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Sub national PPPs

Sub National PPPs based on integration with CPIs

Research Project, Draft Proposal

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by prof. Luigi Biggeri et al., December 7, 2009

I. Introduction

During the last TAG meeting in Washington D.C. the need for constructing sub national PPPs in the context of poverty, rural-urban and regional differences in general was highlighted by several participants of the meeting including Angus Deaton, Alan Heston and Prasada Rao.

This issue has been discussed extensively in literature¹ (see for example Kokoski, 1991, Moulton, 1995, Bretell and Gardiner, 2002, Ferrari G., T. Laureti and F. Mostacci, 2005; OECD Manual 2005).

In surveying international practice it can be seen that only few countries produce official indexes of spatial prices. Australia is working towards the regular production of these statistics while the UK carried out in 2000 a one-off exercise to produce indicative figures on the variation in prices between regions. Then the Office for National Statistics (ONS) published estimates of regional price level comparisons in 2004.

The US undertook various works in this area in the mid-1990s and more recently estimated experimental price level differentials for 2003 and 2004.

Italy started a research project in 2005 and since then it has been carrying out an experiment to calculate PPPs in order to compare the consumer price levels at regional level. In 2008 the Italian Statistical Institute published the results obtained for some expenditure divisions.

In the framework of ICP China calculated PPPs of its 31 provinces (cities, districts) in 2002. Asian update of the 2005 ICP as it was indicated during the last TAG meeting includes sub-national components and several countries including the Philippines are estimating sub-national PPPs based on their CPIs.

New Zealand has been investigating the possibility of constructing spatial comparisons of prices since 2005

Finally, the importance of sub-national and urban-rural price differences cannot be underestimated in the context of poverty studies, as it was stressed during the last TAG meeting.

Taking into account the discussion during the TAG meeting and the analyses already carried out, the following Research Project proposal has been prepared in order to be submitted at the World Bank in the framework of the ICP.

¹ The first official measure of inter-area differences in the cost of living was the standard budget of the Family Budgets program of the BLS of the US, developed in the 1940's.

II. The construction of sub-national PPPs on the basis of CPI

A. Some methodological issue concerning comparability and representativeness

In moving towards implementing and finally compiling and publishing temporally consistent spatial indexes by using as much as possible the CPI data, it is worth to stress that the main issue in building the list of products for such comparisons is the implementation of two main principles, that is *comparability* and *representativity*, which are actually in conflict with each other as widely recognized by Locker (1984), Heston (1996) and Rao (2001) among others.

In the ICP context, the comparability across space is the most important issue to satisfy so that the comparison between two countries is carried out by using the identity products principle, which may hamper the comparison between countries with different consumption behaviour and therefore may produce misleading results.

On the other hand in temporal comparisons (CPI) the main principle to be satisfied is the representativeness of the products to be priced in term of consumption expenditure share and their evolution of price changes over time. The comparability across time is to be upheld while the comparability across space is quite weak because it only required approximately comparable products to be collected which must satisfy the same consumers' need.

In both cases it is important to identify items that are representative, however in the ICP context representativity is harder to attain, and many products cannot be found in all countries or are not representative. Representativity in the ICP context should be given special attention as non-representative items may jeopardize the comparison and decreasing the efficiency and reliability of the resulting PPP estimates as underlined by many authors (Hill, 2007, Diewert, 2008; Biggeri and Laureti, 2009). However the issue might be less important for the construction of sub national PPPs (Biggeri, De Carli and Laureti, 2008).

B. Sub national PPP: International Practice

As already mentioned, in order to meet the growing demand for official estimates of purchasing power parities (PPPs) at a sub-national level different countries have undertaken experiments in recent years.

In some countries, the computation of sub-national PPPs is based on data taken directly from the CPI collected from retail outlets throughout the country while in other cases additional data are collected via a purpose-designed regional price levels survey for items of expenditure where suitable CPI data was not available (mainly clothing, furniture, electrical goods and travel).

Obviously, the estimates of regional price levels or changes are not a natural by-product of the CPI computation. However, although the CPI survey is not designed as an inter-area survey, it is possible to use its price observations and expenditure (or sampling) weights to obtain sub-national PPPs.

In the US the inter-area price level comparison among 38 metropolitan levels is totally based on CPI data (Kokoski, Moulton and Zieschang, 1999; Aten, 2005, 2006). A similar approach has been recently followed by China in order to calculate PPPs of its 31 provinces (cities, districts) in 2002. In particular 127 samples of commodities and services were selected following the comparability and the authority principles (Xiumin Li, Lili Zhang and Yashu Du, 2005).

The first exercise in the UK was done as a by-product of a survey conducted to provide data for Eurostat's Purchasing Power Parities (PPP) programme (Fenwick and O'Donoghue, 2003), afterwards in 2004 the ONS produced regional price level comparisons based on CPI price data (mainly food items, tobacco and drinks) supplemented with a purpose-designed regional price level survey (mainly clothing, furniture, electrical goods and travel) undertaken earlier in the year (Wingfield, Fenwick and Smith, 2005).

Italy followed a similar procedure (De Carli, 2008; Biggeri, De Carli and Laureti, 2008) and decided to integrate the CPI data with data obtained from specific surveys when the items are not sufficiently well defined to ensure like-for-like comparisons. In this first exercise the estimated results were related only to some expenditure categories: Food and beverages, Clothing and footwear and Furniture for the home, which represent about 34% of the total consumer expenditures.

C. Calculation of sub national PPP based on CPI data

In order to compute the PPPs at regional level within the country by using the CPI data firstly it is necessary to analyse the definition of each item used for each CPI elementary aggregate and comparing it with the similar item used for the BH in the PPP computation. It is also essential to decide if it is possible to use only data collected for the CPI computation to calculate also the sub-national PPPs or if to this aim it is necessary to carry out a new price survey for some specific goods to integrate the CPI data as well. In any case, at least for the use of CPI data, we have to follow these steps:

1. Harmonize the product descriptions across regions
2. Build an average price database. Re-code the database using a nationally recognized code for each variety in order to be able to match the same products in the various regions for the calculation of PPPs
3. Carry out, if it is necessary, a specific price data collection for some groups of products
4. Select an elementary aggregate method (CPD, weighted CPD, CPD with regional dummies) based on simulations and analyses
5. Select the index number at an aggregate level (Törnqvist, EKS, Fisher) based on simulations and analyses.

It could be also useful to analyse the existing CPI data base and Budget (Expenditure) Household Survey in order to obtain reliable poverty estimate, to be used for comparison purposes.

D. In short the research proposal has two main objectives:

- to help the National Statistical Institute to plan and carry out its intra-national PPP calculation;
- to develop various methodological aspects concerning the PPP computation both at elementary and aggregate level.

III. Implementation phase

The research proposal could be implemented in three consecutive phases:

A. Phase I : Implementation of the suggested methodology in Italy.

The Italian National Statistical Office (Istat) in principle agreed to do this kind of experiment, so during the first phase of the research project could be useful to start by computing the Sub-national PPPs for Italy. In order to clarify what it is important to do, some information on the Italian CPI system follows.

a) *Analysis of Italian CPI system*

The Italian National Institute (ISTAT) elaborates three different CPIs using, as many other NSIs, a chain index of the Laspeyres type. Here CPIs computed with reference to the consumption of the whole population, called NIC , are considered.

Concerning products, the COICOP hierarchical classification (Classification of Individual Consumption by Purpose) is used, as underlined by the International Labour Office (ILO, 2004) The *elementary aggregates*, that are groups of relatively homogeneous goods and services (that can serve as strata for sampling purposes) have been aggregated in sub-classes (equal to 205 in the year 2008), in *classes* (109), in *groups* (38), up to 12 *divisions* (chapters of expenditure)².

Within each elementary aggregate, the *representative products* (533 in the year 2008) are selected to represent the price movements of all the goods and services in the elementary aggregate and for which a system of weights should be estimated. Moreover, in some cases the representative products are “composite product” so more *items* or products are can be selected for price collection (in 2008 more than 1,000).

The collection of item prices is carried out both centrally, by the staff of Istat and locally, in the chief towns of the provinces (**84 Municipalities in the year 2008**), by the staff of each Municipal Statistical Office (MSO), following two different procedures (Istat, 2007). Istat collects item prices for products and services defined by national pricing policies and show a unique price throughout the whole country, and for prices that are difficult to observe directly at local level because of rapid and continuous technological changes of the products (the elementary items so collected represent about the 20% of the products in the CPI).

The different MSOs included in the survey observe prices from individual outlets at territorial level (nearly 40,000). The outlets are selected by MSOs for each product using a non-probability stratified sample, according to the size and the demographic importance of the local district (municipality), the characteristics of the area (urban and non-urban and so on) inside the municipality, the type of distribution channel and products sold; the size of the outlet; the variability of the price of the product. The selection is made, through a kind of *quota sampling*, to be representative of the behaviour of the consumers in the municipality, using various sources of information (for example, the local Chamber of Commerce).

² The following example shows the possible coverage of the different aggregates. The entire set of consumption goods and services covered by the NIC is divided into divisions, such as “food and non-alcoholic beverages”. Each division is then divided into groups such as “food”; then each group is further divided into classes, such as “fish”. Moreover, each class is divided into more homogeneous sub-classes, such as “fresh fish”. Finally, a sub-class may be further subdivided to obtain the elementary aggregates and inside of these to select the representative product such as “freshwater fish”.

The selection of these **items** is purposive or judgmental; the significant difficulties involved in defining an adequate sampling frame (that is, a list of all the individual goods and services bought by households) preclude, in this moment, the use of traditional random sampling methods.

Therefore, in each outlet selected for a specific product of the basket, collectors gather the price of the *most sold elementary item* of the product. Then the prices of these items are collected throughout the year, with different frequency. About 400,000 elementary prices are collected, mostly on a monthly basis, some twice a month (for fresh vegetables and fruits, fresh fish and automotive fuels), and some on a quarterly basis.

Due to ease of computation, timeliness and clear meaning, for calculating the CPIs on a territorial level, the Municipal CPIs, Istat uses the Laspeyres type formula, but with *annual revision of the system of weights*, referred to the December of the previous year; so that for all the months of the subsequent year the indices are computed referring to the base period December of the previous year (that is the indices are computed as ${}_{t-1,12}P^j_{t+m}$ where t is the current year and $m= 1, \dots, 12$ refers to the months). The Municipal CPIs are calculated for 84 municipalities (chief town of the provinces) using household expenditure share as weights, computed taking into account two main sources of data: the HES (the Households Expenditures Survey) and the National Accounts estimates for household final consumption expenditures (additional information are also obtained from production and trade statistics, scanner data gathered from cash registered data, and so on).

In order to use the sub-national PPPs in the context of poverty, it is important to note that in Italy have been already carried out tentative experiments to compute CPIs for different type of households (Biggeri and Leoni, 2004) and to estimate absolute poverty per different type of households at detailed territorial level (Istat, 2009).

b) ***Implementation of the proposed procedure:***

- Harmonize the product descriptions across regions
- Build an average price database. Re-code the database using a nationally recognized code for each variety in order to be able to match the same products in the various regions for the calculation of PPPs
- Select an elementary aggregate method (CPD, weighted CPD, CPD with regional dummies) based on simulations and analyses
- Select the index number at an aggregate level (Törnqvist, EKS, Fisher) based on simulations and analyses
- Analyse the existing CPI data base and Expenditure Household Survey in order to obtain reliable poverty estimate

B. Phase II The second step extends the research experiment to cover other countries

To extend the experiment to other countries, it could be possible to involve the National Statistical Offices of Spain (for Europe) and Argentina, Brasil and Mexico (Latin American countries). Some of them already expressed, in principle, interest in implementing this kind of Research Project proposal to compute sub-national PPPs. The activities to be carried out are the following:

- a) *Analysis of country CPI system*
- b) *Analysis of the characteristics of the data collected*
- c) *Implementation of the procedure (as described in the phase 1.b)*

Obviously some consultancies on the field of each country will be necessary.

C. Phase III International comparison

The objective of this phase is to develop similar procedures, which allow us to use CPI data correctly for international comparison of price levels among countries. In order to identify an item list for spatial comparison we should start by analysing the comparability of the CPI baskets of the countries to be compared (Biggeri and Laureti, 2009). In this way it is possible to verify the actual overlapping of the consumption baskets in order to calculate “true” PPPs, that is PPPs which express the actual consumption behaviour in different countries.

With the aim of comparing the items included in the CPI baskets of two or more countries, it may be necessary to specify the degree of comparability of the different products, obtaining subsets of products with different degree of comparability (for example, dividing the products and services included in the baskets into two groups: non comparable and comparable items with at least a minimum degree of comparability).

Implementation of the procedure:

- Since the methodology used can differ among countries in particular regarding the phase of price collection we should start by analysing a few countries with similar characteristics concerning the construction of CPIs;
- Each product should be given an internationally recognized code in order to be able to match the same products in the countries selected for the analysis (Need of harmonization)

IV. Recommendations

Price data collection could be improved by using the *Structured Product Descriptions*, or *SPDs* at national level

References

- Aten, B. (2005) "Report on Interarea Price Levels" Working Paper No. 2005-11, Bureau of Economic Analysis, May.
- Aten, B. (2006) Interarea Price Levels: An Experimental Methodology, *Monthly Labor Review*, September, 129, 9, 47–61.
- Biggeri L and Leoni L. (2004), "Families of consumer price indices for different purposes. CPIs for sub-groups of population", *Statistical Journal of the United Nations ECE*, vol.21, n. 2, 157-165.
- Biggeri L. and Laureti T. (2009) Are integration and comparison between CPIs and PPPs feasible, in *Price Indices in Time and Space*, Luigi Biggeri and Guido Ferrari (eds.), Springer, 2009, forthcoming.
- Biggeri L., De Carli R. and Laureti T. (2008), "The interpretation of the PPPs: a method for measuring the factors that affect the comparisons and the integration with the CPI work at regional level", paper presented at the Joint UNECE/ILO meeting on Consumer Price Indices, May 8-9, Geneva.
- Bretell S. and B. Gardiner (2002), "The development of a System of European Regional Purchasing Power Parities", European Regional Science Association Congress, Dortmund, 27-31 August, 2002
- Diewert, W. Erwin (2008). New Methodology for Linking Regional PPPs, *ICP Bulletin*, 5,2, August, 1, 10–21.
- Fenwick and O'Donoghue (2003) 'Economic Trends' No. 599 October 2003, .72-83
- Ferrari G., T. Laureti and F. Mostacci (2005), "Time-Space Harmonization of Consumer Price Indexes in Euro-Zone Countries", *International Advances in Economic Research*, Vol.11, No.4, November, 2005.
- Heston, A.W. (1996), "Some problems in item Price Comparisons with Special Reference to uses of CPI Prices in Estimating Spatial Heading Parities", in *Improving the Quality of Price Indices: CPI and PPP*, EUROSTAT, Proceedings of the International Seminar held in Florence, December 18-20, 1995
- Hill, P. (2007), "Estimation of PPPs for Basic Headings Within Regions", Chapter 11 in *ICP 2003-2006 Handbook*, Washington D.C.: The World Bank.
- ILO et Al. (2004), *Consumer Price index manual: Theory and practice*, Geneva. An electronic updated version of the manual can be found at the web site of ILO.
- Istat (2009), Nuova metodologia per la stima della povertà assoluta, collana Metodi e Norme, n.39.
- Kokoski M. (1991) New Research on Interarea Consumer Price Differences *Monthly Labor Review*, Vol. 114.
- Kokoski, M. and Moulton B, and Zieschang K. (1999), 'Interarea Price Comparisons for Heterogenous Goods and Several Levels of Commodity Aggregation', in *International and Interarea Comparisons of Income, Output and Prices*, ed., by Alan Heston and Robert Lipsey, 123-66. University of Chicago Press.

- Krijnse Locker H. K. (1984), "On the estimation of Purchasing Power Parities on the Basic Heading Level", *Review of Income and Wealth*, 30, 2, 135-152.
- Rao D. S. Prasada (2001), "Integration of CPI and PPP: Methodological Issues, Feasibility and Recommendations", *Joint World Bank-OECD Seminar on PPP*, Washington, DC.
- Xiumin Li, Lili Zhang and Yashu Du (2005) Study on the Method of Regional Purchasing Power Parity in China, *China-USA Business Review* Jul. 2005, Volume 4, No.7 (Serial No.25).
- Wingfield, Fenwick and Smith (2005) Relative regional consumer price levels in 2004 *Economic Trends* 615, February 2005, 36-46