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Asia and Pacific Region
Sub-National Purchasing Power Parities
Case Study for The Philippines

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I. Introduction

1. The International Comparison Program (ICP) is a world-wide statistical project designed to compare the levels of economic activity and relative price levels between countries. The ICP uses each country’s national accounts as the basis of the international comparisons, so the broadest estimate of economic activity provided by the ICP is gross domestic product (GDP), which measures the gross values added of all resident producers in an economy (e.g. a country or region within a country). GDP can also be measured as the sum of final expenditures (consumption and investment) plus exports less imports of goods and services, which is the approach used in the ICP.

2. The main aim of the ICP is to provide estimates of GDP and its major aggregates for all countries, expressed in a common currency, to enable the level of economic activity in any pair of countries to be directly compared. The level of GDP per capita provides an indication of relative living standards between countries and this important statistic is also available from the ICP. The relative price levels of countries can be compared using purchasing power parities (PPPs), which are important outputs of the ICP, in conjunction with exchange rates to derive price level indexes (PLIs).

3. The Asian Development Bank (ADB) was responsible for coordinating the Asia-Pacific region’s participation in the 2005 ICP. The results were published in 2007 in an ADB publication 2005 International Comparison Program in Asia and the Pacific: Purchasing Power Parities and Real Expenditures. They included PPPs, real expenditures expressed in a common currency (Hong Kong dollar) and PLIs for gross domestic product and its major aggregates for 23 economies in the region.

II. Time series national accounts

4. National accounts are generally produced as time series so that changes in economic activity from one period to another can be observed. Most countries produce national accounts estimates annually, with many also producing quarterly estimates to provide an up-to-date indicator of economic activity. Initially, all values are expressed in terms of the prices prevailing during the accounting period being considered (i.e. the annual value for a single product is equal to the quantity produced times its average price for the year). A very useful refinement is to express the values of various national accounting aggregates (including GDP) at constant prices (often referred to as “volumes”), which involves removing the effects of price changes over time from the values. Volumes are important because they show how actual productive activity changes over time. In concept, the volume of a single product can be obtained by substituting the price underlying a value in the latest year by that from some past year (or “base year”). These volumes can be summed to obtain volumes for broader aggregates, up to the level of GDP itself. In practice, volumes are typically obtained by deflating the values for each period by price indexes (“deflators”) that measure the price changes of the products underlying each value. The prices on which these deflators are based are mainly obtained from official price indexes, such as the consumer price index or the various producer price indexes compiled by national statistical offices.

5. Price indexes are constructed by weighting together prices of individual products, with the weights being based on each products relative importance within the group of products that make up the overall index. For example, a price index for bread and cereals would be based on prices for different types of rice, flour and other cereal products, bread, other bakery products, and pasta. In Asian countries, the weight applied to rice would be much higher than that for bread because rice is more important than bread in the average family’s expenditure. The method used to collect the prices
for each product in a price index is to observe the selling price for an identical product in each successive month or quarter to ensure that each product being priced is of consistent quality in each period. If a product becomes unavailable then it is replaced in the price index by a similar product. A key feature of this process is that each product being priced is **comparable** over time.

III. International comparisons

6. In their simplest form, PPPs are the ratios of prices between different localities (countries or regions) and, as a result, they are often referred to as providing “spatial comparisons” of price levels. Formally, a PPP between two countries, A and B, is a price ratio that measures the number of units of country A’s currency that are needed in country A to purchase the same quantity of an individual good or service as one unit of country B’s currency will purchase in country B. PPPs are expressed in terms of the currency of a base country. In the 2005 ICP, Hong Kong, China was used as the base country in the Asia-Pacific region and so the Hong Kong dollar was the base, or “numeraire”, currency in which the real expenditures of all countries in the region were expressed.

7. A parallel can be drawn between time series price indexes and PPPs. The index number theory underlying both time series and spatial indexes is very similar. In some cases, prices that have been collected for time series price indexes can also be used to construct PPPs but it is necessary to collect additional prices for international comparisons. The main reason is that PPPs require not only comparability (between countries rather than over time, though); they must also be representative of the expenditures in each country in the comparison. By definition, the products priced for use in a price index within a country are representative of the expenditures in that country, otherwise they would not have been chosen in the basket of goods and services being priced. However, when products are being selected for pricing in the ICP, they must be both comparable between countries and representative of the expenditures in each country. In practice, each product specified for pricing in the ICP will not be priced by every country because of this **representativity** requirement. For example, beef is not a representative product in some countries but it is in many others, which can readily collect beef prices. The PPPs for meat between all countries in the Asia/Pacific region were constructed by comparing the prices of different types of meat (beef, veal, goat, lamb, mutton, goat, poultry) between each pair of countries for which each type of meat is representative and for which prices were collected.

8. The processes used for making international comparisons can also be used to compare price levels between regions within an economy. In fact, it is often easier to compare regions within an economy than it is to compare countries because the representativity requirement is almost always easier to meet within a country than it is between countries. The theory underlying international comparisons can be used directly in producing sub-national PPPs (i.e. those between regions within a country). In practice, the main constraint in producing sub-national PPPs is obtaining the detailed values for product groups in each region that are required to compile real expenditures (and their per capita equivalents) for expenditure groups and to weight together the component PPPs into PPPs for total regional expenditures.

9. On the other hand, comparing relative price levels between regions is easier than between countries because there are no exchange rates involved when regions within a country are being compared.

10. The data from the ICP are important analytical inputs for policy makers, economists, academics and international organisations. In particular, PPP-based data provide crucial inputs into generating internationally comparable datasets that can be used in analysing poverty, in determining international poverty lines (IPLs), and in converting an IPL (such as the World Bank’s $US1 per day) into local currencies. Similarly, sub-national PPPs can be used to analyse poverty lines within a country.
IV. The CPI and sub-national PPPs

11. The ADB report for the 2005 ICP stated that “The Regional Office [i.e. the ADB] intends to explore the extent to which ICP products could be included in each economy’s CPI …..” . The ADB has been experimenting with several countries to determine the extent to which products could be priced for both CPI and ICP purposes. Incorporating ICP products in the CPI is difficult in practice because the criteria for selecting products in the CPI are not the same as those for the ICP. In particular, representativity is the key criterion for selecting a product for the CPI while comparability with products in other countries does not have any weight at all. On the other hand, products for the ICP are selected so that the competing aims of representativity within countries and comparability between countries both have to be taken into account.

12. As part of this project, the ADB has also been examining the extent to which CPI price data could be used to compare the price levels between regions within a country. The scope of the CPI data is broadly consistent with that of household final consumption expenditure in the national accounts (the main difference is that the rent imputed for owner-occupied dwellings is not usually included in a CPI). Conceptually, the methods used to construct sub-national PPPs are identical to those used in the ICP. The requirements for the price data are the same as those for the ICP; namely, they should be representative of consumers’ expenditures and comparable across regions. Representativity is not a problem in these sub-national comparisons because a product will not be priced in a country’s CPI unless it is representative. Comparability can pose some problems, but less so than in international comparisons. The main issue concerning comparability is that the staff collecting products for the CPI often have the option of selecting the actual product to be priced within a set of broad parameters that distinguish the type of product to be selected. Apart from satisfying the broad specifications, the main criterion in selecting a product to be priced for the CPI is that it has to be possible to identify exactly the same product each month so that the prices observed are not affected by changes in quality. Therefore, the actual products priced for the CPI are not necessarily identical in different regions (and sometimes not even within a single region). For example, the specifications for a TV set may describe the screen size, the type of audio system, whether it is high-definition and whether it is LCD or plasma. However, the brand of TV to be included in the CPI is left to the discretion of the price collector, based on the brand that dominates the sales in each retail outlet. While the brand can be a significant contributor to the price to be paid, the important aspect from the CPI viewpoint is that the same brand (and model) is priced each month so that changes in price can be observed. For sub-national PPPs, it is necessary to take the extra step of matching up the prices for those TV sets that not only meet the CPI specifications but which must also be the same brand (and model) if they are price-determining characteristics.

13. The ICP uses values from each country’s national accounts in calculating real expenditures (real expenditure equals a value in national currency divided by its corresponding PPP). A basic heading PPP can be divided into the value for that basic heading directly to provide an estimate of its real expenditure. However, once basic heading PPPs have to be combined to estimate real expenditures for broader aggregates, it is necessary to use the basic heading values as weights to calculate PPPs for each of those broader aggregates, up to the level of GDP. As a result, values are also required for sub-national comparisons even though the values for all regions are expressed in the same currency. Ideally, regional accounts consistent with the national accounts would provide the sub-national values but these data were not available in the Philippines. Therefore, regional data from the Family Income and Expenditures Survey (FIES) were used to provide the values. In some cases the FIES did not provide values at a sufficiently detailed level and so the CPI weights for the relevant categories were used to impute values for the basic headings involved by splitting the lowest level value in proportion to the CPI weights.

14. The ADB study aimed to explore the possibility of comparing regional price levels for the 17 major regions in the Philippines by applying the PPP concepts and methodology at the detailed commodity level (e.g. rice); for broad product subgroups (e.g. cereals and cereal preparation); for main
categories (e.g. Food, Beverages and Tobacco) and total family expenditures. A second aim was to establish whether it would be possible to collect ICP prices from only a handful of regions (or perhaps in only one region or capital city) and adjust the collected price levels to national average prices using the regional relationships identified in the CPI after calculating the relationships between price levels in the various regions.

15. The National Statistics Office of the Republic of the Philippines (the PNSO) is one of the statistical offices involved in the pilot project and this report describes the outcomes of this work.

Using CPI data in the ICP

16. A price index measures changes over time in the prices of the goods and/or services within its defined scope. Price indexes can be compiled for any period (e.g. month or quarter or year) but, most commonly, they are compiled monthly. Their scope can be the country as a whole or one or more regions within a country (e.g. for the main city or a handful of major cities only). A consumer price index (CPI) is designed to measure changes in the prices of consumer goods and services purchased by the “target population”, which may be all persons living in the country or some subset of them (e.g. wage and salary earners, or all persons excluding the bottom 20% of income earners).

17. The components of a price index that includes a regional dimension may be published for each region as well as for the country as a whole. However, it is important to note that the regional index numbers do not provide a measure of differences in price levels between the regions. Rather, they provide a measure of the changes in prices in each region since the base period (i.e. the period for which the index is set equal to 100.0). For example, price indexes of 120.0 in region A and 125.0 in region B mean that prices have risen 20% in region A and 25% in region B since the base period. However, if prices were 10% lower in region B than in region A in the base period, then they would still be about 6% lower in region B than in region A despite the higher rate of price increase observed.

18. The ADB study was designed to overcome this limitation in the CPI output by using the prices underlying the sub-national CPIs to calculate PPPs to provide information about the relative price levels in different regions within the country.

19. An important spin-off from this study is the potential for information on sub-national price levels to reduce the ICP’s price collection workload. The ICP has added another dimension to the potential uses of a CPI. A major part of the workload (and the cost) of the ICP is in collecting the prices of products in a number of regions within each country to enable annual national average prices to be compiled. Two dimensions are involved – a geographic one to measure the different price levels in different regions and a time dimension so that an annual average can be constructed.

20. One of the ADB’s aims after the 2005 ICP round was to investigate the extent to which countries’ CPIs could be used to reduce the data collection load imposed by the ICP. The main option being investigated initially was to include some ICP-specific products in the regular CPI because a major part of the ICP data collection involves obtaining prices for household final consumption expenditure, which has a similar scope to the CPI. The ADB acknowledged that, while being a useful initiative, it would be unlikely to lead to a large reduction in the data collection workload. More recently, the ADB has been investigating another option. In many countries, the CPI data base provides a very rich source of information on regional price levels, even though it was not designed specifically for this purpose. The ADB has been investigating the extent to which these prices could be used to estimate the price relativities between regions. If it were possible and if the relationships proved to be reasonably stable then the data collection process could be scaled back significantly. In particular, it would mean that prices could be collected in a handful of regions (or perhaps in just one major region) and then adjusted to national average prices using the regional relativities calculated
from the CPI database. Apart from reducing the price collections, it would also mean that the data
could be edited more intensively without increasing the number of staff involved.

21. The data sets required are prices from the CPI database for products that are similar to those
specified for the ICP together with values that can be used to indicate the relative importance of each
product group in each of the regions in the country. An average, weighted price level can then be
calculated for the country as a whole as well as for the region in which prices have been collected for
the ICP. The ratio of the national prices to those for that region is then applied to the prices actually
collected in that region for the ICP to estimate the national price for the ICP.

Types of CPI organisation in Asia region

Introduction

22. A set of recommendations for countries to follow in compiling their CPIs is provided in the
international manual: Consumer price index manual - Theory and practice, which is available at:
processes that should be followed but it also allows for variations that may be required to meet
particular countries’ requirements. For example, countries can adapt to their own circumstances the
guidelines such as the frequency of updating weights, handling seasonal products, preferred
aggregation methods, levels at which weights should be applied etc. Some procedures will differ
depending on the institutional arrangements in a country, the structure of its statistical office (e.g.
centralised/decentralised), while the size of a country is likely to determine the need for data below the
national level. As a result, there is no single type of organisation for CPI collection and compilation
that could be described as “typical” of the Asian region, but the following provides a summary of the
main features underlying the CPIs in the region.

Classification

23. All countries classify their CPIs into a number of groups, sometimes based on the classification
in the 1993 System of National Accounts and sometimes on a variation of that classification, which
may have been created to cater for particular circumstances in the country concerned. A group
classifies like products together; for example, it might cover “Clothing, fabrics and footwear”, which
could be split into two sub-groups “Clothing and fabrics” and “Footwear”. Food is the largest group
and, because of its importance, it is usually split into a number of sub-groups, which may vary from
one country to another depending on the relative shares of the various components.

Sampling outlets

24. Outlets are sometimes sampled using a scientific sampling process and sometimes using a
purposive sample (i.e. outlets are selected on the basis of the prices statisticians’ requirements for
particular types of products to be priced in a range of different types of outlets because of their overall
importance). In large countries, it is common for outlets to be sampled in a way that ensures regions
are represented so that sub-national (provincial or state) price indexes can be compiled.
Products

25. Products are generally selected on a judgemental basis. The underlying basis for selecting a product for pricing is that it should be a significant contributor to overall expenditures and it should be representative of price changes of similar products. It is also important that the product should be available for pricing each month, although special procedures are adopted to handle those seasonal products that are sufficiently important to be included in the CPI, particularly some food products and seasonal clothing.

26. The number of products for which prices are collected differs markedly between countries, with several hundred product specifications being fairly common, although the number can vary significantly even between regions within a country. The number of prices collected for these products each month is largely dependent on the size of the country, ranging from several thousand prices in smaller countries to hundreds of thousands of prices in the largest countries.

Data collection

27. The dominant method of collecting prices is for staff to visit the selected outlets and observe the prices of the specified products. In some cases, this may entail purchasing products rather than just observing a marked price, e.g. where bargaining is common in reaching a final purchase price.

Aggregating prices

28. The products selected for pricing in a CPI are referred to as the “basket” of goods and services being priced. The products do not each have the same importance in consumers’ expenditure so they need to have weights attached to each to reflect their relative importance. The weights are generally based on some form of household expenditure survey (HES), which is referred to in different countries by slightly different names, such as family budget survey or family expenditure survey. Whatever they are called, their common feature is that they are used to collect detailed information on the types of products that households purchase and how much they spend on each.

29. The Laspeyres fixed-base formula is generally used to weight together the product groups. In effect, this formula attaches a weight from some past period, generally a year (the “base year”) to each group of products for which information on expenditures is available from the survey. It applies the base year weights to an index (sometimes referred to as a price relative) that is calculated as the ratio of the price of the product group in the latest period to its average price in the base year. For example, expenditures on each of apples, oranges, pears and plums may be available from the HES and these values are used in conjunction with indexes showing changes in the average price for each type of fruit to reflect their relative importance in weighting them together. In the above case, the average price for a particular type of fruit (e.g. oranges) is obtained by taking an unweighted average of all the prices collected for that fruit. The average is often an arithmetic mean, although countries are increasingly moving to a geometric mean at this level because of its useful properties (see paragraphs 1.124 to 1.132 in Consumer price index manual - Theory and practice) provided there are no zero prices involved.

Updating weights

30. The frequency of updating CPI weights varies significantly throughout the region. Many countries aim to update their CPI weights regularly, with 5 or 6 years being a common interval.
However, some others have much lengthier periods between weight updates, some even stretching to more than a decade.

Coverage

31. Generally, the whole resident population is included in the scope of the CPI, although there are some countries that restrict it to particular groups such as wage and salary earner households or urban households only. In some cases, separate price indexes are compiled for groups within the population (e.g. low-income, middle-income and high-income households) as well as for the whole population.

32. The geographic coverage varies significantly, with the size of the country frequently being a significant influence. In some large countries, rural areas may be excluded from the coverage, whereas in others the first stage of sampling may be based on selecting localities and then outlets within those localities so rural areas have a chance of being selected for inclusion in pricing products.

CPI-ICP integration

33. An innovation introduced in the 2005 ICP was to describe the products to be priced using a consistent set of criteria. The outcome was a “Structured Product Description” (or SPD), which provides a systematic means of matching product specifications. An SPD identifies all the characteristics of a product, with the aim being to distinguish those characteristics that are price determining. For example, the weight or volume of a product will affect its price but, generally, the colour will not do so. Examples of characteristics included in an SPD are the type, variety, seasonal availability, quantity, packaging and pricing basis. The next step involved identifying those characteristics in each SPD that could be considered as being price determining. The advantage of SPDs was that it became much easier to determine if exactly the same products had been priced in different countries or whether unexpected variations in price were due to differences in the products being priced in different countries.

34. One of the important criteria in selecting products to be priced in the ICP was that they should be representative of expenditures in a country, which is also an important criterion for products to be included in a CPI. Even though it should be possible to increase the extent of the overlap between the products priced for the CPI and those in the ICP product list, it will be impossible to ever have a complete overlap. The ICP requirement for products to be comparable across countries as well as being representative of expenditures within a country inevitably leads to compromises being made when defining the products for the ICP.

35. Within a country, the problem of identifying comparable products will be less than those encountered in international comparisons. Therefore, calculating sub-national PPPs within a country becomes an easier process than the ICP, although the extent of comparability (or lack of it) depends on the economic and social diversity within the country.

36. The outcome is that integrating the ICP with the CPI is possible to some extent. Ideally, countries will integrate their ICP and CPI price collections as far as possible because it would reduce the workload imposed on NSOs by the ICP. It would also provide a means of updating the ICP to reduce the impact on extrapolated PPPs (calculated using time series national accounts data) of errors arising when there is a large gap between benchmark years.

37. An advantage of integration between the CPI and the ICP is that NSOs could calculate PPPs for regions within their countries. However, it is important to recognise that the extent of such integration may be affected by regional differences which could reduce the comparability of product
specifications. The types of regional differences that have been observed in different regions within a country are package sizes, clothing styles and housing types, with housing being particularly significant in large countries that have quite different weather conditions around the country. The comparability constraint could be mitigated, however, by changing some CPI product specifications to better match those required in the ICP. The accuracy of the CPI should not be affected provided that the products priced as a result of this process are still representative.

V. CPI requirements for sub-national price levels – The Philippines as a case study

Description of Philippines CPI

38. The project that is the subject of this report was based on “data mining” the prices information stored in the PNSO’s CPI database.

39. The CPI measures the change from one period to another (generally months, but it can also be years) in the average prices of a fixed basket of goods and services purchased by households. The CPI is expressed as an index number relative to a base year, which is set equal to 100.0. The prices for each product group for each month are compared with those in the base year and weighted by their relative consumption in the base year. In effect, the weight is the expenditure on a product (or group of products) which indicates the relative importance of that product (or product group) in the overall basket of goods and services included in the CPI.

40. The Philippines is split into 80 provinces and 17 regions. The CPI is compiled for the Philippines as a whole and for each of the 17 regions (including the national capital region, which consists of metropolitan Manila). Explicit weights are used in the CPI at the regional level and for the Philippines as a whole.

41. Currently, the base year is 2000, which was chosen mainly because it was the year when the Family Income and Expenditures Survey (FIES) was conducted. It was also perceived to be a politically, economically and socially stable year so that no abnormal events affected the expenditure patterns observed in the FIES. The scope of the FIES is similar to that of the CPI and so it provides a comprehensive and coherent data source for the expenditures used to calculate the CPI weighting patterns. The 2000 FIES was conducted nationwide, and covered 41,000 households. Details were available for each province/city so weights could be calculated at this very detailed level to distinguish the different consumption patterns in different geographical locations. The weight for each product is effectively the percentage of expenditure on that product to the total expenditure on all products. Similarly, provincial expenditures were aggregated to regions. The weight of each region was expressed as a share of the expenditures in the Philippines as a whole. In practice, a matrix of weights was constructed (product by region) which enabled weights to be aggregated across either a product or a geographical dimension. As a result, the weights enable the CPI itself to be aggregated into product groups and into regions with the broadest level being “all products” for the Philippines as a whole.

Basket of products and broad classification

42. The “basket of products” included in the CPI is a sample of goods and services that are commonly purchased by Filipino households. It varies by region to reflect differences in the regional availability and popularity of products. The number of individual products included in the basket ranges from 286 in Batanes to 753 in Negros Occidental. The national capital region’s basket contains 716 products and its weight accounts for just over 30% of the Philippines total.
Prices for the individual products are weighted together to generate price indexes for broad groups, including a total for all products, within each of the 17 regions and for the Philippines as a whole. The top two levels of the CPI classification comprise six main groups and 27 subgroups:

**CPI classification**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Subgroups</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food, beverages and tobacco</strong></td>
<td></td>
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<tr>
<td>Cereals and cereal preparations</td>
<td></td>
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<tr>
<td>Dairy products</td>
<td></td>
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<tr>
<td>Eggs</td>
<td></td>
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<tr>
<td>Fish</td>
<td></td>
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<tr>
<td>Fruit and vegetables</td>
<td></td>
</tr>
<tr>
<td>Meat</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous foods</td>
<td></td>
</tr>
<tr>
<td>Beverages</td>
<td></td>
</tr>
<tr>
<td>Tobacco</td>
<td></td>
</tr>
<tr>
<td><strong>Clothing and footwear</strong></td>
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<tr>
<td>Footwear</td>
<td></td>
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<tr>
<td>Ready-made apparel, except footwear</td>
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<tr>
<td>Custom clothes (accessories and services)</td>
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<tr>
<td><strong>Housing and repairs</strong></td>
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<tr>
<td>Minor repairs</td>
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<tr>
<td>Rentals</td>
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<tr>
<td><strong>Fuel, light and water</strong></td>
<td></td>
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<tr>
<td>Fuel</td>
<td></td>
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<tr>
<td>Light</td>
<td></td>
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<tr>
<td>Water</td>
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</tr>
<tr>
<td><strong>Services</strong></td>
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<tr>
<td>Educational services</td>
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<td>Medical services</td>
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<tr>
<td>Personal services</td>
<td></td>
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<tr>
<td>Recreational services</td>
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<tr>
<td>Transportation and communication</td>
<td></td>
</tr>
<tr>
<td>Other services</td>
<td></td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td></td>
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<tr>
<td>Household furnishing and equipment</td>
<td></td>
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<tr>
<td>Household operations</td>
<td></td>
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<tr>
<td>Personal care and effects</td>
<td></td>
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<tr>
<td>Other miscellaneous goods</td>
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<tr>
<td><strong>Total (All groups)</strong></td>
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</tbody>
</table>

Food, beverages and tobacco is the most important group in the CPI, accounting for 50.0% of the expenditure weight, with food alone having a weight of 46.6%. Other large groups are housing and repairs (16.8%) and services (15.9%). However, these averages mask some significant regional differences. For example, food has only 37.6% of the expenditure weight in the national capital region (NCR), while the NCR’s weight for housing and repairs (24.6%) is much higher than the Philippines average.
45. The monthly CPI is based on about 459,000 price quotations collected throughout the country. The prices are collected from a sample of outlets, selected on the basis of their importance in sales of the line of products to be priced and on the consistency and completeness of the stock of those products. In practice, the outlets sampled should sell a number of products included in the CPI and they should be patronised by a significant number of consumers purchasing those products. In addition, the outlets should have a regular stock of those products included in the CPI product list and should be an established store or market stall (i.e. transient vendors are excluded).

46. The CPI on a 2000 base year was first published in October 2002, replacing the 1994-based series that had been introduced in 1996. Over time, consumers change their expenditure patterns in response to differential price changes (e.g. switching between types of meat as one becomes relatively more expensive than the other). In addition, preferences change as income levels change. For example, a typical outcome of increasing incomes is a lower share of overall expenditure going to food.

47. The weights of the CPI are always lagging the current situation because of the cost and time involved in obtaining the data to update the weights. The cost of major surveys (such as the FIES) mean that they can be undertaken only infrequently. In addition, once the results are available it takes time to use them to update the CPI weights. The next base year for the CPI is going to be 2006.

Using CPI data for sub-national comparisons

48. The CPI is compiled each month as a weighted average of the monthly prices observed, using the Laspeyres formula as the aggregation formula. A price index is a means of comparing prices between two different periods. In its simplest form, it is the ratio of the prices of a single product. For example, if the price of 1 litre of orange juice in the base period (period 0) is PHP120 and the price of 1 litre of the same orange juice in period 1 is PHP150, then the price index is 150/120 = 1.25. In most cases, price indexes are expressed on a base of 100.0 so, in the above example, the price index in period 1 would be 150/120*100.0 = 125.0.

49. The prices for orange juice in two different regions can be used to calculate a PPP that shows how the sub-national price levels compare. To simplify the illustration we will assume that there are two regions (A and B) and that 7,000 litres are sold in region A during the year selected as the CPI base year and 3,000 litres in region B. Based on prices collected for the CPI, the average price for orange juice is PHP 110 in region A and PHP 143 in region B, resulting in a weighted average price of PHP 120 for the country as a whole:

\[ \frac{(110 \times 7000) + (143 \times 3000)}{7000 + 3000} = 119.9 \text{ (which rounds to 120).} \]

50. The PPP for orange juice in region A compared to that in region B is 110/143 = 0.769, while the PPP in region B compared to region A is 143/110 = 1.300. The PPP for region A compared to region B is the inverse of that for region B compared to region A. The main point to note is that the PPP for a single product is not unique; it is dependent on the region (or country in an international comparison) chosen as the base region. In the ICP, there is no particular reason to select one country rather than another as the base country. In fact, one of the desirable characteristics of PPPs is that they should be “base-country invariant”. In other words, the outcomes of comparing different countries should be exactly the same no matter which one is selected as the base country and the same is true for regions in sub-national comparisons.

51. The above examples for both time series and spatial indexes are rather trivial because only one product was involved. The process becomes more complicated once extra products are included in the price index. It then becomes necessary to weight the products together to reflect their relative
importance in consumers’ expenditures. The simplest way of doing so is to use their quantities as the weights.

Sub-national comparisons

52. The current study is designed to compare prices for similar products between regions within the Philippines. One of the implications is that the products being compared must be identical so that their price relativities are not distorted by being between dissimilar products. In the International Comparison Program (ICP) this characteristic is referred to as “comparability”. In the 2003-2006 ICP Handbook it is defined as follows:

Two, or more, products are said to be comparable either:
- if their physical and economic characteristics are identical, or
- if they are sufficiently similar that consumers are indifferent between them.

Two similar products may be said to be comparable if consumers are indifferent as to which of the two they consume. This implies that consumers are not prepared to pay more for one than the other.

53. As is the case for international comparisons, another characteristic required for sub-national comparisons is representativity. One of the criteria for selecting products in computing sub-national PPPs is that they should be representative of consumers’ purchases, so this need not be considered further in the current project since all products in the CPI can be considered to be representative. However, the process of sub-national comparisons using CPI data is not completely straightforward.

54. The basket of goods and services priced for the CPI remains relatively stable in the short to medium term because the main aim of the CPI is to compare prices over time. The changes that do occur are to replace products that are no longer available and to introduce new products that were not previously available. For example, when the CPI was updated from a 1994 to a 2000 base year, 68.4% of the products in the national capital region were retained while 31.6% of the products were changed. The price specifications for the CPI in different locations within the country are broadly similar as far as the coverage of products is concerned but the exact specifications can differ between regions to take account of local conditions (e.g. package sizes may not be the same in different regions or the varieties of a product may be different). As a result, some problems arise when the CPI data are used in comparing sub-national price levels.

55. Handling some of these problems is relatively straightforward. Different package sizes can be adjusted to a unit price, provided that the package sizes are relatively similar (e.g. a 300 gram packet could be compared with a 250 gram packet of the same product on the basis of price per 100 grams, but a 250 gram packet would be considered to be a different product from a 500 gram one). A more difficult problem arises when different varieties of the same product are sold in different regions. For example, consider three different brands of coffee which are considered to be of different qualities. In region 1, brand A and brand B are sold, while in region 2 all three brands are included in the CPI, but only brand C is priced in region 3. The regional availability of the different brands is summarised in the following table.

<table>
<thead>
<tr>
<th>Coffee</th>
<th>Region 1</th>
<th>Region 2</th>
<th>Region 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand A</td>
<td>Priced</td>
<td>Priced</td>
<td></td>
</tr>
<tr>
<td>Brand B</td>
<td>Priced</td>
<td>Priced</td>
<td></td>
</tr>
<tr>
<td>Brand C</td>
<td>Priced</td>
<td></td>
<td>Priced</td>
</tr>
</tbody>
</table>
56. In this example, it is clear that coffee prices cannot be directly compared between region 1 and region 3 because none of the brands is common to both regions. It is possible, though, to compare brands A and B between regions 1 and 2 and to compare brand C between regions 2 and 3. The process in such cases is to include all the possible matches when making the comparison. In the above example, brands A and B would be compared between regions 1 and 2 and brand C would be compared between regions 2 and 3. Region 2, in which all three brands were priced, provides a link between coffee prices in regions 1 and 3.

57. The above example of coffee brands being priced in different regions assumes that the same products are being specified in the same way in each region. In practice, some products have a common specification across all regions, which provides a firm basis for sub-national comparisons. However, the specifications for some products may not be identical in the different regions because of the options given to price collectors to determine exactly which product is to be priced, within a broad set of parameters. The greater the extent of national (or at least multi-regional) specifications for products, the easier it is to compare price levels between regions.

58. In the Philippines CPI, different numbers of products are priced in different regions, with the number of individual products included in the basket ranging from a low of 286 in Batanes to a high of 753 in Negros Occidental (Manila’s basket contains 716 products). There is a large degree of product overlap between the regions even though, to some extent, the provinces specified their own market baskets in the 2000 CPI update.

Organisation of CPI price collection

59. The CPI is published for the Philippines but is also available for a number of regions. Data for 17 regions, including the national capital region (i.e. metropolitan Manila), were used in the analysis described in this report.

60. Prices for the Philippines CPI are collected in Manila, in 11 selected cities and in the urban areas of 77 of the 80 provinces. The retail outlets from which prices are collected were selected on the basis of selling popular products, the consistency and completeness of their stock, their accessibility to the population and their permanency. The frequency of price collection depends on the type of product, with perishable products being priced more frequently than non-perishables.

61. Data collection for the CPI tends to follow a relatively similar pattern in each part of the country. Prices are generally collected by PNSO staff who visit a range of retail outlets and observe prices or obtain details about prices being charged for a variety of consumer products. For example, the overall price index for coffee might involve collecting prices for three different brands of coffee in several different outlets such as markets, corner stores and supermarkets. The Bureau of Agricultural Statistics is responsible for collecting prices for agricultural products in the provinces in which their provincial offices are located.

62. The extent to which regional prices and non-urban prices are collected for a CPI depends on a combination of its uses, the costs of collecting data, and the extent to which regional and non-urban prices vary around the country. In the Philippines, regional price levels can be quite different and economic analysts are interested in examining these differences so prices are collected across a broad geographic spread of the country.

63. Prices at the most detailed level (i.e. for individual products, such as each of the three brands of coffee mentioned in the example above) are combined without explicit weights to obtain an average price that can be compared with the equivalent average for the previous month to form a “price relative”. The price relative for a particular product group (coffee) is derived as the arithmetic mean of these price relatives for the three individual brands of coffee. Although no weights are applied at
this level, there is an implicit weighting that depends on the number of prices collected for each brand of coffee from each type of outlet because each price has an equal weight.

64. The field staff collecting prices have to ensure they price the same product each month. In some cases, it is not possible to observe a price for a product because it is available only at certain times of the year (e.g. seasonal fruit or vegetables). Similarly, special procedures are used for products that change regularly (e.g. women’s fashion) to ensure that the prices recorded are based on matching “like with like” products to the greatest extent possible.

65. Assessing the effects of quality change in products that are subject to rapid quality change poses particular problems. The traditional means of estimating the effect on prices of changes in quality has been to ask the manufacturers to estimate the price of each of the various changes that have been made (e.g. when a new model of a car is released). However, electronic products such as computers change so rapidly that it becomes difficult to price the same model for any significant length of time. In addition, quality tends to improve even while prices are falling and so it becomes very difficult to assess the impact on prices of the quality changes. As a result, statistical techniques are being used increasingly to estimate quality changes. An example of such a technique is “hedonic regression”, which estimates the price of a product based on its main characteristics. The regression technique estimates the extent to which each of its price-determining characteristics affect the overall price of the product. For example, the price-determining characteristics of a computer are the size of RAM, the capacity of the hard drive, the clock speed, screen size, screen resolution etc. While the main use of hedonic regressions is to estimate the effects of quality changes in products such as computers, hedonics have also been used in some countries to estimate quality changes in products as diverse as clothing, motor vehicles and houses. In the Philippines however, hedonics methodology has not yet been adopted.

66. The important issue for sub-national comparisons is that the prices actually paid for products are recorded in the CPI database rather than only the quality-adjusted prices because PPPs should be based on the prices observed in the various retail outlets. The PNSO price database for the CPI does contain the recorded prices rather than quality-adjusted ones so they can be used directly in calculating PPPs.

Organisation of data for computing sub-national PPPs

67. There is no standard structure for a prices database, with national statistical offices adopting procedures that best suit their own needs. Often, they are driven by the computer systems used to compile a CPI, which are a function of the computing environment in each national statistical office. Extracting data in the format required to calculate average prices for each product can be a time-consuming process, which depends on the data structure, the data descriptors, and the availability of programs to extract the prices in the format required to be able to average them within each region.

68. The PNSO was able to extract prices data relatively easily, convert them into average prices for each product in each region and copy them into a special database for the sub-national comparisons. The output was examined closely with the first stage essentially being a manual exercise to identify those products whose average prices could be compared directly across regions. The process involved ensuring that the products which appeared to be the same were actually identical in practice, and that the average prices were not unduly influenced by differences in key characteristics, with the size of the packages or containers being particularly important. For example, an average price for “soft drinks” would include containers ranging from 300 ml to 1.5 litres which could distort the average prices even after they were converted to a price per litre, because the price per unit of quantity is much lower for large soft drink bottles than for smaller ones. In such cases, it was necessary to split the category into two or more product groups (e.g. soft drink containers of 600 ml or less and those greater than 600 ml).
69. The system used to process the sub-national comparisons was based on Excel spreadsheets that were adapted from some spreadsheets that had been produced to assist in analysing international PPPs. The average prices extracted from the CPI database were the main inputs but, as is the case with international comparisons, values were also required so that the PPPs for individual products could be aggregated into those for broader product groups. The aim was to have values available for each region at the equivalent of the basic heading level defined in the 2005 ICP. In some cases, it was not possible to obtain the value data at this level so prices for products were combined to produce PPPs at the most detailed level for which values were available. In the Philippines, national accounts household disposable income data are not available below the national level. However, regional household income can be estimated from the FIES although these estimates are not consistent with the national accounts. The FIES also contains sufficiently detailed data to enable expenditures on broad product groups to be estimated but it was generally not possible to calculate basic heading values using the FIES. The weights underlying the CPI in each of the regions were used to split the most detailed expenditures available from the FIES.

70. A direct use of regional price levels is to calculate PPPs that can be used for analysing poverty levels within a country. Apart from the prices themselves, the other critical elements required are data on regional expenditures cross classified by incomes. During the 2005 ICP, the World Bank Global Office established a Poverty Advisory Group to provide advice on the methods to be adopted for assessing poverty lines using ICP data. The Group suggested that poverty PPPs should be compiled using basic heading PPPs from the ICP, but reweighted using expenditures specific to the poor. An assumption is made in this process that the prices faced by the poor are proportional to national average prices in each of the countries being compared. In the Philippines study, data on the consumption patterns of low-income households must be derived for each region to compute sub-national poverty PPPs. The FIES provides a very important dataset for poverty analysis because it is necessary to match the PPPs calculated from the CPI-based price levels with income levels. Even though the FIES is not consistent with the national accounts, the data it provides are conceptually consistent across all regions.

VI. Diagnostics of price data

Editing procedures

71. Editing the prices collected for the CPI concentrates on checking the consistency of changes in prices from the previous month or the corresponding month of the preceding year, with the aim being to ensure the same product has been priced or that adjustments have been made for quality changes, if it is necessary to do so. However, different procedures are required for comparing sub-national price levels, because the key concern in this case is the comparability of the products being priced in different regions. In the CPI, it is important to ensure that factors such as package size or number of units are consistent from one month to the next for a particular individual product in a particular outlet so that the correct price change is observed. When comparing price levels it is important to compare identical products in each of the regions and so differences in package sizes for a single product have to be identified so that the products concerned can be treated as different products. One of the indications of products not being comparable is a large spread in the individual prices. Any prices that varied by more than 50% from the average for that product were examined closely to ensure that the quantities were consistent and that the correct price had been recorded in the sub-national price database.

72. The procedures used to validate the regional price levels were similar to those adopted by the ADB during the 2005 ICP. The first step was to check the coefficients of variation (CVs) of the prices for each product group and to examine those above 30% (the CV is defined as the ratio of the standard
deviation to the arithmetic mean of the prices for the product concerned). Prices that fell outside the bounds were checked and discarded if there were any doubts about their validity. The next step was to compare the price data using the Dikhanov Table, which is a standard ICP editing tool.

73. The Dikhanov Table shows the relationships between product prices across product groups. It is based on a regression technique used in the ICP known as the country-product-dummy (CPD) model. The CPD model is a means of estimating PPPs for each basic heading for all countries within a region. The underlying model is multiplicative and it assumes that, within a product group, prices vary by product within countries at the same rate across all countries, and that prices vary between countries at the same rate across all products. The CPD model can be used to estimate PPPs in sub-national comparisons, with similar assumptions to these applying between regions. In this project, the CPD model was used to estimate PPPs for all 17 regions within the Philippines. The PPPs generated by the CPD model are transitive. In other words, the measure of the relationship between any pair of the 17 regions for a product group’s PPP is the same no matter whether the two regions are compared directly or via any third region within the Philippines.

74. One of the by-products of estimating PPPs using the CPD model is a set of “expected prices” for every product in every region included in the regression. The Dikhanov Table compares the distribution of these expected prices for each region with that of the prices actually observed. Large differences between the observed and estimated prices can indicate potential problems with the consistency of the prices for a product group. Any significant divergence between the observed and expected prices indicates that the prices for the same product are varying significantly across regions or that the relativities between prices in a product group within a region vary significantly compared with those in other regions. The distributions of prices are presented on graphs to identify potential problem prices, either for a product group or within a region.

75. More details about the CPD model, the Dikhanov Table and the ways they are used in editing data can be found in the ADB publication containing the 2005 ICP results for the Asia-Pacific region: 2005 International Comparison Program in Asia and the Pacific - Purchasing Power Parities and Real Expenditures, which is available at http://www.adb.org/Documents/Reports/ICP-Purchasing-Power-Expenditures/PPP-Real-Expenditures.pdf.

VII. Sub-national aggregation

Introduction

76. In the ICP, the national accounts perform two different functions. The more important one is to provide the values that are “deflated” using the PPPs to provide estimates of the real expenditures (and per capita real expenditures) on different aggregates across countries. The most detailed level for which real expenditures are calculated in the ICP is the basic heading level. In concept, the basic heading is a group of similar well-defined goods or services for which a sample of products can be selected that are both representative of their type and of the purchases made in countries. In practice, a basic heading is defined as the smallest aggregate for which expenditure data are available. In the sub-national comparisons, it is necessary to have values at detailed levels (ideally equivalent to the basic headings used in the ICP), particularly for aggregating the lowest level PPPs to broader levels including for each region as a whole. These sub-national values were estimated using a combination of the data from the FIES and detailed CPI weights.
Aggregation procedures

77. Note: This section is based on the description of the aggregation models presented on pages 19 to 22 of the ADB publication containing the 2005 ICP results for the Asia-Pacific region: *2005 International Comparison Program in Asia and the Pacific - Purchasing Power Parities and Real Expenditures*, which is available at [http://www.adb.org/Documents/Reports/ICP-Purchasing-Power-Expenditures/PPP-Real-Expenditures.pdf](http://www.adb.org/Documents/Reports/ICP-Purchasing-Power-Expenditures/PPP-Real-Expenditures.pdf)

78. The starting point for calculating PPPs is the dataset of prices for each of the products specified for price collection. In the case of the Philippines sub-national PPPs, the prices are those that were obtained from the CPI database. There are two stages involved in estimating PPPs. The first one is to estimate PPPs at the level for which values are available (i.e. basic headings in the ICP). The second stage involves aggregating the basic heading (or equivalent) PPPs to broader aggregates including the PPP for each region as a whole (equivalent to the PPP for GDP in the ICP).

79. As is the case with time series price indexes, for which several alternative index number formulas could be used, different methods can be used to calculate PPPs. Each has different limitations and benefits. Some can produce biased results in some circumstances while the results from others are not additive. It is not necessary to use the same approach for both stages and, in fact, two different aggregation methods were used in obtaining the sub-national PPPs for the Philippines.

Calculating PPPs from price data – The country-product-dummy (CPD) method

80. The country-product-dummy (CPD) method was used in the first stage to obtain PPPs at the most detailed level for which values were available in each of the 17 regions. It has the advantage of providing information that can be used in editing, via the Dikhanov Table (see paragraphs 73 to 75 above).

81. The CPD method is a multilateral approach, which means the PPPs are estimated simultaneously for all regions within the Philippines rather than step by step between each pair of regions in turn. The PPPs generated by the CPD model are transitive. In other words, the measure of the relationship between any pair of regions for a product’s PPP is the same no matter whether the regions are compared directly or via a third region within the Philippines.

82. The basic dataset for the CPD approach was a matrix of prices for all priced products within each of the 17 regions. Obviously, there were gaps in the matrix because it was not possible to obtain prices in every region for every product due to the unavailability of some products in some regions and variations in the number of products priced across regions. The CPD method is a regression technique. The underlying model is multiplicative and it assumes that prices vary by product within regions at the same rate across all regions, and that prices vary between regions at the same rate across all products. As is usual with a regression equation, an error term (also multiplicative in this case) is required to handle variations in the observed product/region prices from those generated by the model. In practice, one region and one product in one region have to be chosen as the bases and all other product/region combinations are measured in terms of their variation from these bases.

83. The multiplicative CPD model can be shown using a simple example. Assume that we have $m$ regions and their product list consists of $n$ products. Then, for each product in each region the price observed is $p_{ij}$ for $i = 1, 2, \ldots, m$ and $j = 1, 2, \ldots, n$. Note that the prices are all expressed in Philippines pesos. The CPD model is expressed as where $\alpha_i$ is the product term, $\beta_j$ is the region term, and $\nu_{ij}$ is the error term.
Additive models have some useful properties and so, in practice, the CPD model is converted from a multiplicative one to an additive one by expressing the terms in the model as logarithms:

\[
\log(p_{ij}) = \log(\alpha_i \beta_j \nu_{ij})
= \log(\alpha_i) + \log(\beta_j) + \log(\nu_{ij}).
\]

The parameters in the model are estimated using a least-squares approach. Given the model requires the outputs to be expressed in terms of one region’s currency, the outputs are simply PPPs expressed in terms of that base region. In the model, if we assume the base region is region 1 (metropolitan Manila in this project), then \(\alpha_1 = 1\). In addition, it is necessary to select a product to act as a base product so, if we make \(\beta_1 = 1\), then the model produces estimates of prices in terms of their variation from product 1 in region 1. Any other region can be made the base region simply by dividing each other region’s PPP by that (new base) region’s PPP. The CPD model assigns the same weight to each product’s price, so it is often referred to as an “unweighted model” although it should be really be described as using equal weights.

One useful output from the CPD model is a set of estimated prices for each product for each region. These prices provide an estimate of what the prices would be if the relationships set out in paragraph 82 above held in practice. The differences between observed prices and these modelled prices can provide an indication of possible problems with the prices provided by an region. Large differences indicate possible problems, e.g. because the prices for the same product vary significantly across regions or because the relativities between prices of products within an region vary significantly compared with those in other regions. The distribution of these differences provides the underlying basis for the “Dikhanov tables” which were developed by Yuri Dikhanov of the World Bank as an editing tool. The distributions can be graphed to provide a simple means of identifying potential problem prices, either for a particular product or within a region.

Second-stage estimation (aggregating PPPs)

As is the case with time series price index numbers, several alternative aggregation methods are available for estimating PPPs above the product group level. In early ICP rounds, an additive method (the Geary-Khamis, or GK, method) was used because additivity was considered to be a desirable property given the values deflated by the PPPs came from the national accounts. When expressed in terms of current prices, the values of the components of GDP add to total GDP, although this is not necessarily true in volume terms. In practice, in time series, calculating volumes using the fixed-base Laspeyres formula is the only means of retaining the additivity of the volume estimates. Many countries now use a Laspeyres chain volume measure, which is not additive for years other than the base year and the immediately following year. The situation in the ICP is similar; the Geary-Khamis and Iklé formulas retain additivity but at the cost of a potential bias in the results.

The EKS formula (named after its developers Eltetö, Köves and Szulc) was used to aggregate the detailed PPPs to broader levels for each of the 17 regions. It is a method used to produce transitive PPPs from a set of non-transitive bilateral PPPs. The starting point is to calculate bilateral PPPs for each group of products above the most detailed level for which values were available, for each possible pair of regions, which results in non-transitive PPPs. The EKS method is then used to make the results transitive.

The values derived from the FIES provided the explicit values used in this process, unlike in the first stage in which prices were combined with equal weights. The first step was to combine the PPPs calculated in the first stage between two regions using the values of the first region as weights. A similar process was then followed, but using the second region’s values as the weights. The PPP for
that category between the two regions was calculated as the geometric mean of the two PPPs calculated using each region’s weights separately.

90. The outcome of this process was a matrix of PPPs for each pair of regions, for each aggregate for which PPPs were required, up to the regional total. Each matrix consisted of non-transitive PPPs, which were then made transitive by applying the EKS formula described below to obtain transitive PPPs for each aggregate.

91. The mechanics of the EKS formula are quite straightforward. If there are \( n \) regions, transitive PPPs are obtained as the \( n \)th root of the \( n \) direct and indirect PPPs that can be calculated, with the direct PPPs having twice the weight of the indirect PPPs. For example if there are three regions – A, B and C – the transitive PPP for regions A and B for a given aggregate is:

\[
PPP_{A/B}^{\text{transitive}} = \left( \frac{P^A}{P^B} \right)^{1/3} \left( \frac{1}{P^B/P^A} \right)^{1/3} \left( \frac{P^C}{P^B} \right)^{1/3} \left( \frac{P^A}{P^C} \right)^{1/3}
\]

92. The EKS formula produces transitive PPPs that are as close as possible to the non-transitive PPPs originally calculated in the binary comparisons. For the EKS formula to work, it is necessary for PPPs to be available for all regions for each basic heading. The aggregation process was identical for each level of aggregation. For example, all product groups had to be combined to obtain each regional total PPP. The EKS-based PPPs have to be calculated separately for each expenditure category because it not possible to obtain PPPs for broader aggregates by simply weighting together those for more detailed categories.

93. The EKS formula was used for the Philippines sub-national PPPs for the same reasons it was used in most regions in the 2005 ICP. Its advantages are that it produces results that are unbiased and transitive. However, the sum of the components does not equal the total aggregate to which the components relate (including GDP). The EKS method was adopted in the Asia-Pacific region in the 2005 ICP because the advantages of not having a bias in the results were considered to outweigh the disadvantages of non-additivity. In any case, a supplementary set of additive estimates (based on the GK formula) were produced for those wishing to analyse the economic structure of any individual country.

VIII. The results

94. The attached graphs of price levels for various products and groups of products show the price level on the vertical axis and the 17 regions on the horizontal axis. The lines present the price levels in each of the 17 quarters from the first quarter 2005 (Q1 2005) to the first quarter 2009. All price levels are expressed on a base of Manila in Q1 2005 equal to 1.000. For example, the price level for the food, beverages and tobacco group in Manila was 1.223 in Q1 2009 compared with 1.000 in Q1 2005, which indicates that the price level for this group rose by 22.3% in Manila over these 4 years. Similarly, the price level for the food, beverages and tobacco group in region 2 was 0.873 in Q1 2005, which means it was almost 13% lower than the price level in Manila during that quarter. Four years later, in Q1 2009, the price level for this group in region 2 had risen to 1.088, which was just over 11% below the price level for the equivalent group in Manila.

95. Examining the graphs shows there is generally a large difference in price levels in some regions, with most (but not all) regions having a lower price level than Manila in most cases. There is also a reasonably consistent pattern of price differences over time between the different regions. The PPPs for all product groups were obtained by weighting the detailed PPPs using expenditure data from the FIES. The results show some significant differences in price levels in the 17 regions. One of the aims
of the project was to determine whether it would be possible to use information on differences in regional price levels to adjust the price levels in a major region to annual national average prices and so avoid having to collect prices in all regions for the ICP.

96. Some results have been simulated for 2005 and compared with the PPPs used for the Philippines in the 2005 ICP round. The process was to use regional expenditures from the FIES in 2000, price update\(^1\) them to 2005 and then use the weighted ratio of the national price levels to those for Manila to adjust the price level of the corresponding products collected in Manila for the 2005 ICP.

Data quality

97. One of the requirements of estimating sub-national PPPs in the Philippines was that the costs had to be minimised. The CPI is designed to provide information on changes in prices over time rather than to provide the data required to compare regional price levels. Some compromises had to be made in using the CPI data to estimate regional prices, with some price data having to be discarded. In addition, no extra products were priced to improve the coverage.

98. Very plausible results have been obtained. One means of assessing the quality of the price level data is to examine the diagnostic indicators provided by the residuals from the CPD regressions. They show the differences between the observed prices and the corresponding prices estimated by the regressions. Large differences or erratic behaviour in the residuals can indicate that the price data are not consistent with the assumptions underlying the CPD regressions. While such behaviour could be caused by the assumptions themselves not being valid, experience over many years has shown that these assumptions are generally sound.

Index numbers used in the CPI

99. The Laspeyres fixed-base formula (or a variant called the Lowe index) is commonly used by National Statistical Offices to calculate official price indexes such as the CPI, producer price indexes (PPIs) and export and import price indexes. The Laspeyres formula uses as weights the relative expenditures on the various products comprising the regimen of the price index. Weighting data are expensive to obtain and are usually available only some time after their reference period because it is necessary to conduct surveys to obtain the details. The Laspeyres formula generally leads to an upwards bias in the price indexes because it does not allow for substitution between similar types of products as the prices of one rise relative to those of the other. For example, if the price of beef increases while that of chicken remains the same, consumers are likely to switch part of their expenditure from beef to chicken. Because the Laspeyres price index has fixed weights it does not allow for this substitution until the next time the weights are updated and so the price increase recorded for meat is too high.

100. There are no major implications for the sub-national PPPs of the Philippines CPI being compiled using the Laspeyres formula. The basic data used in calculating the sub-national PPPs were the prices collected for the CPI and they were copied into the special database created for the sub-national PPPs before any index number formula had been applied. They were then combined and aggregated using procedures specially designed for spatial price indexes.

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\(^1\) Price updating refers to a procedure designed to maintain the underlying (base period) quantity weights as values change over time; it is described in detail in paragraphs 9.95 to 9.104 of the international CPI Manual (available at: [http://www.ilo.org/public/english/bureau/stat/guides/cpi/index.htm](http://www.ilo.org/public/english/bureau/stat/guides/cpi/index.htm))
Consistency between ICP and CPI for sub-national data

101. The price data collected for the CPI could be used directly for the ICP provided that the specifications for any products common to the two collections are identical. As mentioned previously, though, one of the requirements of ICP products is that they must be representative and comparable across several regions while representativity alone is the key requirement for a product to be included in the CPI.

102. An alternative method of using the CPI data would be an indirect approach. One of the key requirements of the ICP is to have national average annual prices on which to base the PPPs so that they are consistent with the expenditure values provided by the national accounts. In practice, this requirement is difficult to meet because price levels tend to differ by region within a country. A typical scenario is for housing prices to be higher in metropolitan than rural areas, with fuel prices often being the other way round. Another example is processed foods, which are often more expensive in rural areas than in cities while basic foodstuffs tend to be cheaper in the rural areas than in cities.

IX. Conclusion

103. A major aim of this project was to determine the extent to which prices collected for the CPI could be used to provide reliable estimates of price levels of a range of products in each region. If the relationships between these price levels proved to be consistent then the data collection process for the ICP could be substantially reduced, with consequent cost savings. The process would involve collecting prices for the ICP in a handful of regions (or, at an extreme, only in the national capital region) and then use the relationships identified in the CPI price data to adjust those prices to national average prices for the ICP reference year.

104. Regional prices could also be used to produce regional PPPs, provided expenditure weights are available. Ideally, these expenditure weights would be consistent with the national accounts so that the regional PPPs would be consistent with the national ones produced for the ICP. The data set most likely to be used for estimating weights is the family expenditure survey. While its scope is not identical to that of the national accounts, it would provide an excellent starting point for estimating a regional split of the national estimates of household final consumption expenditure.

105. As can be seen from the graphs of the regional price levels by product group, the relationships between price levels in each of the 17 regions in the Philippines are reasonably consistent for each product group. The conceptual framework provided by the ICP can be used to produce PPPs for each of the 17 regions identified for this project. The outputs will be useful for anyone interested in studying the regional incidence of poverty by enabling the national poverty lines to be adjusted for regional price differences, which are substantial in some cases. They are also useful for studying differences in overall regional standards of living.

106. The key lesson for the ICP is that collection costs could be reduced significantly if the datasets of prices collected for the CPI in each country can be used to adjust prices for one or more major cities to national average prices. The current project using data collected for the Philippines CPI has shown that such an approach is feasible, provided that the prices data are classified by region, defined consistently across regions and can be easily accessed and manipulated. The ADB intends to extend the current study to include a broader range of economies with a view to simplifying the ICP data collection in future ICP rounds.
X. Future work

**Improvements in methodology for sub-national price levels**

107. The current project was designed to determine the feasibility of using the CPI prices dataset to calculate regional price levels, with the dual aim of reducing the effort involved in collecting prices for the ICP and to provide analysts with the data required for regional price level comparisons and studies into the incidence of poverty in different regions. The outcome has been very positive, and feedback will be requested from analysts on the usefulness of the various datasets and their suggestions for improvements and/or extensions to the data currently available.

108. It is clear that improving both the price and expenditure data is an important step in producing more firmly-based and reliable regional PPPs. Ideally, the products being priced for the CPI will be selected so that they overlap in different regions and can be easily compared across regions. Regional expenditures consistent with the national accounts are desirable in order to achieve complete consistency between the international data on PPPs (used in compiling poverty lines for countries) and the regional data. Clearly, the FIES is the key dataset in this regard, and studies could be undertaken to determine the best means of matching the expenditure data from the FIES to the country-wide national accounts data for household final consumption expenditure. User requirements for regional PPPs should also be assessed in detail, particularly for poverty analysis.

XI. References


