Sub-national PPPs in Viet Nam

I. Introduction

In VietNam, we call Sub- nation PPPs in the term SCOLI (Spatial cost of living). Sub - national PPPs is a statistical index reflecting the difference in price of goods and services serving for daily life of the people among provinces/cities, among regions in the country at one time (month, quarter or year). In 2010, WB supported GSO to study on a pilot basis to calculate SCOLI 2012 with the list of 64 goods and services of which food and foodstuff are majority. Since 2012, GSO has officially conducted survey and calculated SCOLI 2012 by state budget, including 101 goods and services, rising by 37 commodity items over 2010. The increased items are mainly non-food and non-foodstuff goods to improve the representation of SCOLI as well as use for other purposes such as calculating HDI. However, there have faced many difficulties in collecting SCOLI prices in provinces/cities, thus the quality of SCOLI data has not reached the standards as required.

In 2011, GSO participated in International Comparison Program 2011 (ICP 2011) in the region Asia - Pacific coordinated by ADB. WB and ADB experts introduced calculation method of Sub-PPPs for each country basing on CPI data available. Sub-PPP indicator can be equivalent to SCOLI because Sub-PPPs also reflects the difference in the price of goods and services among provinces/cities, among regions in the country at one time.

Using CPI data to calculate SUB-PPPs has some advantages as follows:

- Do not obligate to conduct SUB-PPPs survey every 2 years in 63 provinces/cities. Thus, it can save budget, human resource and time, etc and the essential data can still be published more frequently (quarterly, yearly).

- Commodity items in CPI are more adequate, covering food, foodstuff and non-food goods and services.

- Using CPI data to calculate SUB-PPPs can serve better for assessing the poverty alleviation program, HDI calculation and other purposes.

With the above advantages of SUB-PPPs indicator calculated using consumer price data source, GSO developed Project to Improve SUB-PPPs calculation method using consumer price data source. From 2014, SCOLI price survey will not be conducted in provinces/cities. Budget for SCOLI survey 2014 will be moved to the estimation for studying methodology and calculation on pilot basis of SUB-PPP index using consumer price data source in 2014.

II. Scope and uses of sub-national PPPs

(1) Scope

SCOLI index is compiled and grouped according to the following :

- According to 63 provinces: compare with the average price of Hanoi city.

- According to 6 geographical regions: compare with the Red River Delta region.

- According to 11 groups of consumer goods by purpose (COICOP).

(2) Uses of sub – PPPs

Sub -PPPs is used in analyzing the results of implementation of poverty reduction policies, difficulty subsidies, wage subsidies and living standards studies among provinces, regions and regions throughout the country. These indicators are also the basis for calculating the Human Development Index (HDI), calculating the Gross Domestic Product (GRDP) according to its purchasing power, assessing the minimum living standards and adjusting regional wages, calculate the investment costs, evaluate competitiveness of prices, diets, accommodation, working costs according to regional prices.

Currently, the General Statistics Office uses the Sub - PPPs index to eliminate price differences in household income and expenditure across regions. Therefore, calculate the income and expenditure of the household with the same price level to determine the number of poor households and the poverty rate.

In order to compile the HDI indicator, the Sub - PPPs is used to calculate the GRDP of the provinces in terms of the overall price level of the whole country or of a selected province in Vietnam currency, then set up the GRDP in USD to calculate components index of the composite HDI index.

Sub - PPPs is also used to calculate minimum living standards in regions and other studies on spatial / geographic comparison.

III. Methodology used

ICP's theory and process are applied to calculate SUB-PPP at provincial level and compare price levels among regions or provinces in the country. In fact, comparing prices among regions in the country is easier than that across countries. The major difficulty in calculating SUB-PPP is to collect detailed values of product groups in each region. This is also the essential requirement to aggregate the real expenditure (and average expenditure per capita) for expenditure groups and counting weight with components of SUB-PPP to tabulate SUB-PPP for total regional expenditure. On the other hand, comparing related prices among regions in the country is easier than that

among countries because it is not impacted by exchange rate among regions in the country.

CPI data is important analytical material for decision-makers, economists, universities and economic organizations. SUB-PPP can be used to determine national poverty line and compare poverty rate among regions or provinces based on goods and services basket.

In order to develop SUB-PPP at provincial level, we need to consider 3 main issues: (i) Compiling data to calculate SUB-PPP at provincial level; (ii) Identify products overlapped among provinces/cities; (iii) Aggregate SUB-PPP at provincial level.

a. Compiling data to calculate SUB-PPP at provincial level

Review and code the item list from the consumer price survey database in 2010 to now to calculate SCOLI; check and convert to the same unit for calculating commodity prices among provinces. Based on specifications, grades, units, prices of each item of the same province to put in the same group then add the code to create the code of Sub - PPPs list. Placing Sub - PPPs code was created and used uniformly in compiling Sub - PPPs indexes. Database is first checked basically to determine average price of the commodities which are directly comparable among provinces/cities. This process also determines commodities that are considered similar and their average price is not impacted too strictly by the difference in main features, where its specification and package are especially important. For instance, average price of "soft drink" bottled from 300ml to 1.5 liter will imbalance the average price even when the price is converted to unit price because price on one volume unit of a big bottle of soft drink is often much lower than that in a small bottle. In such cases, they should be broken down into two or more than two commodity groups (for example: bottle less than 600ml and bottle more than 600ml).

Average price which is extracted from CPI database is basic input information but when implementing international comparison, it needs further data on expenditure, accordingly SUB-PPP data on each commodity will be aggregated in to SUB-PPP for larger commodity groups.

b. Determine products overlapped among provinces/cities

One of the criteria to select products in compilation of SUB-PPP is their representation for purchases of the consumers. It is supposed that national CPI basket meets this feature and it does not need to consider this case because all products in CPI can be considered representative. However, each province, city has its own "commodity basket" and that basket represents the consumption of the province/city and reflects its consuming model. Therefore, it needs to identify the list of representative products for

province/city and get price in at least two provinces/cities to set up the overlapping. In case data sets are scattered, it cannot calculate Sub - PPPs even when the overlapping is set up. Thus, it needs to establish at a certain extent that the double combination and its transition are clear and can create SUB-PPP more practical and reliable.

Goods and services basket which are used in the compilation of CPI are relatively stable in short-term and mid-term because the main purpose of CPI is to compare prices over time. Changes will arise when old products do not exist and the new ones are not available before. The accurate technical parameters of CPI commodities can be different among provinces/cities depending on local conditions (for example: package size can be different among regions and the diversity of one product can be different). It results in some issues arising when CPI data is used in sub-national comparison. These issues can be addressed simply. Different package sizes can be adjusted by price unit, regulation as package sizes are relative similar.

c. Structure of CPI

CPI has structure as follows:

+ Group level 1, includes:

- Restaurant and catering services
- Beverages and tobacco
- Garments, hats and footwear
- Housing, electricity, water, fuel and construction materials
- Household equipments and appliances
- Medicament and health services
- Transportation
- Post and telecommunication
- Education
- Culture, sports, entertainment and tourism
- Other goods and services

+ 32 groups level 2; 86 groups level 3 and 256 group level 4

d. Aggregate SUB-PPP at provincial level

After arranging price data and weight and determining overlapped commodities, national SUB-PPP estimation will be carried out at different levels, including grass-root and higher aggregated levels.

Aggregate Price index at basic level

Calculating price index at the lowest level is called basic aggregated level. At this level there is no weight. This is product level in CPI and basic group in ICP. In this study, Country-Product-Dummy (CPD) index is used at basic aggregated level.

The basic data set to calculate CPD is a price matrix of all products with price in each region. Apparently, there are blank cells in the matrix because it cannot get price for each product in each province, city due to unavailability some products in some provinces/cities and the difference in quantity of products priced in provinces/cities. The CPD's basic model is multiplying and assumes that difference in prices of products in provinces, cities is the same rate in all provinces/cities and price difference within province/city is the same rate for all products.

CPD index is often used in international comparison (by space), however, for this study CPD is the basic general combination of space and time. CPD was first introduced by Summers (1973) and presented in two equivalent forms, interception and non-interception. Regression equation for CPD is as follows:

$$\text{Inp}_{cp} = Y_{cp} = x_{cp}\beta + \varepsilon_{cp} \tag{1}$$

Where: $p_{cp:\,\text{là}}$ Price of product p in the country c

Dc_j and Dp_i: product and country dummy variables

Np and Nc: number of products and number of countyries

$x_{cp} = [Dc_2 \ldots Dc_{Nc;}\ Dp_1 Dp_2 \ldots Dp_{Np}]$

$$\beta = [\alpha_2 \ldots \alpha_{Nc;\ \pi 1,\ \pi 2,\ldots,\ \pi Np}]^{\ T} \tag{2}$$

In matrix denotation, arrangement by separate observations can be

$$Y = X\beta + \varepsilon \tag{3}$$

Aggregate price index at higher level

Using formula Laspeyres geometric mean, PPP for region *k* with region *j* as base is given by

$$PPP_{jk} = \prod_{i=1}^{N} \left[\frac{p_{ik}}{p_{ij}} \right]^{w_{ij}} \tag{4}$$

IV. Price and weights data
(1) Sources of data
The General Statistics Office uses sources of consumer price survey data to calculate the SCOLI index according to the method of the World Bank (WB) and Asian Development Bank (ADB).

- Consumer price survey is being carried out monthly by the General Statistics Office in 63 provinces with 572 goods and services in the 2014-2019 period;

- Data quality ensures a close reflection of the trend and level of living price fluctuations among provinces and regions because the list of items has a high level of representation of popular consumption of residents and this list is periodically reviewed and updated by the General Statistics Office. Consumer prices are surveyed 3 times / month of 12 months of the year

- The use of available data from the consumer price survey (instead of organizing a separate survey to calculate the Sub - PPPs) will help save the State budget, save time and reduce the opportunity cost. Field surveys for the statistics industry, thereby helping to improve the quality of other professional jobs, which improve the quality of periodic surveys on consumer prices.

(2) Survey framework

PSOs review and strengthen network for price survey in provinces/cities as follows:

Enumeration area

Based on administrative, geographical and population scope, GSO allocates number of enumeration areas for provinces/cities (see Annex 3). With allocated enumeration areas, PSOs select and distribute enumeration areas suitable with real conditions of provinces/cities and following requirements are met:

- Selecting enumeration areas representing whole urban and rural areas of province;

- It is possible to collect price of all goods and services by list of representative items in the enumeration areas

- Refer to field materials of Household Living standard survey and weight survey in 2014 to select enumeration areas for precisely reflecting reality of price fluctuation of province/city.

Enumeration point

Enumeration point should satisfy two requirements:

- Enumeration point as an establishment with stable business operations;

- If item has different price among enumeration points, more enumeration points need to be selected; if item has relatively similar variation in price among enumeration points, fewer enumeration points are selected (Annex 2). For example, Market A (enumeration area) has 7 pork outlets located in different positions. By observation, price of griskin (selected item for survey) is different among these outlets. Therefore, in order to reflect rightly price of griskin in the enumeration area, it is necessary to select 3 outlets (3 enumeration points) to collect price. While retail price of condensed milk "Ong Tho",

380 gram is quite similar in outlets in the market, thus one outlet is selected for collecting price.

To meet two requirements above, GSO regulated needed enumeration points for each item in each enumeration area as follows:

- Food and foodstuff: 3 enumeration points per each item

- Other items: 1 enumeration point is needed

And norm for enumerator is

- Items for collecting price with 1 period/month, each enumerator is responsible for gathering price of 80 items (maximum).

- Items for collecting price with 3 period/month, each enumerator is responsible for gathering price of 50 items (maximum).

With 572 items and services representing for period 2014-2019, it is necessary 7-8 enumerators for one enumeration area.

(3) Weight

The weight of CPI calculation is the expenditure proportion of commodity and services groups in the total expenditure of the people. The weight of CPI calculation of the whole country is the expenditure proportion of each region in comparison with total expenditure of the country by each commodity group. The weight of CPI calculation at regional level is the expenditure proportion of each province/city in the region over total expenditure of the region. The weight of CPI calculation of each province/city is the expenditure proportion of each commodity group over total expenditure of province/city. The weight is calculated by urban and rural area and generally calculated for two areas.

There are two kinds of weight for CPI :

- Vertical weight : is ratio of expenditure of each group of item with total expenditure of people. The vertical weight is calculated for urban and rural areas and for two areas of each province, each region and the whole country.

- Horizontal weight : is ratio of expenditure of each urban and rural area with expenditure of whole province, region or country.

Weight for CPI is used stably in 5 years and for base year (identical with year updating classification of representative goods and services). In the period 2014-2019, the base year is 2014, thus, price of base period is followed by new classification of representative goods and services, and weight for CPI is data from year 2014.

2014 weight is compiled from results of Household Living Standard Survey and survey on CPI weight in 2014 of the GSO.

Groups of weight are classified consistently with structure of CPI (including 11 groups of items at level 1, 32 groups at level 2, 86 groups at level 3 and 256 groups at level 4).

2014 weight is calculate by the GSO for each province/city, 6 economic zones and whole country (divided by urban and rural area).

(4) Issues in using CPI Data for sub-national PPPs

Determining products overlap among provinces/cities is the best difficult. In CPI, each province and city has a representative list of popular consumer goods and services, so the review of provinces and cities with the same representative item to calculate sub PPP takes a lot of time.

IV. Empirical Results

1. *Spatial cost of living index among regions (Red River Delta = 100)*

Unit: %

	2011	2012	2013	2014	2015	2016	2017	2018
Red river delta	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Northern midlands and mountain areas	101.73	102.32	103.02	102.99	104.77	101.34	101.41	100.54
North Central and Central coastal areas	97.37	98.17	99.37	100.09	101.90	100.33	100.43	99.50
Central Highlands	101.16	101.32	100.60	100.81	103.85	101.12	101.01	100.41
South East	103.91	103.35	103.05	103.96	104.31	101.73	101.88	101.57
Mekong River Delta	97.32	96.39	95.62	95.73	96.29	98.29	98.56	98.15

2. *Spatial cost of living index among provinces (Ha Noi city = 100)*

Unit: %

	2011	2012	2013	2014	2015	2016	2017	2018
Hà Nội	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Vĩnh Phúc	87.48	87.88	87.85	88.37	88.54	94.74	93.17	92.62
Bắc Ninh	87.89	91.84	92.23	92.86	93.62	97.11	94.58	94.95
Quảng Ninh	93.70	93.53	93.12	93.02	95.56	97.05	95.78	96.12
Hải Dương	86.89	87.39	88.24	88.08	89.26	94.52	93.11	92.87
Hải Phòng	91.48	91.53	93.89	94.88	95.53	97.03	95.41	96.13
Hưng Yên	84.08	83.68	83.98	84.47	85.01	93.10	90.44	91.09

Thái Bình	81.48	81.04	80.54	79.40	81.61	93.23	92.87	91.60
Hà Nam	84.29	84.84	85.03	84.63	86.94	93.48	90.63	91.52
Nam Định	81.15	84.29	84.63	84.38	83.23	92.35	92.09	91.80
Ninh Bình	88.75	90.09	89.70	88.44	89.68	95.49	93.51	92.69
Hà Giang	91.17	92.30	93.80	94.30	96.50	97.98	96.10	96.12
Cao Bằng	91.20	90.10	87.90	87.50	91.18	96.15	93.68	94.23
Bắc Kạn	83.57	83.67	84.16	83.61	86.70	94.63	92.84	92.85
Tuyên Quang	87.39	87.12	88.60	88.96	88.91	95.09	94.05	94.33
Lào Cai	94.78	96.60	96.54	96.95	99.02	99.97	96.05	96.25
Yên Bái	90.17	91.22	90.98	91.20	92.90	96.68	93.68	94.23
Thái Nguyên	89.36	90.91	90.71	89.99	92.46	96.98	94.13	93.63
Lạng Sơn	90.02	91.82	92.92	92.40	94.38	98.21	95.84	96.20
Bắc Giang	87.13	87.51	87.28	87.08	88.79	94.86	93.21	92.25
Phú Thọ	86.23	86.34	87.98	87.42	87.66	92.76	89.97	91.20
Điện Biên	94.77	95.82	98.41	99.50	98.85	99.45	95.99	96.04
Lai Châu	96.50	97.61	98.34	99.58	100.30	99.45	96.00	95.96
Sơn La	96.33	97.98	99.46	99.01	99.27	97.49	95.58	96.17
Hoà Bình	89.87	89.18	90.85	90.93	94.83	96.95	94.76	94.40
Thanh Hoá	85.22	84.07	86.22	86.01	87.96	94.46	91.74	90.85
Nghệ An	85.31	84.90	86.92	86.49	87.52	93.00	92.15	92.23
Hà Tĩnh	88.98	90.96	95.21	97.09	97.14	97.89	95.21	95.29
Quảng Bình	88.54	89.14	88.66	89.50	92.10	96.44	95.19	95.77
Quảng Trị	90.34	90.03	90.45	92.21	93.90	96.45	94.18	93.11
Thừa Thiên - Huế	86.52	88.50	91.47	91.55	94.30	96.90	95.43	96.38
Đà Nẵng	91.93	92.42	94.29	93.53	96.44	97.98	96.68	97.81
Quảng Nam	85.20	87.68	86.93	87.14	90.33	95.99	94.59	94.86
Quảng Ngãi	86.05	85.05	83.79	84.24	88.05	94.01	92.33	91.18
Bình Định	86.43	86.48	86.05	87.42	90.04	95.13	93.43	93.68
Phú Yên	82.98	82.65	86.31	87.79	87.79	93.05	92.31	92.03
Khánh Hoà	87.44	88.13	88.69	88.68	91.56	96.15	94.90	95.80
Ninh Thuận	86.63	87.56	88.10	89.13	91.61	95.32	92.55	92.24

Bình Thuận	86.02	87.24	86.75	87.91	91.39	95.84	93.79	93.64
Kon Tum	87.74	89.05	89.58	89.98	94.06	96.33	94.86	95.17
Gia Lai	91.65	91.46	89.45	90.12	90.90	94.30	92.99	92.34
Đắk Lắk	90.02	90.07	90.12	90.53	95.20	96.19	94.85	93.77
Đắk Nông	89.55	90.25	89.37	89.86	93.84	96.63	93.46	92.82
Lâm Đồng	88.34	90.25	90.19	90.52	93.61	97.28	95.79	95.95
Bình Phước	93.80	93.47	92.95	95.09	96.12	96.80	94.55	95.27
Tây Ninh	83.75	83.96	85.02	85.34	89.36	94.63	93.54	93.11
Bình Dương	88.74	89.05	89.70	88.63	93.64	97.49	95.38	95.95
Đồng Nai	87.64	89.41	89.47	88.76	93.13	95.83	93.50	92.98
Bà Rịa-Vũng Tàu	91.27	91.98	91.20	92.17	95.74	97.50	95.54	96.22
TP. Hồ Chí Minh	100.84	99.70	97.80	96.86	97.39	99.67	101.38	101.52
Long An	88.73	88.35	88.20	88.07	92.08	95.29	93.18	93.14
Tiền Giang	86.97	85.47	85.95	86.39	88.40	94.80	92.48	92.27
Bến Tre	90.31	90.67	91.35	91.33	93.02	95.94	92.72	91.72
Trà Vinh	79.12	78.17	79.17	79.33	80.72	92.93	89.45	90.84
Vĩnh Long	84.31	84.55	83.77	83.54	82.93	91.91	91.87	91.32
Đồng Tháp	87.37	87.38	87.27	86.96	87.03	93.26	90.13	90.67
An Giang	90.74	90.46	90.27	89.67	91.82	95.33	93.69	93.08
Kiên Giang	84.27	84.28	84.43	85.09	87.96	93.29	90.89	91.53
Cần Thơ	90.88	89.82	89.24	89.33	92.14	96.88	94.24	94.22
Hậu Giang	83.30	81.89	83.11	83.23	83.53	90.70	89.38	90.50
Sóc Trăng	81.70	80.90	81.67	82.04	83.50	92.41	89.92	91.07
Bạc Liêu	85.61	85.48	84.79	85.45	87.29	94.11	92.70	91.84
Cà Mau	83.61	84.03	84.73	85.24	88.42	93.59	91.51	91.43

V. Conclusions

Vietnam's SUB-PPPs are compiled by the General Statistics Office in order to provide input into policy-making process related to regional socio-economic development; serving research, comparing economic performance results, economic growth rate, general productivity as well as price competitiveness. Enterprises use SCOLI indexes to evaluate competitiveness related to price, output, market share and product cost. Individuals use the SCOLI index to negotiate wage rates and consider inter-provincial migration.

Looking at Vietnam's SCOLI Index from 2010 to 2018, the Southeast region is the most "expensive" in the country, price level is higher than the price level in Red River Delta and the price in this region show increasing trend. Areas with "expensive" levels are followed by North Central and Central coastal areas, Central Highlands and Northeast.

The Mekong River Delta region has the lowest price, the price is lower than the average price of the Red River Delta and the price trends show decline. The Mekong River Delta has an average price lower than the average price in the Red River Delta because it is a flat terrain, favorable climate and hydrological conditions for intensive cultivation in agricultural production. Therefore, food, food and eating out by families have lower prices.

Hanoi and Ho Chi Minh City are the provinces with the highest prices in the country. In addition, the northern mountainous provinces have a relatively high price level and tend to be higher because this is a mountainous area where many goods are not produced on the spot but must be taken from the lowlands. Since roads are difficult, freight rates are high; In addition, the region's distribution system is very fragmented, the cost of maintaining a high distribution system, along with the cost of stockpiling goods in warehouses has pushed commodity prices higher than those of other areas.

The publication of cost of living index for users of statistical information is the effort to improve the quality of statistical information in Vietnam.

We have published SUB-PPP index data from 2010 to 2017 via the link:
http://gsoweb.gso.gov.vn/default.aspx?tabid=720