Title of paper

Inter-Temporal and Spatial Price Indices for National and International Comparison Programs1: The Case of the Philippines

Abstract

The United Nation’s Statistical Commission (UNSC) in its 47th meeting has endorsed the institutionalization of the International Comparison Program (ICP) and its integration in the regular statistical programs of national and international organizations. The challenge is to find suitable strategies to meet the required data inputs that can be derived from regular price collection of national statistics offices. One of the proposals endorsed in the UNSC meeting is to implement a rolling-benchmark approach for ICP price collection. Said approach would require different methods for adjusting purchasing power parities (PPP) for broad and detailed categories of gross domestic product; and an investigation of the availability and quality of data that will support its implementation. This paper highlights the plausibility and importance of inter-temporal and spatial price indices derived from national consumer price index of the Philippines for implementing the proposed rolling benchmark approach. It also shows that the same set of indices may be used to improve indicators for evidence-based policy making at the national level.

Keywords: purchasing power parities; consumer price index; temporal index; spatial index

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1 The views expressed in this paper are those of the author and do not necessarily reflect the views and policies of the Asian Development Bank, its Board of Governors, or the governments they represent.
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II. Introduction

1. The International Comparison Program (ICP) is one of the longest running global statistical initiative that is designed primarily to produce purchasing power parities (PPP) that are necessary to obtain consistent and internationally comparable estimates of gross domestic product (GDP) and major economic aggregate. The PPP from the ICP also provide better measurement of poverty levels across countries; and, are critical for formulating policies that support inclusive growth. The quality of PPP estimates derived ICP hinges to a large extent on the quality of price and national accounts data and information coming from participating economies. Through the years, the ICP have been underlining the importance of compiling national statistics adhering to scientific principles and international standards and practices.

2. Cognizant of the importance of carrying out the worldwide ICP on a continuous basis and with either shorter interval or none at all, the United Nation’s Statistical Commission (UNSC), in its 47th session, has endorsed the institutionalization of the ICP. Vital to its implementation is mainstreaming the ICP in the regular statistical programs of national and international organizations. The technical and logistic complexities of the ICP, however, require enormous resources.

3. This paper posits that by harmonizing and establishing comparability in certain standards and principles at the national, regional and global level, data produced from regular price collection of NSOs particularly the CPI can be data mined to suit the requirements of the ICP. Using the Philippine ICP and CPI data, the paper highlights the importance of spatial and temporal price indices for implementing the proposed rolling benchmark approach particularly for household. By applying the ICP concept and methods, the uses of CPI data can be extended such that the same set of indices derive may also be used to improve indicators and level of analysis for evidence-based policy making at the national level.

III. Spatial and Temporal Indexes Using ICP and CPI

4. Technically, spatial and time series indexes share conceptual similarities. Past studies show that prices that have been collected for time series price indexes can be used also to construct subnational PPP or spatial price index (SPI). The nature and concepts of ICP and the CPI and the way in which concepts and information derived from these two price indexes that are meant to serve different purposes (spatial and temporal comparison, respectively) are used for subnational PPP or SPI calculations are examined.

5. Purchasing power parities from the ICP are spatial indexes which allow users to compare real economic outputs across economies at a common set of average international prices. It is defined as, the number of currency units required to purchase an amount of goods and services equivalent to what can be bought with one unit of currency in the base country (or the numeraire currency), say the United States. The PPPs are primarily used as “currency
converters” in place of the usual market exchange rates for converting GDP and its major aggregates. The converted aggregates are then considered as “real” since they are technically devoid of price variations among economies allowing users to conduct cross country comparisons. Given its originally intent which is establishing comparability across space, the coverage and list of items priced in ICP between two ICP benchmark years may significantly vary especially to take into account the “more relevant” items prevailing and what is available in the market in each year. It is particularly observed for non-household sectors and for household durable items and services.

6. The CPI, on the other hand, is a temporal index and basically measures the change in the average prices of a fixed basket of goods and services purchased by households from one period to another. It is mainly expressed as an index number relative to a base or reference year, which is set equal to 100. The prices for each product group for each period, usually a month, are compared with those in the base year and weighted by their relative consumption in the base year. 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. The CPI is one of the most widely used economic indicators regularly compiled and disseminated by national statistics office and plays a major role in monitoring the effects of government policies and provides the measure of price changes in consumer goods and services.

7. It is widely recognized that the theory and processes underlying ICP can also be adopted by NSOs to produce subnational PPPs or SPIs which will be more relevant for governments and policy makers. Comparing prices of regions or provinces within a country is relatively easier than across country since the concerns on representativeness or importance of certain items are satisfied. The main challenge is obtaining the detailed variety level information for prices and the appropriate expenditures for each target area or region which is required for subnational PPP estimation.

8. Operationally, any recommendations for ICP price surveys or activities will require resources: human and financial. Capacity building work to encourage and sustain expertise at the national level must be carried out on a more sustainable basis. Availability of reliable indices for services and non-household sectors must also be carefully reviewed. Otherwise, conduct of ICP price surveys, will have to be factored in the institutional budget of NSOs and international organizations.

9. Governments support remains critical for the future rounds of ICP. It is important to underline the relevance of ICP for local and national planning. For international organizations like the ADB, it is important to find ways in which ICP activities will be less burdensome to NSOs without compromising the quality of the PPPs for cross country comparisons.

10. The ensuing sections describe the methods, feasibility, and benefits of assimilating ICP and CPI survey activities. And how such practice will streamline the process of establishing item lists and geographic coverage for the rolling benchmark approach.
IV. Estimating Subnational PPPs for the Philippines

11. The proposal to adopt the rolling benchmark approach to come up with more frequent PPPs calls for the assimilation of international and national statistical programs. To assess the feasibility of such integration in the Philippines, the first step is to understand the conditions that will allow such integration. Applying the ICP concepts and procedures for subnational PPP calculations provides alternatives for implementing the rolling benchmark approach and in filling-up data gaps for non-benchmark years.

12. To effectively apply the ICP concepts in the national context, it is important to obtain a set of prices for items in the CPI that are identical. This will guarantee that their price relativities are not distorted by being dissimilar products. Following the ICP principle of comparing “like with like”, two, or more, products are said to be exactly comparable either: i) if their physical and economic characteristics are identical; or ii) if they are sufficiently similar that consumers are indifferent between them. This implies that consumers are not prepared to pay more for one than the other. Identifying these items from ICP is quite easy given the nature of the ICP. However, it is not too straightforward for CPI. The unique codes assigned to each of the more than 12,000 varieties from the Philippines CPI facilitated the matching and identifying identical or exactly the same items.

Table 1: Number of Items Priced, Philippines 2011

<table>
<thead>
<tr>
<th>BH_Description</th>
<th>ICP</th>
<th>CPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 Food and non-alcoholic beverages</td>
<td>200</td>
<td>1177</td>
</tr>
<tr>
<td>02 Alcoholic beverages and tobacco</td>
<td>16</td>
<td>75</td>
</tr>
<tr>
<td>03 Clothing and footwear</td>
<td>75</td>
<td>581</td>
</tr>
<tr>
<td>04 Housing, water, electricity, gas and other fuels</td>
<td>13</td>
<td>238</td>
</tr>
<tr>
<td>05 Furnishings, household equipment and rout ing maintenance of the house</td>
<td>105</td>
<td>435</td>
</tr>
<tr>
<td>06 Health</td>
<td>61</td>
<td>227</td>
</tr>
<tr>
<td>07 Transport</td>
<td>43</td>
<td>34</td>
</tr>
<tr>
<td>08 Communication</td>
<td>15</td>
<td>41</td>
</tr>
<tr>
<td>09 Recreation and culture</td>
<td>74</td>
<td>225</td>
</tr>
<tr>
<td>10 Education</td>
<td>7</td>
<td>36</td>
</tr>
<tr>
<td>11 Restaurants and miscellaneous goods and services</td>
<td>63</td>
<td>229</td>
</tr>
<tr>
<td>Household Consumption Expenditure</td>
<td>672</td>
<td>3298</td>
</tr>
</tbody>
</table>

Source: Author's estimate, April 2016

13. The study concentrates on the household consumption expenditure categories from the 2011 ICP and CPI data of the Philippines. In particular, the variety level average prices for each of the quarters for each of the 17 regions of the country were used in the calculations. Further, regional expenditure shares from the 2006 Family Income and Expenditure Survey at the 2-digit COICOP were used in the higher level aggregations of PPPs for the ICP and CPI. The FIES is similar to that of the CPI and so it provides a comprehensive and coherent data source for expenditures. The number of items included and the weights used by region for ICP and CPI are provided in Tables 1 and 2, respectively.
14. There are three major considerations for constructing spatial price level indices (or subnational PPPs). This include: 1) the organization of price information and expenditure data in a database format where direct information can easily be satisfied; 2) determination of overlapping items; and 3) subnational aggregation. It should be noted that two sets of PPPs were calculated for this study, one for ICP and the other for CPI. Hence, it was also necessary to conduct a mapping of the classification between these two datasets when comparing the resulting PPPs (Dikhanov, Palanyandy, Capilit, 2011). The Philippines was the first to construct subnational PPPs in Asia following these simple considerations.

15. In the Philippines, each area (province/region) has its own “regional’ basket that represents the regionally purchased or consumed items and reflects the consumption pattern. In order to establish the product overlap, it is necessary to determine which of the regional representative products are being priced by at least two regions. For this purpose, the condition is assume to be satisfied since only items which are priced by at least two regions are included in the PPP calculation. 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. The 2006-based CPI adopted the United Nations Classification of the Individual Consumption According to Purpose (COICOP) in determining the commodity groupings of the items and services included in the market basket.

16. While the prices for about 12,000 unique varieties are available from the Philippines’ CPI, only 3,298 were included in the calculation or about 27% of the total. On the other hand, 672 items were priced by the Philippines in the 2011 ICP. For both list, the most number of

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2 Full description of the subnational PPP estimation methodology is provided in Section VI of ADB Economics Working Paper No. 290 (Dikhanov, Palanyandy, Capilit, 2011).
items priced were for food and non-alcoholic group with 200 and 1,170 for ICP and CPI, respectively.

17. Subnational PPP or the regional/spatial price level index estimation undergoes two stages of aggregation: elementary index and higher level index. For this study, the Spatial-Time-Product-Dummy (STPD) which is an extension of the Country-Product-Dummy (CPD)\(^4\) method was used in elementary aggregation. Accordingly, the number of “country/area/region” dummies will be equal to 17 to represent the regions in the Philippines multiplied by the four quarters in 2011. Basically, the CPD was used as the combined spatial-temporal model where the “spatial” in the original CPD model would have to be read as the country (region) at time period. The regression equation for the CPD can be written as:

\[
\ln p_{cp} = y_{cp} = x_{cp} \beta + \varepsilon_{cp}
\]

Where \(p_{cp}\) is the price of product \(p\) in country \(c\);

\(Dc_j\) and \(Dp_i\) are country and product dummies, respectively;

\(Np\) and \(Nc\) are number of products and countries, respectively;

\[x_{cp} = \left[ Dc_2 \ldots Dc_{Nc}, Dp_1, Dp_2 \ldots Dp_{Np} \right]
\]

\[\beta = \left[ \alpha_2 \ldots \alpha_{Nc}, \gamma_1, \gamma_2 \ldots \gamma_{Np} \right]^T\]

18. Given that the STPD method is a multilateral approach, the resulting PPPs are, therefore, estimated simultaneously for all the regions within the Philippines and across the four quarters of 2011.

19. For higher level aggregation, geometric Laspeyres – the weighted geometric average of the current to base period price relatives using the value shares of the base period as weights was estimated for household consumption expenditures.

V. Some Results and Findings

20. Preliminary results reveal that it is possible to calculate inter-temporal (quarterly) spatial price level index using CPI and ICP data for 2011. Chart 1 and 2 provide the 2011 quarterly regional price level index for Household Final Consumption Expenditure derived from CPI and ICP, respectively. The regions are located on the horizontal axis. The price level is on the vertical axis. The regional prices indices are plotted by quarter, from Q1 to Q4 2011. For each region, each quarter is presented by an individual column. The reference point is the price level in Manila in Q1 2011 (Manila Q1 2011 = 1.0). Thus, for the ICP data, the price level in

\[^{4}\text{For more information on the country-product-dummy model and its variant, the country-time-product-dummy, please refer to Dikhanov, Palanyandy and Capilit, 2011.}\]
Philippines in Q4 2011 is 91% of Manila’s price level in Q1 2011. In Q4 2011, the Manila price level rose to 103% of the reference point (Manila Q1 2011). For CPI data, the Manila price level in Q4 also increased to 102%, slightly lower than the estimates using CPI data.

21. The charts further reveal that there are generally differences in price levels in some regions, with most (but not all) regions having lower price level than Manila. However, the differences of the price levels from ICP data are not as obvious as the CPI data.

22. In terms of the feasibility of using the results for the rolling benchmark, it was found that there is consistency between the results of the CPI and ICP data in terms of Manila’s price levels for food, beverages and tobacco; alcoholic beverages and tobacco; communications; and restaurants and miscellaneous goods and services. These means that for these major group the capital city to national average price relation from CPI can be utilized for adjusting the price levels in a major region to annual national average prices or to use the capital city prices to avoid having to collect prices in all regions for the ICP. The preliminary results also support earlier findings that CPI information may be used for the proposed rolling benchmark approach and fine-tuning existing PPP extrapolation and retrapolation methods.
The regional price level indices derived from CPI will provide insights to policy-makers when planning for regional wage rate adjustments and or improving the indicators that require regional or across space comparisons. Also, subnational PPPs may be used to estimate regional standards of living for a better-informed decision making.

<table>
<thead>
<tr>
<th>Major Group</th>
<th>ICP</th>
<th>CPI</th>
<th>ICP &amp; CPI Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERSONAL CONSUMPTION EXPENDITURE</td>
<td>PHI Manila AOM</td>
<td>PHI Manila AOM</td>
<td>Manila AOM</td>
</tr>
<tr>
<td>01 FOOD AND NON-ALCOHOLIC BEVERAGES</td>
<td>1.00 1.05 0.98</td>
<td>1.00 1.06 0.98</td>
<td>(0.9) (1.9)</td>
</tr>
<tr>
<td>02 ALCOHOLIC BEVERAGES AND TOBACCO</td>
<td>1.00 1.01 1.00</td>
<td>1.00 1.01 1.03</td>
<td>0.1 (2.7)</td>
</tr>
<tr>
<td>03 CLOTHING AND FOOTWEAR</td>
<td>1.00 1.05 0.98</td>
<td>1.00 1.10 0.97</td>
<td>(4.7) 1.2</td>
</tr>
<tr>
<td>OTHER FUELS</td>
<td>1.00 0.96 1.00</td>
<td>1.00 1.11 0.95</td>
<td>(14.1) 5.5</td>
</tr>
<tr>
<td>AND ROUTING MAINTENANCE OF THE HOUSE</td>
<td>1.00 1.04 0.98</td>
<td>1.00 0.95 1.02</td>
<td>9.5 (3.9)</td>
</tr>
<tr>
<td>06 HEALTH</td>
<td>1.00 1.05 0.98</td>
<td>1.00 0.98 1.01</td>
<td>7.1 (2.6)</td>
</tr>
<tr>
<td>07 TRANSPORT</td>
<td>1.00 1.04 1.00</td>
<td>1.00 1.50 0.90</td>
<td>(30.6) 11.0</td>
</tr>
<tr>
<td>08 COMMUNICATION</td>
<td>1.00 1.01 1.02</td>
<td>1.00 1.00 0.99</td>
<td>0.9 2.8</td>
</tr>
<tr>
<td>09 RECREATION AND CULTURE</td>
<td>1.00 1.05 0.99</td>
<td>1.00 1.10 0.96</td>
<td>(5.2) 3.1</td>
</tr>
<tr>
<td>10 EDUCATION</td>
<td>1.00 1.28 0.83</td>
<td>1.00 2.79 0.53</td>
<td>(54.1) 56.4</td>
</tr>
<tr>
<td>11 RESTAURANTS AND MISCELLANEOUS GOODS AND SERVICES</td>
<td>1.00 1.05 0.98</td>
<td>1.00 1.09 0.95</td>
<td>(3.8) 3.5</td>
</tr>
</tbody>
</table>

Source: Author’s Estimates

VI. Conclusions and Way Forward

PPP derived from ICP has longed been recognized as critical for cross country comparisons of GDP, price levels and establishing the international poverty line; among others. Carrying out the ICP on a continuous basis has become imperative especially with UNSC’s endorsement of its institutionalization at the national and international level.

Finding ways to better integrate the ICP methods and practices at the national level is largely critical to ensure sustainability of the ICP. The study shows that in the Philippines, it is quite possible to integrate ICP with national statistical program. Applying the ICP concepts and methods, temporal and subnational/spatial price level index were computed using the 2011 CPI data. The PLIs closely approximate the relationship of capital city to national price levels from the 2011 ICP and may be able to complement the proposed rolling benchmark approach. Once implemented, such approach would effectively reduce the cost for ICP price surveys as CPI information for a number of major expenditure groups like food, and other shop items may be used to infer on the national averages.

The importance of using the ICP concepts and methods for estimating subnational PPPs for downstream analyses of price levels and policy-relevant national indicators such as the HDI,
are critical in securing the platform future ICP work. Apart from the Philippines, the same study must be extended and its findings must very well have to be verified in other geographically large or culturally diverse economies.

27. Given the logistics and technical complexities of the ICP, research initiatives previously implemented in the region such as the PPP Updating which used the combinatorial approach for deriving the core list of items from household and nonhousehold sectors and the collection of prices only at the capital city; and the inclusion of ICP core list items in the CPI baskets (or vice versa) following the same SPD should also be considered when implementing the recommendations of the technical advisory group.

VII. References


