th>
<th>Combined Poverty Line (Asian poverty line + food insecurity + vulnerability)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central and West Asia</td>
<td>1.25</td>
<td>[1.54, 1.89]</td>
</tr>
<tr>
<td>East Asia</td>
<td>1.25</td>
<td>[1.86, 1.86]</td>
</tr>
<tr>
<td>South Asia</td>
<td>1.25</td>
<td>[1.62, 1.96]</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>1.25</td>
<td>[1.63, 2.73]</td>
</tr>
<tr>
<td>Pacific</td>
<td>1.25</td>
<td>[1.62, 1.67]</td>
</tr>
</tbody>
</table>

Source: ADB estimates.

18 There are limitations to the estimation method used in this report for long term projections. For example, we rely on strict assumptions on how certain factors behave (such as economic growth), and no probabilities are associated with the estimated scenarios. Thus, the projections here can only provide a rough picture of future poverty in Asia and the Pacific.

Poverty estimates under the combined poverty lines encompass poverty induced by food insecurity and vulnerability (Tables 5.2 and 5.3). In terms of poverty rates (Table 5.2), for 2005, it increased from 26.9% to 48.7% for developing Asia as a whole, 18.8%
to 38.9% for Central and West Asia, 16.3% to 40.7% for East Asia, 41.5% to 62.7% for South Asia, 18.9% to 36.4% for Southeast Asia and 43.0% to 56.8% for the Pacific. For 2010, the increases were from 20.7% to 49.5% for developing Asia as a whole, 11.2% to 41.7% for Central and West Asia, 11.6% to 45.6% for East Asia, 33.2% to 58.2% for South Asia, 14.2% to 39.6% for Southeast Asia and 34.9% to 53.0% for the Pacific.

And in terms of the number of poor (Table 5.3), there was an increase for 2005 of 731.93 million for developing Asia (from 901.96 million to 1,633.89 million), 41.32 million (from 38.79 million to 80.11 million) for Central and West Asia, 318.75 million (from 211.85 million to 530.60 million) for East Asia, 282.05 million (from 552.03 million to 834.08 million) for South Asia, 88.71 million (from 95.87 million to 184.58 million) for Southeast Asia and 34.9% to 53.0% for the Pacific.

For 2010, the increases are 1,017.36 million for developing Asia (from 733.06 million to 1,750.42 million), 68.11 million (from 25.14 million to 93.25 million) for Central and West Asia, 454.57 million (from 155.51 million to 610.08 million) for East Asia, 356.75 million (from 472.72 million to 829.46 million) for South Asia, 136.33 million (from 76.59 million to 212.92 million) for Southeast Asia, 1.60 million (from to 3.10 million to 4.70 million) for the Pacific.

Naturally, some may wish to use different benchmarks or assumptions on how food insecurity and vulnerability contribute to poverty. But the results here can nonetheless be taken as indicative of the impacts of these factors.

### 5.3. Asia’s poverty projections using the $1.25 poverty line, and the combined poverty line which accounts for food insecurity and vulnerability

The key to projecting Asia’s poverty under the $1.25 poverty line is to forecast economic growth. ADB (2011a) used a Cobb-Douglas production function model—through which real GDP is determined by labor input, physical capital input, and total factor productivity growth. The projected GDP levels are converted into growth of per capita consumption expenditure (in 2005 PPP). This has been done using a regression model where the Box-Cox–transformed per capita consumption expenditure is regressed on the Box-Cox–transformed per capita GDP and a time trend. This predicts mean expenditure.

Assuming expenditure dispersion does not change over time, poverty can then be estimated simply by shifting expenditure distribution by the change in its mean. Of course, dispersion of the expenditure variable may well change over time. In this case, its impact on poverty can be estimated by the poverty elasticity of inequality presented in Wan and Francisco (2009), which requires forecast of inequality.

The Kuznets hypothesis is used to project inequality. In his classic paper, Nobel laureate Simon Kuznets (1955) established the relationship between
Poverty in Asia: A Deeper Look

inequality and industrialization or urbanization. Although almost all subsequent research replaced the industrialization or urbanization variable by per capita GDP, the urbanization rate is used here to explain and forecast inequality. This not only preserves Kuznets’ original idea, but allows use of projections of urbanization rates by the United Nations (2014b).

Thus, the Gini index is regressed on the urbanization rate and its square. Gini estimates from the World Bank’s World Development Indicators and the World Institute for Development Economics Research are combined to form an unbalanced panel of 30 economies in Asia and the Pacific. Countries with three Gini estimates or less are excluded. A model with fixed country effects fits the data best (Box 5.2). Using this model and urbanization rate forecasts, inequalities for individual countries can be easily projected.

Poverty projections are tabulated in Tables 5.4 and 5.5. Primarily due to strong economic growth, extreme poverty under the $1.25 poverty line will drop significantly in developing Asia in the coming years. The overall poverty rate in developing Asia is projected to decline from 20.7% in 2010 to 12.7% in 2015, 5.8% in 2020, 2.5% in 2025, and 1.4% in 2030.

The largest percentage point reduction will occur in South Asia—declining from 33.2% in 2010 to 1.6% in 2030. Poverty in Central and West Asia will drop from 11.2% in 2010 to 1.0% in 2030. It will be reduced in East Asia from 11.6% to 1.4%, Southeast Asia from 14.2% to 0.8%, and in the Pacific from 34.9% to 6.1%.

### Box 5.2: Projecting Inequality

Based on Kuznets (1955), the following model is specified and estimated:

$$\log Gini_t = \alpha + \gamma_1 \text{urb}_t + \gamma_2 \text{urb}^2_t + \gamma_3 t + \epsilon_t$$

The data used to fit the above model cover a unbalanced panel of 1978–2012 from 24 countries, including Armenia, Azerbaijan, Bangladesh, Bhutan, Cambodia, the People’s Republic of China, Fiji, Georgia, India, Indonesia, Kazakhstan, Kyrgyz Republic, the Lao PDR, Malaysia, Maldives, Nepal, Pakistan, the Philippines, Sri Lanka, Tajikistan, Thailand, Timor-Leste, Turkmenistan, and Viet Nam.

<table>
<thead>
<tr>
<th>Dependent Variable: Log Gini</th>
<th>Coefficients</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urbanization</td>
<td>0.017***</td>
<td>0.005</td>
</tr>
<tr>
<td>Squared urbanization</td>
<td>-1.57e-04**</td>
<td>6.58e-05</td>
</tr>
<tr>
<td>Time</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>Constant</td>
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<td>2.66</td>
</tr>
<tr>
<td>Dummy variables (not reported)</td>
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<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.58</td>
<td></td>
</tr>
<tr>
<td>Degree of Freedom</td>
<td>203</td>
<td></td>
</tr>
</tbody>
</table>

** significant at 5%, *** significant at 1%.

This model is used to generate Gini projections based on urbanization rate forecasts from United Nations (2014b).

### Table 5.4: Poverty Rate Projections (%)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Central and West Asia</td>
<td>6.5</td>
<td>2.5</td>
<td>1.3</td>
<td>1.0</td>
<td>17.1</td>
<td>9.3</td>
<td>3.3</td>
<td>1.8</td>
<td>41.1</td>
</tr>
<tr>
<td>East Asia</td>
<td>7.1</td>
<td>4.3</td>
<td>2.5</td>
<td>1.4</td>
<td>10.3</td>
<td>6.7</td>
<td>4.2</td>
<td>2.5</td>
<td>29.9</td>
</tr>
<tr>
<td>South Asia</td>
<td>21.0</td>
<td>8.7</td>
<td>3.1</td>
<td>1.6</td>
<td>34.7</td>
<td>18.3</td>
<td>7.2</td>
<td>2.9</td>
<td>54.9</td>
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<tr>
<td>Southeast Asia</td>
<td>6.9</td>
<td>2.5</td>
<td>1.3</td>
<td>0.8</td>
<td>14.9</td>
<td>6.5</td>
<td>2.7</td>
<td>1.5</td>
<td>32.4</td>
</tr>
<tr>
<td>Pacific</td>
<td>25.6</td>
<td>17.9</td>
<td>12.1</td>
<td>6.1</td>
<td>34.1</td>
<td>25.3</td>
<td>17.8</td>
<td>12.3</td>
<td>49.0</td>
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<td>5.8</td>
<td>2.5</td>
<td>1.4</td>
<td>21.5</td>
<td>11.7</td>
<td>5.2</td>
<td>2.5</td>
<td>41.2</td>
</tr>
</tbody>
</table>

Source: ADB estimates.

19 In this case, developing Asia is defined based on data availability. It accounts for 94.5% of the total population of ADB’s 45 developing member countries in 2010. It includes 26 economies: Armenia, Azerbaijan, Bangladesh, Bhutan, Cambodia, the PRC, Federated States of Micronesia, Fiji, Georgia, India, Indonesia, Kazakhstan, Kyrgyz Republic, the Lao PDR, Malaysia, Maldives, Nepal, Pakistan, Papua New Guinea, the Philippines, Sri Lanka, Tajikistan, Thailand, Timor-Leste, Turkmenistan, and Viet Nam.

By number of extreme poor, poverty in developing Asia will fall from 733.06 million in 2010 to 223.15 million in 2020 and 56.46 million in 2030, with a total of 509.91 million Asians rising above the $1.25 poverty line between 2010 and 2020 and a further 166.69 million between 2020 and 2030. The
The number of people moving above the $1.25 poverty line between 2010 and 2020 is 18.59 million in Central and West Asia, 94.30 million in East Asia, 334.27 million in South Asia, 61.56 million in Southeast Asia, and 1.19 million in the Pacific. Between 2020 and 2030, 3.73 million people in Central and West Asia will be lifted out of extreme poverty, with 41.14 million in East Asia, 111.21 million in South Asia, 9.49 million in Southeast Asia and 1.14 million in the Pacific.

The projections made above are in line with those from other sources. For example, Ravallion (2012, 2013) projected $1.25 poverty in the world into 2030. Under one scenario he examined global poverty rates since 1981 and concluded that the global poverty rate declined more or less by 1% per year. Assuming that such a trend continues, the poverty rate in the developing world would drop to 3% already in 2027. Under another scenario, he noted that during the past ten years household expenditure per capita in the world has been growing at a rate of 4.5% per year. If this growth rate were to continue, the poverty rate in the developing world would reach the level of 3% by 2027.

However, Yoshida, Uematsu, and Sobrado (2014) consider these over-optimistic. In particular, they criticize Ravallion’s assumptions of uniform population growth rates, uniform growth rates of mean household expenditure or income, and unchanged income or consumption distribution. And, of course, earlier forecasts do not consider the impact of the additional elements of poverty examined in this special chapter.

In what follows, more comprehensive poverty projections for Asia will be provided using the Asia-specific poverty line and incorporating the effects of food insecurity and vulnerability, in addition to relaxing the assumptions of uniform growth rates of mean household expenditure and constant consumption distribution. Such an exercise requires projecting per capita consumption for each country and each year, which have been done earlier in this section. Additional projections are needed for the ratio of food CPI over general CPI, and the variance of the disturbances (representing shocks). The needed population projections are readily available from United Nations (2014a).

### Projecting the price index ratio

To forecast the ratio of food price index to general consumer price index (FPI/CPI), historical patterns in different countries are examined first. Two distinct groups emerge: one seeing a continuous rising trend in the ratio—implying that food prices rose faster than general consumption prices—with the other seeing the ratio fluctuate.

Another finding is that current FPI/CPI ratios are highly correlated with their one-period lagged values, irrespective of group. Therefore, the price ratio follows an “autoregressive process”. A time series model taking advantage of this process can be estimated and used to predict the ratio (Box 5.3).

Different model specifications with structural variables—such as population and urbanization rate—were estimated in an attempt to enhance forecasting

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<td>2.71</td>
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<td>4.45</td>
<td>3.99</td>
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<td>1,531.92</td>
<td>1,229.69</td>
<td>973.03</td>
<td>708.43</td>
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</table>

Source: ADB estimates.
quality. However, they did not improve the quality of the original estimated model.

**Box 5.3: Price Ratio Projections**

A time trend and crisis dummy are added as the explanatory variables. To incorporate population heterogeneity, the weighted least square method is employed with population share as weights to estimate

\[
\frac{FPI}{CPI} = \alpha_i + \frac{FPI}{CPI}_{t-1} + \beta_2 \text{dummy}_\text{crisis} + \epsilon_i
\]

FPI/CPI data over 2000–2012 from 17 countries are used for model estimation. These countries include Armenia, Azerbaijan, Bangladesh, Cambodia, the People’s Republic of China, Georgia, India, Indonesia, Kazakhstan, Kyrgyz Republic, Lao People’s Democratic Republic, Nepal, Pakistan, the Philippines, Tajikistan, Thailand, and Viet Nam.

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<tr>
<th>Table B5.2: Food Price Ratio Model</th>
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<td>Dependent Variable: FPI/CPI</td>
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<td>Coefficient</td>
<td>Standard Error</td>
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<td>One period lagged FPI/CPI</td>
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<tr>
<td>Dummy for Crisis (year 2007 and 2008)</td>
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</tr>
<tr>
<td>Constant</td>
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</tr>
<tr>
<td>Estimates for fixed effects are not reported</td>
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<tr>
<td>Adjusted R-squared</td>
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<tr>
<td>Degree of Freedom</td>
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</table>

*** significant at 1%.

The one-period lagged FPI/CPI and the dummy for crisis are significant at 1%. The adjusted R-square is 0.83. As the regression is a cross-country first order autoregression, R-squared is sufficiently high for the purpose of making projections. Using the parameter estimates, the FPI/CPI for each country/year can be projected.

**Projecting variances (representing risks)**

Variances reflecting unpredictable shocks to expenditures were used to obtain vulnerability-adjusted poverty lines (see Section 4). To project the variance, one must find its correlates—which include the mean of the underlying expenditure distribution, one-period lagged variances, and the country fixed effect. Consequently, a first-order autoregressive model with country fixed effect and the mean of the underlying expenditure distribution, variance, one must find its correlates—which include adjusted poverty lines (see Section 4). To project the expenditures were used to obtain vulnerability-based on this model.

**Poverty projections**

Tables 5.4 and 5.5 tabulate the resulting poverty projections. In Table 5.4, the poverty rate projections are under $1.25, $1.51, and the combined poverty line. Table 5.5 presents the corresponding poverty numbers. As the combined poverty line is multiplicative in nature (see Box 5.1), total poverty under this line is larger than the sum of poverty estimated in Sections 2–4. The difference represents the additional poor who suffer food insecurity as well as vulnerability simultaneously. For example, a household may not be poor under the threat of food insecurity or of vulnerability, separately. But it may become poor when hit by both food insecurity and vulnerability at the same time.

Table 5.4 and Figure 5.1 show that the poverty rate as well as the number of poor under both the $1.25 and $1.51 poverty lines decline dramatically for all subregions, except for the Pacific, which is projected to have slower future economic growth. For Asia as a whole, the $1.51 poverty rate decreases from around 21.4% in 2015 to 2.5% in 2030, technically meaning poverty has been eradicated. However, adding food insecurity and vulnerability slows the pace of poverty reduction. More importantly, it leads to a different conclusion: poverty rate remains as high as 41.2% in 2015, declines to 31.7% in 2020, 24.2% in 2025 and 17.1% in 2030. South Asia will have relatively
Box 5.4: Variance (shocks) Projection

A first-order autoregression with mean consumption expenditure as the additional explanatory variable is postulated to model the variance

$$\tilde{\sigma}_{it} = \alpha_i + \lambda \tilde{\sigma}_{it-1} + \beta \hat{\mu}_{it} + \varepsilon_{it}$$

where it is expected that $\lambda > 0$ and $\beta > 0$.

The data used to fit the above model cover a unbalanced panel of 1978–2012 from 24 countries, including Armenia, Azerbaijan, Bangladesh, Bhutan, Cambodia, the People’s Republic of China, Fiji, Georgia, India, Indonesia, Kazakhstan, Kyrgyz Republic, Lao People’s Democratic Republic, Malaysia, Maldives, Nepal, Pakistan, the Philippines, Sri Lanka, Tajikistan, Thailand, Timor-Leste, Turkmenistan, and Viet Nam.

The intercept, one-period lagged standard deviation of noise, and the mean of the distribution are all significant at 1%. The coefficient for the one-period lagged standard deviation of noise is 0.642 and the coefficient for the mean of the distribution is 0.113. The adjusted R-squared is 0.94.

<table>
<thead>
<tr>
<th>Table B5.3: Vulnerability Model</th>
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<tr>
<td>Dependent Variable: Standard Deviation of Noise $\tilde{\sigma}_{it}$</td>
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<tr>
<td>One-period lagged standard deviation of noise $\tilde{\sigma}_{it-1}$</td>
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<tr>
<td>Mean of the distribution $\hat{\mu}_{it}$</td>
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Estimates for fixed effects are not reported

Adjusted R-squared | 0.94
Degree of freedom | 446

*** significant at 1%.  
1 Linear interpolation has been used to get continuous annual data.

high poverty rate throughout: 54.9% in 2015, 45.5% in 2020, 35.0% in 2025, and 24.5% in 2030. For the Pacific, the poverty rate is 49.0% in 2015, decreasing to 27.0% in 2030. Central and West Asia’s poverty rate will decline from 41.1% to 20.1% over 2015–2030. Poverty in Southeast Asia will decline from 32.4% (2015) to 9.7% (2030). For East Asia, the poverty rate will drop from 29.9% in 2015 to 14.6% in 2025, and down further to 10.9% in 2030.

In terms of number of poor in 2030 for the region (Figure 5.2), the $1.25 poverty line leaves only 56.46 million poor. Using the $1.51 regional poverty line increases the number of poor to 103.89 million. But under the combined poverty line, the number of poor is as many as 708.43 million in 2030.
Section 6: Summary and Policy Implications

6.1. Summary

Asia and the Pacific will likely see extreme poverty eradicated by 2025—when measured using the current conventional extreme poverty line of $1.25/person/day. However, previous sections have shown that this measure does not give a complete picture of extreme poverty in the region.

First, the $1.25 poverty line is based on 1988-2005 data, highly weighted by Africa. Therefore, it is not just outdated, but inappropriate for measuring poverty in Asia. When updated Asian data is used, the result is a $1.51 regional poverty line. Using this, an additional 343.20 million people in 2010 were identified as extremely poor. The 2010 regional poverty rate climbs to 30.5%, instead of the 20.7% more commonly cited.

Second, food insecurity has become an emerging challenge for many countries in the region. With food prices rising much faster in recent years than consumer prices generally—with price volatility up as well—the near-poor find it more difficult to meet basic nutritional needs. When factored in, food insecurity adds 4 percentage points to the region's poverty rate, increasing the number of Asia's extreme poor in 2010 by 140.52 million. And with urbanization likely to divert more land and water resources away from food production, food insecurity will remain a key development challenge for years to come.

And third, low income households face increasing vulnerability from various risks or shocks such as those from frequent natural disasters and illness. Given limited resources, the poor are typically risk-averse. These constraints leave low income households more exposed to vulnerabilities and uncertainties that reduce welfare. Using a vulnerability-adjusted poverty line adds another 417.99 million people to the number of extreme poor in 2010 identified under the $1.25 poverty line.

Combining these factors—withstanding possible overlaps—offers a more complete picture of extreme poverty in Asia and the Pacific\textsuperscript{20}. Thus, in 2010, 1,750.42 million Asians, or 49.5%, could be considered living in extreme poverty, instead of 733.06 million (20.7%). This underscores the fact that, despite all the economic growth over recent decades, poverty in Asia must remain a priority development challenge well past 2030, when an estimated 17.1\% (or 708.43 million Asians) will remain extremely poor.

How should Asia confront these realities? Needless to say, economic growth, prudent macroeconomic management and good governance remain fundamental. Also, regional cooperation can be helpful. But the quality of growth is just as critical. The challenges of tackling food insecurity and increasing vulnerability will require policy strategies that are in some ways generic, but adapted to specific domestic conditions.

6.2. Tackling food insecurity

Improving food availability, its affordability and access, and stabilizing food supply are partial solutions.

**Ensure food availability.** Improving farm productivity is the fundamental long-term solution to food insecurity. This can occur through (i) improved productivity in food production, and/or (ii) enhanced

\textsuperscript{20} Poverty estimates under the combined poverty lines, as reported in Section 5, do not equal to the sum of poverty estimates obtained in Sections 2 to 4. This is because the combined poverty line is a product, not sum, of Asian poverty line and poverty lines adjusted for food insecurity and vulnerability.
postharvest productivity—more efficient marketing and better storage (including refrigeration) and transport infrastructure (ADB 2012a).

The potential for improving productivity varies as crop yields differ widely across countries in Asia (Table 6.1). Regardless, it will require innovation through research and development (R&D), technology transfer and adoption through extension and on-farm assistance (applying appropriate technologies). Private sector investment in R&D is increasingly important (corporate or through foundations). It must be sufficiently large and long-term as many innovations lack immediate commercial potential.21 R&D investments that increase yields and improve quality must be attuned to the landless and small-holders, particularly marginal farmers in mountainous or remote regions (Asia Society and IRRI 2010). These small farmers make up the vast majority of the rural population (Salim 2010).

In Asia, the search for alternatives to rice and wheat is important. A case in point is the potato, which has high yields and produces more energy and protein per unit area than many other crops. It also fits well into multiple-cropping systems prevalent in the region. However, most potato varieties used in the region, originally from Peru, were developed for European or North American climates. It is already known that R&D can contribute to developing potato varieties more suited to tropical climates as well as to current production technologies and postharvest processing (ADB 2012a).

Research by itself does not directly lead to higher farm productivity. New knowledge must be transmitted to farmers through extension work. In this context, reforms are needed to bring about an extension system that is demand driven, responsive to farmers’ needs, and accountable to the farmer, rather than the supply-driven systems prevailing across much of the region (ADB 2012a). Agricultural extension and information services should form part of a national multi-sectoral integrated food security agenda (Rivera and Qamar 2003).

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</tbody>
</table>


21 A prime example is private sector and foundation involvement in rice breeding research and extension services (Asia Society and IRRI 2010).
subsidies for inputs such as fertilizers, seed and others (Timmer 2014).

Infrastructure investments on irrigation, transport and communications play a critical role in boosting food production. Irrigation allows farmers to harvest more than once a year. Nepal and Afghanistan, for example, have the ability to increase and intensify crop production. But proper irrigation has yet to reach even half of irrigable farmland (World Bank 2010).

**Ensure Affordability and access.** A person’s ability to purchase adequate food depends on its affordability and access. Having decent and sustainable employment is prerequisite (see Section 6.3). Developing and expanding agroindustry goes far in helping raise rural incomes. Another way is to promote rural non-farm industries. For example, town-and-village enterprises in the PRC employ some 100 million rural workers. To promote rural non-farm industries, improving the rural investment climate and quality of rural human capital is vital. Both are key requirements in developing and expanding small and medium enterprises (SMEs) (Asia Society and IRRI 2010).

A major determinant of food access is price. Without rising income or expenditures, high and rising food prices make access to food far more difficult, especially given the poor’s large food budget share. Rising prices erode purchasing power and can easily push those just above the poverty line into poverty. Those already poor may find themselves on the verge of hunger and malnutrition. From this perspective, targeted food aid can protect the poor from an irreversible deterioration in their food or caloric intake. It can also reduce deleterious price effects on producers as targeted food aid does not cause price distortions in the market (Ninno, Dorosh, and Subbarao 2005, Timmer 2014). Reallocation of government subsidies away from biofuels to food crops is also an incentive for farmers to revert back to food production (Nellemann et al. 2009).

Crises make affordability and access serious problems. Social protection systems—including crop insurance—should be expanded to cover more eventualities (World Bank 2005). In general, though, governments should abandon costly general subsidies and adopt targeted safety net programs—such as cash transfers or food stamps, feeding programs for school children, and food-for-work programs. These do not distort markets (as food subsidies do), and they are more effective (as they are targeted). Cash transfers may even have a multiplier effect on the local economy, making them more sustainable (ADB 2012a).

**Maintain stability.** Production shortfalls, high input prices and trade restrictions are some of the causes of unstable food supply. National grain stocks can stabilize prices and help domestic food security, although storage can be costly. Stocks must be released in a transparent, preannounced manner—and only when prices are unusually high. On the other hand, emergency reserves can be released to meet the immediate food requirements of a population hit by transitory food insecurity. Each ASEAN member, for example, maintains a national rice reserve. Regionally coordinated reserves—as are being discussed—could help allow members to tap into the regional reserve pool and reduce storage costs (ADB 2012a).

An emergency fund, which could be used to finance safety net programs, might also be considered. Private sector incentives—such as tax deductions—would allow companies to contribute to the fund, perhaps run by a government agency in partnership with the private sector. The fund can be linked to insurance against natural disasters and other calamities (ADB 2012a).

Food trade can help stabilize food prices and ensure food security. But national policies often vie against liberalization, particularly when it comes to food. Further, negotiating multilateral rules on export restrictions or even a reduction in import restrictions on food has always been difficult. Here,
regional cooperation holds potential. Food-importing countries can negotiate with food-exporting countries to ban unilateral export restrictions by agreeing to reduce levels of self-sufficiency in exchange. This could be augmented by agreements for the establishment of emergency food stocks and financial aid.

Accurate and timely information on food markets and stocks can help policy coordination, mitigate price volatility and avoid speculation. For example, when a lower food stock level is anticipated, appropriate tax or price incentive schemes may be put in place to intensify food production.

R&D can also play a role by building resilience across agricultural systems. A good example is the development of new rice varieties with increased tolerance of abiotic stress (such as drought, flooding, and salinity), resistance to insects and disease, and improved micronutrient content through new precision-breeding approaches (Asia Society and IRRI 2010). Drip irrigation technology can also help use water more efficiently.

6.3. Tackling vulnerability

**Disaster risk reduction.** Identifying and assessing areas and population groups at risk—along with the sources of vulnerability—is an essential precondition for disaster risk reduction (DRR) (Joakim 2011). This information—in the form of vulnerability mapping—provides the growing global disaster-response community with more precise knowledge on who to target, before or during a disaster strike (Birkmann 2007). These maps indicate community resources and response capacities—such as shelters, community centers, parks, local service groups, and neighborhood response networks (Morrow 1999). They must be constantly updated with new data and better forecasting techniques. More research is needed to analyze the dynamic processes of vulnerability to better detect how susceptibility to disaster changes, as well as the coping and adaptive capacities (BEH 2011).

DRR investments can reduce disaster vulnerability. They focus on what can be done to deal directly with hazards—which include forest conservation to reduce probabilities of landslides and flooding; careful land use planning to minimize exposure to hazards; early warning systems and livelihood diversification into more resilient occupations. Government investment in DRR is increasing in Asia. For example, in 2006, Indonesia allocated 0.6% of its budget to DRR, growing to more than 1% by 2012. Bangladesh has invested more than $10 billion over the past 35 years, resulting in declining disaster losses. And the PRC’s Comprehensive Disaster Prevention and Reduction Plan (2011-2015) is designed to reduce annual disaster losses to less than 1.5% of GDP (Bonapace, Srivastava, and Mohanty 2012).

There has been an exponential increase in small- and medium-scale disasters, increasing vulnerability. Thus, it is important to involve vulnerable people themselves in planning and implementing mitigation measures. This bottom-up approach is now widely accepted, in which the community participates in each stage of disaster risk management—from situational analysis to planning to implementation (Yodmani 2001). This approach requires building community capacities, local resources, and strategies to cope when disaster strikes (Yodmani 2001, BEH 2011).

The current practice of international disaster relief organizations centers on jumping in quickly once a disaster occurs. While providing immediate relief, it is not as helpful as having local teams prepared to provide onsite knowledge and ownership. Long-term and proactive engagement is required. Disaster risk reduction must begin long before disaster strikes (BEH 2011). In particular, early warning systems must be expanded.
Addressing climate change—mitigation and adaptation. Climate change is closely related to DRR in terms of rising vulnerability. Plenty has been written on its consequences and suggested policies. There are mitigation policies that have proven environmentally effective—such as reducing fossil fuel subsidies, taxes on carbon charges on fossil fuels for energy supply; taxes on vehicle purchase, registration, and motor fuels; taxes on vehicle use, road and parking pricing; investments in environmentally sound public transport facilities and non-motorized transportation; public sector leadership programs, including procurement and incentives for energy service companies (ESCOs); providing benchmark information, performance standards, and subsidies, tax credits for industry; financial incentives and regulations for improved land management, maintaining soil carbon content, and efficient use of fertilizers and irrigation under agriculture (Metz et al. 2007).

Adapting to climate change requires everyone to hold some type of resilience with the capacity to cope and respond to both current and future events and seek to build on a community’s existing strengths (Joakim 2011). Five generic approaches to anticipatory adaptation have been identified: (i) strengthening physical infrastructure to withstand climate change impact—for example, to extend the temperature or rainfall range a system can withstand; (ii) increasing flexibility of potentially vulnerable managed systems—for example, changing land use or relocating vulnerable populations; (iii) making vulnerable natural systems more adaptable—for example, reducing stress due to non-climatic effects, or removing unnecessary barriers to the migration of plants or animals; (iv) reversing trends that increase vulnerability—ranging from reducing human activity in vulnerable areas to preserving natural systems that protect against hazards; and (v) improving public awareness and preparedness—public information campaigns on the risks and possible consequences of climate change and establishing early warning systems for extreme weather events. These are all relevant for hazard risk reduction, whether in coastal zones or within megacities. There is no clear-cut boundary between preparing for climate change and reducing weather-related hazard risks (Klein, Nicholls, and Thomalla 2003).

The success of climate change adaptation strongly depends on development progress in general. Climate change does not occur in isolation. For example, while providing a rural household with a more drought-resistant subsistence crop may help, a better strategy improves food security through a set of coordinated measures that include agricultural extension, crop diversification, integrated pest management, and rainwater harvesting. In addition, if a poor rural household has at least one literate family member, it will more likely use these options, particularly if it (i) has access to investment capital through local financial institutions, (ii) it can draw on relatively intact social networks, and (iii) it can hold policymakers accountable. In other words, it takes more than narrow, climate-focused measures to build adaptive capacity (Klein 2010).

Social assistance and protection. In developing Asia, social safety nets have not kept up with rapid economic growth. Statistics indicate that the government pays only a small portion of losses due to disasters (Figure 6.1). This has a major impact on the poor. A comprehensive social security system aimed at protecting vulnerable groups, including...
the elderly, needs to be established (Giang and Pfau 2009). Vulnerability maps can be used to implement social protection with better and more effective targeting.

Generally, the elderly are more likely to suffer health-related problems. They are less likely to respond to risks and are slower to recover from illness. Some are reluctant to leave their homes when told to evacuate. The community requires not only advance knowledge of their location and circumstances, but also an understanding of their concerns (Giang and Pfau 2009). A child’s vulnerability is self-evident, especially for those without adequate family support. School systems in disaster-prone areas should be actively involved in prevention and evacuation planning, and develop realistic, timely plans for resuming classes (Morrow 1999).

Living in mountainous or coastal areas is the strongest single determinant of vulnerability (McCulloch and Calandrino 2003). Governments and NGOs need to improve outreach programs to ensure relief is available, particularly during the immediate response to natural disasters (Toufique and Yunus 2013). These include emergency shelter, markets, health care, schools, and fire services, among others.

**Diversification of income sources.** In rural areas, being able to earn a living from multiple work is better than relying on a single income source. This clearly reduces vulnerability (Ellis 2000). This diversification may also increase income as different types of work can be done during different times of the year (Dercon 2002). In particular, expanding non-farm activities can help smooth income. But poor households have limited opportunity to diversify due to their lack of assets and entrepreneurship (Gaiha and Imai 2004). This is one reason why financial inclusion and human capital formation for the poor are important.

For example, non-farm employment significantly increased per capita consumption or expenditure for people in rural Viet Nam and India. A significant number of households are not only poor but vulnerable to weather shocks, illness or macro-economic slowdowns. Thus, diversification helps reduce these risks (Imai, Gaiha, and Thapa 2012).

**Inclusive finance and education.** Education and skills can significantly influence household resilience to vulnerabilities. They help gain knowledge on coping strategies and dealing with bureaucracies during relief and recovery, particularly in gaining access to assistance programs (Morrow 1999). For example, better education helped reduce the risk of food inadequacy in Timor-Leste (Jha and Dang 2010). It was also found to be highly negatively correlated with vulnerability in rural Sichuan in the PRC. Addressing gender gaps in human capital also reduces vulnerability and poverty (McCulloch and Calandrino 2003).

Access to capital is also important, particularly as a buffer against financial shocks. For households, microfinance institutions that offer savings and insurance (as well as credit) allow families to maintain consumption in the face of shocks without having to sell livestock or other productive assets (Johnson 2006). Microfinance can also strengthen mutual support networks and empower women, which both help reduce vulnerability among members (Swain and Floro 2011, Donaghue 2004). It can also help consumption smoothing as vulnerable households can draw on credit or savings when dealing with a shock to family expenditures (Montgomery and Weiss 2006).

**Market-based instruments.** Despite a recent boost in providing agricultural insurance—mainly in the PRC—less than 20 countries in Asia have agricultural insurance schemes. Thus, the major
challenge for policy-makers is to develop or scale-up the range of insurance products and services, and then market them. Where there is currently little agricultural insurance supply, governments can help create the insurance infrastructure, including (i) establishing an enabling legal and regulatory framework; (ii) enhancing weather station infrastructure along with data and information systems; (iii) carrying out insurance product R&D; and (iv) arranging education, training and capacity building for insurers, distributors and farmers. In some situations it may also be cost-effective for governments to provide catastrophe reinsurance protection. And finally, while governments may wish to use carefully targeted premium subsidies to promote the purchase of agricultural insurance, they should exercise caution if offering open-ended premium subsidies—once introduced, they are very difficult to withdraw. In particular, smaller countries only now trying to scale up their agricultural insurance programs may find large premium subsidy costs prohibitive.

Only a few countries in Asia have achieved universal or near-universal health insurance coverage. Here, government subsidies are critical for the poor. A good example is the PRC’s New Rural Cooperative Medical Scheme, which targets the entire rural population. The government provides 80% of the revenue and subsidizes premiums and co-payments for the poorest families (ADB 2013).

Finally, the availability of microinsurance in the region is growing, as it is one risk-coping instrument particularly good for the poor. It offers comprehensive coverage and reduces vulnerability to a wide array of risks (Collins et al. 2010).

6.4. Other Poverty-related issues

The scope of poverty analysis is broad and evolving. Aside from the three issues of Asia’s poverty story examined in this chapter, there are other relevant challenges that deserve attention.

**Multidimensional poverty**

Until recently, poverty was measured using money-metric poverty lines. The fact that wellbeing is multifaceted means poverty is intrinsically multidimensional. Thus, money-metric measures do not provide a complete picture of well-being for either individuals or households. Other dimensions need to be taken into account (see Hulme and McKay 2007, Carter and Barrett 2006, Baulch and Masset 2003, McKay and Lawson 2003). Money means little when there is market failure—or where markets simply do not exist.

Empirical evidence is emerging that shows a lack of correlation between monetary income and other dimensions of human wellbeing (Baulch and Masset 2003, McKay and Lawson 2003, Günther and Klasen 2009). Non-monetary poverty tends to be more persistent than monetary poverty. For example, once a child is stunted, it is almost irreversible regardless how the income status of the person evolves. The same can be said about education—most school dropouts remain poor in terms of human-capital, even if some may grow rich later in life (Baulch and Masset 2003, Stifel, Sahn, and Younger 1999).

The challenge lies in developing a set of indicators and weights that allow for a consistent analysis of poverty over time and across space. The Multidimensional Poverty Index (MPI) published by UNDP in 2010 is a first attempt to create this type of comparable poverty measure. It uses a so-called “dual cut-off” method (Alkire and Foster 2011), where the first cut-off defines whether a household is deprived in a particular dimension, with the second cut-off determining whether a household has passed the threshold of deprivation that defines them as multidimensionally poor.
While many details have yet to be worked out (Dotter and Klasen 2013), one could still generate an Asia-specific version of an MPI. Why and how an Asian MPI would have different indicators, cut-offs, or weights remain uncertain. It is not a straightforward question and must deal with Asia’s great heterogeneity.

Relative poverty

Relative poverty has been a growing research field over the last two decades. Analyzing the impact of a so-called “reference income/group” on life satisfaction has been of particular interest. In other words, the welfare of an individual depends not only on one’s own income, but also that of others. For example, the utility of an individual is negatively affected by the income of anyone with higher income (Duesenberry 1949).

The challenge often lies in how to identify the reference group. One way would be to consider colleagues (Senik 2009). For example, Clark and Oswald (1996) analysed job satisfaction by defining the reference group of a worker as the employee who had the same kind of job, and same age and qualification. Ferrer-i-Carbonell (2005) formed the reference group using people with the same characteristics such as age, level of education and region of residence. Others use 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 (Kingdon and Knight 2007). The objective rank of an individual in the area where they live has also been shown to affect life satisfaction from consumption (for example in Nepal) (Fafchamps and Shilpi 2008).

Poverty challenges brought about by rapid urbanization

Asia faces unprecedented urbanization (ADB 2012b). And it is taking a lot less time to reach 50% urbanization (from 10%). It took 210 years (between 1750 and 1960) for Latin America, 160 years for Europe (from 1800 to 1960), 105 years for North America (from 1825 to 1930), and Asia is expected to take 95 years (from 1930 to 2025).

Urbanization and poverty are closely intertwined from several perspectives. First, Asia’s cities are full of poor people—not because cities make people poor, but because they attract poor people anxious to improve their lot in life (Glaeser 2011). Worldwide, the share of urban poverty to total poverty has risen alongside urbanization. It rose from 49.5% in 1993 to 58.0% in 2002 (Ravallion, Chen, and Sangraula 2007). In Asia, irrespective of the poverty line used (conventional or national), there is a clear trend toward geographical relocation of poverty from rural to urban areas. Urban poverty rose not only as a share of total poverty, but often in absolute numbers as well.

Second, urban cost of living is much higher than in rural areas. This is due to relatively weak internal market integration and the existence of geographically non-traded goods between urban and rural areas. Ravallion, Chen, and Sangraula (2007) found that national urban poverty lines were, on average, 30% higher than rural poverty lines. In Cambodia, for example, different poverty lines were used by the government in 1999—KHR2,470 per capita per day in Phnom Penh, KHR2,093 in the other urban areas, and KHR1,777 in rural areas (Haughton and Khandker 2009). In addition, as one relocates from the countryside to cities, public transportation and a variety of public services either unavailable or otherwise free must be paid for. These people have to buy almost everything in the marketplace. Moreover, basic needs expand with development—particularly during early stages of development. Migrants generally earn more than they did in the countryside, making some previously peripheral purchases an absolute necessity in an urban environment (such as the mobile phones cited earlier).
Finally, people may feel poorer in cities than in the countryside for several reasons: (i) they are known to be more vulnerable to shocks, both natural or economic; (ii) they probably have stronger feelings of deprivation because they can see higher standards of urban living; (iii) social ties become weaker in urban areas, leaving people feeling more deprived in social capital after migrating.

**Chronic vs. transient poverty**

The analysis here does not distinguish between chronic and transient poverty. This distinction is important because ways to alleviate each type differ. Appropriate insurance schemes (such as crop insurance) and other consumption-smoothing measures can be effective in reducing transient poverty. But they are unlikely to work against chronic poverty. Significant investment in human and health capital and some redistribution of assets—particularly land— are better at reducing chronic poverty.

A household can be chronically poor because its response to risk permanently lowers consumption (McCulloch and Calandrino 2003). The quest for household security can lock poor people into social structures that reduce vulnerability, but keep them poor nonetheless. Many households ‘stay poor’ in an attempt to ‘stay secure’ (Wood, 2003). If measures of chronic poverty are based on mean consumption over time, then a large part of chronic poverty in fact reflects risk (Elbers and Gunning 2003). And conventional approaches tend to underestimate chronic poverty (Wan and Zhang 2013).

**6.5. Concluding remarks**

Fast growth has made Asia a role model in reducing extreme poverty—measured by the conventional $1.25 poverty line. However, that fast growth has been accompanied by rising food insecurity and vulnerability. Exploring these lead to the conclusion that poverty will remain a serious challenge for Asia including those already in the middle-income stage—well beyond 2030. To confront this challenge, in addition to promoting growth, Asia must enhance food security and reduce vulnerability. This requires resources, assistance and appropriate policies targeted at the poor by national governments, development agents, and donors from Asia and beyond.
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Poverty in Asia: A Deeper Look


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The special chapter of Key Indicators for Asia and the Pacific 2014 entitled “Poverty in Asia: A Deeper Look” finds that despite Asia’s remarkable achievements in poverty reduction, poverty will continue to be a feature in the region beyond 2030. This finding is based on methodologies that take into account: a consumption basket representative of Asia; rising food insecurity; and rising vulnerability to natural and man-made shocks.

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ADB’s vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region’s many successes, it remains home to approximately two-thirds of the world’s poor: 1.6 billion people who live on less than $2 a day, with 733 million struggling on less than $1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

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