Synergies between CPIs and PPPs and the Integration of Survey Activities: The Case of Galápagos Islands

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1 Introduction

Galápagos Islands are part of the economic and political territory of Ecuador. So far, wages and salaries paid to public and private employees in the islands have been fixed to 2.0 and 1.75 times those paid to their inland counterparts, respectively.

However, a presidential law promulgated in June 2015 (*Ley Orgánica de Régimen Especial de la Provincia de Gálapagos, Segundo Suplemento, Registro Oficial n. 520, 11 de junio 2015*) has established that government employees in the Galápagos Islands should receive a remuneration equal to the one fixed for government employees in the continental Ecuador, multiplied by the difference between the consumer price index, CPI, of the Galápagos with respect to the continental CPI.

Actually, the CPI for Ecuador does not include observations for the Galápagos Islands, whereas a correct application of the law requires both the availability of intra-annual observations for CPIs for the islands, and spatial lower-frequency PPPs calculated comparing price levels of a common basket of goods and services in the islands and the continent at common exchange rate, namely Price Level Indices (PLIs).

The UN-ECLAC, upon request of the Instituto Nacional de Estadísticas y Censos (INEC) of Ecuador, has recently provided technical statistics support to settle the estimation of a monthly CPI and a bi-annual PLI for the Galápagos, which will serve as a basis for routine calculations of wages and salaries to be paid to employees residing in the islands.

This paper describes the steps undertaken for the establishment of a regular CPI calculation for the islands, which will be regularly published jointly with the national CPI, as well as the integration of the new and the available data sources (including the Rural and Urban National Household Expenditure Survey, NHES) for the estimation of the Galápagos PLIs.

The results of the calculations for the temporal and spatial comparison show some degree of difference from the ratios used so far in setting up remunerations in the Galápagos Islands. This data will be officially released later on this year, therefore they will not be included and discussed in this note.

In Section 2 of this short note we provide a description of the frame used and the price data collection, while in Section 3 we detail on the estimation formulas used. Section 4 contains some conclusions and lines for future research.

2 The frame and price data collection

The spatial consumer price index (SCPI, or PPP) of Galápagos measures the relationship in the price level of the islands with respect to the continental Ecuador, considering a common basket of goods and services for both domains derived from the comparison of price levels and expenses for a reference period.

The main institutional purpose of this index is to apply the Law on the Special Regime of the Galápagos Province, by calculating the Purchasing Power Parity (PPP) between Galápagos and the continental Ecuador.

The first spatial index is calculated for the period October 2015 - March 2016, for which a common basket of aggregates of representative goods and services is established according to expenditure made by households both in the continent and Galápagos, obtained from the NHES of 2011-2012. The spatial index will be updated once a new survey will be available.

The consumption pattern analysis for the construction of the basket comprises on the one hand the areas of San Cristobal, Santa Cruz and Isabela in the Galápagos province; and on the other hand, the areas of Guayaquil, Quito, Cuenca, Manta, Machala, Loja, Esmeraldas, Santo Domingo and Ambato for the continent, under the sampling frame of the NHES 2011-2012. The SCPI is calculated using the methodology of PPPs, which use the Laspeyres, Paasche, Fisher and Elteto-Koves-Szulc (EKS) formulas to establish the relationship in the price level between Galápagos and the Continent, as an index that compares the level of prices of these geographical areas based on a common basket for a given period.

For both areas, the basket has been established by considering the various items of expenditure in the NHES reflecting the consumption of households in the continent and the Galápagos. It should be noted that the Galápagos Islands are not included so far in the calculation of the national CPI.

Overall, the procedure used is based on the selection of a higher number of items for important headings (in terms of ratio expenditures) and headings with greater variability of prices spending and heterogeneity of products. Some products are easier to aggregate than others, for example food vs. clothing. Finally, as discussed later, in the case of certain items that are of importance for Galápagos Islands (such as transportation, education, health, etc.), a special treatment is required.

The final list of goods and services is a structure expressed according to the Classification of Individual Consumption by Purpose (COICOP) with 12 "Divisions", 41 "Groups" and 75

"Classes" at the higher level, and a specific classification at the lower level of the "Basic Headings", which are 116 totally.

It is important to note that the Basic Heading is the most elementary level of aggregation for calculation of the PPPs. This level of aggregation is generally determined by the lowest level of final expenditure of households on items that have some similarity and for which expenditure weights are estimated.

Price data collection is carried out through direct interview by price data collectors directly in the property, using Mobile Devices Data Capture instruments. Reporting units that form the directory for gathering information are classified according to type in: large establishments; medium and small shops; markets; street vendors; specialized stores; individualized service establishments; establishments or regulated basic services; and other sources without establishment, in order to diversify and optimize price data capture.

Some goods and services deserve a special treatment for obtaining prices. Four categories should be considered in this respect.

(1) External estimates for the case of island items that cannot be priced in the continent under the same conditions specification through the process of field and therefore are estimated by applying the Hot Deck model, considering prices of articles with similar characteristics (distance, time, number of passengers etc.) and having the same use[1].

(2) Parametric estimates for items whose average price requires a particular calculation process in order to better reflect the reality of households in the islands in contrast to the Continent. Thus, specific treatments were designed in the following areas: health, education, transport, recreational services (see Annex 1).

(3) Goods for which the average prices of Galápagos is compared not with the national average price of the Continent, but with the average price of the coastal region (for example, Bermuda shorts, pyjamas, school uniforms etc.). It should be also noted that for food, a category of 'similar items' has been introduced in some cases, in order to ensure comparability for the quality of products.

(4) Stratum brand and establishment for items in which it is not possible to achieve comparability in the brand attribute, due to the limited availability of varieties of some items or some service providers in the province of Galápagos. Appear in this group: metal cookware set, by brand; mobile rate plan, and electronic recharges for mobile phones, by establishment.

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[11] For example, light aircraft travels, estimated from inter-cantonal transport, air travel with domestic destination, travel by plane and boat trip; and boat trips, estimated from inter-parochial transport, inter-cantonal and inter-province transport.

3 Formulas for the calculation of the PPPs

The calculation of the SCPI starts with the monthly estimation of the average price of each item in the basket of both Galápagos and the Continent as a geometric mean of the price collected for each good and service. Then, a single geometric average price item is calculated by domain for the entire reference period of six months, using the formula

$$\bar{p}^i = \left(\prod_{t=1}^{n} \bar{p}_t^i \right)^{1/n}$$

where

$\bar{p}^i$: Overall price of good or service i in the reference period (6 months)

$\bar{p}_t^i$: Average price of good or service i in month t, $\bar{p}_t^i = \left(\prod_{c=1}^{k} p_{c,t}^i \right)^{1/k}$ where $p_{c,t}^i$ is the observed price of i in month t and k is the total number of prices collected for i in month t

n   : 6, number of months for price data collection

Once estimated the matrices of average prices, we proceed to calculate the PPPs in two phases: (1) aggregation below the level of the basic headings; and, (2) aggregation above the level of the basic headings.

3.1 Aggregation below the level of the basic headings

The procedure to obtain the PPPs at the basic heading level is as follows:

(1) Calculation of Laspeyres price indices (geometric average of the prices collected in both areas, which are representative in the base area)

$$L_{j/h} = \left(\prod_{i=1}^{k} \frac{*_h P_j^i}{*_h P_h^i} \right)^{1/k}$$

where h is the base area, j is the partner area, $*_h P_j^i$ and $*_h P_h^i$ are the prices of i in the areas j and h that are representative in the area h; and k is the number of representative products of the base area.

(2) Calculation of Paasche price indices (geometric average of the prices collected in both areas, which are representative in the partner area)

$$P_{j/h} = \left(\prod_{i=1}^{m} \frac{*_j P_j^i}{*_j P_h^i} \right)^{1/m}$$

where $*_j\,P_j^i$ and $*_j\,P_h^i$ are the prices of i in the areas j and h that are representative in the partner area j; and m is the number of representative products of the partner area.

(3) The two matrices calculated under (1) and (2) are, in this particular case, equal. Therefore, the Fisher matrix calculated as $F_{j/h} = \left(L_{j/h} * P_{j/h}\right)^{1/2}$ will give the same results of the Laspeyres and Paasche formulas.

(4) Calculation of the matrix Elteto-Koves-Szulc (EKS) that, in this particular case, will be equal to the Fisher, Laspeyres and Paasche one. The matrix will be then standardized, by dividing each of its elements by thee geometric average of the PPPs calculated with respect to the base area, namely $EKS_j = \dfrac{EKS_{j/j}}{\left(\prod_{s=1}^{N} EKS_{s/j}\right)^{1/N}}$.

(5) In our case, where N is equal to two, the PPP for each basic heading expresses how many dollars are necessary in the Galápagos in order to have the same purchasing power of one dollar in the Continent

$$PPA_{j/h} = \frac{EKS_j}{EKS_h}$$

where $PPA_{j/h}$ is the number of monetary units necessary in the area j (Galápagos) to obtain the same basic heading that one could buy in the area h (Continent) with one dollar.

3.2 Aggregation above the level of the basic headings

The steps are the same and the procedure similar to the one followed at the level of the basic headings, but here they are applied to the PPPs obtained in the previous phase. Briefly,

(1) Calculation of Laspeyres and Paasche PPP indices, as follows

$$L_{\frac{j}{h}} = \frac{\sum_{i=1}^{k}\left(\frac{PPA_{i_{\overline{j}}}}{PPA_{i_{\overline{h}}}}\right)*w_{ih}}{\sum_{i=1}^{k} w_{ih}} \text{ and } P_{j/h} = \frac{\sum_{i=1}^{k} w_{ij}}{\sum_{i=1}^{k}\left(\frac{w_{ij}}{\frac{PPA_{i/j}}{PPA_{i/h}}}\right)}$$

where w_{ih} is the weight (obtained from the NHES) of the basic heading i in the area h (note that here the two matrices give different results)

(2) Calculation of Fisher PPP indices, the EKS, namely the geometric average of the direct Fisher PPPs and all indirect between the two areas, and its standardization

$$EKS_j = \frac{EKS_{j/j}}{\left(\prod_{s=1}^{N} EKS_{s/j}\right)^{1/N}}$$

4 Results and conclusions

As discussed above, the results of the calculations will be officially released in Ecuador during 2016, possibly by the end of May. However, from the work carried out some considerations are worth mentioning.

First of all, the procedure applied will finally lead to results that will allow the calculation of an adjustment factor for both public and private salaries in the islands, leading to a more robust calculation of remunerations in the two sectors. Furthermore, it will be possible to calculate, on a monthly basis, a CPI for Galápagos, which will be regularly published jointly with the traditional measure of inflation for the Continent.

Discussions with authorities, policy-makers and sector experts have led, during the course of the elaborations, to refinements in the calculations made, especially concerning the treatment of special cases; they have stimulated a deeper knowledge of the methods used and, possibly, more ownership of future results by stakeholders.

A line for future research and analysis is the search for more appropriate information to take into account the differences among the islands, due to their size or economic and geographic importance, i.e. some islands do not offer all services available in other islands (i.e. in the areas of education or health), some islands trade goods that should first pass by other islands.