

estimate is only 77 percent of the chain estimate. Figure 33.3 shows both estimates for 1970 for all the African economies in the Penn World table. Most countries are close to the 45-degree line, but there are many exceptions: the ratios of adjusted to unadjusted GDP were 69 percent for Algeria, 80 percent for Lesotho, 79 percent for Nigeria, 62 percent for Uganda, and 128 percent for Zambia (the price of copper was *lower* in 1985 than in 1970.) Although some of these differences reflect the difference between output and income measures of GDP—commodity price changes have no (direct) effect on physical output although they make the country richer or poorer — these examples should illustrate the conceptual difficulties of making international comparisons in a many commodity world. (Note that I am not concerned here with measurement error, but with what is essentially an aggregation problem. The Penn World Table take their underlying data from the national accounts of the countries themselves, and these data are repriced, not corrected.)

Although these difficulties are real enough, they are minor compared with those in making comparisons across space. International differences in relative prices are both large and systematic, so that the choice of base country makes a large difference to the estimates. Because labor is relatively cheap in poor countries, the relative price of non-tradeables to tradeables rises with economic development, so that, for example, services and government tend to be relatively cheap, and investment relatively expensive in poorer countries. There are associated substitution patterns in both production and consumption which give rise to the standard biases associated with fixed weight or current weight index numbers. Using American wage rates to revalue Indian labor costs will tend to overstate Indian relative to American GDP, because Indian GDP is (or should be) more specialized in labor-intensive activities, a substitution effect that is turned into apparently high income by applying the prices of a labor-scarce economy. In India, servants — both domestic and civil — are cheap and widely used, so that, at American prices, the real size of the domestic service sector in India is exaggerated. For the same reasons, making comparisons in American prices will bias down the estimated growth rates of the poorer countries, since rising real wages will narrow the relative price differentials, and progressively reduce the exaggeration of GDP in LDCs.

Once we go beyond output measures to interpret GDP as a measure of living standards, then we also have to face the question of whether it makes sense to treat preferences as identical across 'countries, or at the very least, whether international differences in climate and the conditions of production do not severely compromise international welfare comparisons. The problem of calculating the comparative costs-of-living for an American diplomat in Karachi or Reykjavik is well-defined and calculable to some degree of approximation. It is more of an open question whether it makes sense to