PRODUCING EXPORT AND IMPORT PRICE INDICES (XMPI) IN BHUTAN

Documentation of process and results

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This is a study of how the Bhutan National Statistics Bureau began producing Import and Export Price Indices (XMPI) using existing administrative data. This was made possible through support from the Regional Programme on Economics Statistics in Asia and the Pacific run by United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) and supported by Department for International Development (DFID). This study was developed by the National Statistics Bureau (NSB) of Bhutan and ESCAP. It documents the context and process followed to support other countries thinking of producing XMPIs. This is one of five studies of successful projects and aims to advance statistics in Asia and the Pacific through shared knowledge and experience.

Authors:
Penjor Gyeltshen and Bikash Gurung (NSB, Bhutan), Michael Biddington and Jessica Gardner (ESCAP)
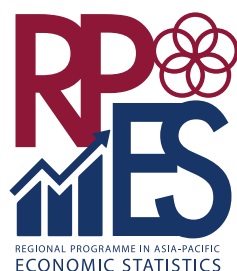
Reviewers:
Rikke Munk Hansen and Eileen P. Capilit (ESCAP)

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REGIONAL PROGRAMME IN ASIA-PACIFIC
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Acronyms

BTC	Bhutan Trade Classification
CIF	Cost, Insurance and Freight
CPI	Consumer Price Index
CV	Coefficient of Variation
DFID	Department of International Development
DRC	Department of Revenue and Customs
FOB	Free-on-board
GDP	Gross Domestic Product
NSB	National Statistics Bureau
PPI	Producer Price Index
RPES	Regional Programme on Economic Statistics
UNESCAP	United Nation Economic and Social Commission for Asia and the Pacific
US IPI	United States Import Price Index
XMPI	Export and Import Price Index

I. EXECUTIVE SUMMARY

Export and Import Price Indices (XMPIs) are needed to strengthen the economic statistics of Bhutan. Historically, Bhutan used the Consumer Price Index (CPI) to deflate the import and export components of the Gross Domestic Product (GDP). This approach resulted in biased results as CPI is meant to capture changes in prices of goods and services consumed by households rather than movements of prices of goods and services that went into external trade. The basket of goods and services used for CPI compilation is therefore not suitable as the basis for deflating import and export components of the GDP and will give a different result to using XMPIs.

In Bhutan, exports of electricity comprise about 40% of total exports and only around 2% of the total household expenditure in the CPI. This implies that if export prices fluctuate, this may not be significantly felt by households and would have little impact on the overall CPI given the small share of electricity in the CPI. Even if electricity prices for both exports and households change in the same way at the same time, total XMPIs and the total CPI will vary substantially due to the different shares of electricity.

As an import-driven economy, XMPIs are extremely useful for Bhutan, serving as an indicator of inflationary trend expected to impact consumers. Any increase in the price of imported commodities at the point of entry will be passed on to final consumers. XMPIs will alert both consumers and policy makers about the expected inflation in the market and help develop interventions to control it.

Steps involved in producing the XMPIs

The National Statistics Bureau (NSB) and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) worked together on the project, commencing in 2017. Developing the Bhutan XMPIs involved six steps:

1. Data assessment – establish the project team which included an international expert, NSB staff and ESCAP; assess data availability and suitability, document methodology and train NSB staff in how to compile XMPIs.

2. Consultation – solicit inputs from data suppliers in the Department of Revenue and Customs (DRC) and data users in the NSB's national accounts team.

3. System development and pre-test – the NSB staff together with the international consultant prepared detailed documentation and an Excel spreadsheet for NSB to compile the data and produce the index.

4. Data compilation – data from the Department of Revenue and Customs, the Druk Green Power Corporation, inputs to the Producer Price Index and from the United States Price Index were compiled.

5. Data processing, estimations and validations – data processed, and limitations of data assessed, validated and edited to ensure an accurate and reliable XMPIs. Various checks and adjustments made.

6. Training and documentation - The NSB team was trained in each step of the process so they could continue the work independently. Detailed documentation of the steps and process involved in producing the index was developed to support institutionalization; ensure consistency in producing the XMPIs; and continuity when there is staff turnover in the future.

Outcomes and lessons learned

The estimated XMPIs from 2014 produced quite different results to the CPI that had previously been used as deflators for imports and exports in the GDP. Apart from being a more appropriate deflator for national accounts, the XMPIs are also useful to signal market changes likely to flow to consumer level in time for policy interventions.

The project has strengthened economic statistics in Bhutan and provided valuable capacity development for the NSB Prices Team in particular.

Lessons learnt and recommendations for others:

- Trade statistics from administrative sources are fit for XMPI

- Building on existing systems is practical and requires minimal training

- Establishing strong relationships, trust and institutional mechanisms among agencies are fundamental to regularly producing the XMPI

- Working with experts accelerates capacity development

- Detailed documentation is necessary to guide institutes in their current and future work

II. BACKGROUND AND CONTEXT

The National Statistics Bureau (NSB) is the main agency responsible for producing statistics to support evidence-based decision making in Bhutan. One of its responsibilities is to produce economic statistics to monitor and assist government in framing policy for sustainable economic development. Price statistics provide an important macroeconomic indicator for monetary and fiscal policy making. NSB currently compiles the monthly consumer price index (CPI) and the quarterly Producer Price Index (PPI) only.

Producing Export and Import Price Indices (XMPIs) for Bhutan is an important step in strengthening the economic statistics of the country and will substantially improve GDP estimates. The need for XMPIs was recommended in an assessment of the Bhutan Statistical System conducted by ESCAP in 2011. The index is part of the core set of economic statistics measuring average price change of goods and services exported and imported. It also serves as fundamental input to the national accounts as a deflator to measure exports and imports and their corresponding growth rates at real or constant prices.

Currently, in the absence of XMPIs, CPI is used for deflating the export and import component of the GDP by expenditure approach. Using the CPI, however, biases the GDP estimate due to differences in the value and composition of the basket of goods on which it is based. For example, electricity is a major export for Bhutan contributing to about 40% of the total exports while electricity is only around 2% of total household expenditure in the CPI. If the export price of

electricity increases it has a substantial impact on the total export index but not necessarily the overall CPI, unless the cost to household changes by a significantly higher magnitude (rate) than the export index. Even if both prices increase equally at the same time, the total or aggregated XMPI and the CPI will vary substantially due to the different share electricity has of the total value.

As an import-driven economy, XMPIs are extremely useful for Bhutan as an indicator of the inflationary trend expected to occur at the consumer level. Any increase in the price of imported commodities at the point of entry will be passed on to final consumers. XMPIs will alert both consumers and policymakers about the expected inflation in the market and help in developing interventions to control it.

Good quality administrative data makes it relatively easy to produce the XMPIs. In the case of Bhutan, the Department of Revenue and Customs (DRC) compiles and publishes trade statistics quarterly. Using these data, NSB could develop the index without additional resources for data collection. The DRC data contains information on unit of measurement, quantity and value of export and import by countries at the detailed eight-digit level of the Bhutan Trade Classification Code (BTC). The published data is available in electronic spreadsheets providing convenience and flexibility for compiling the index.

III. HOW WAS THE PROJECT CONDUCTED?

The project was a collaboration between ESCAP and NSB and began in 2017. It comprised six phases (Figure 1) explained below.

Figure 1. Project phases to produce the XMPIs for Bhutan

1	2	3	4	5	6
Data assessment	Consultation	System development and pre-test	Data compilation	Data processing, estimaton and validation	Training and documentation
June 2017	July 2017	August - September 2017	June - December 2017	January - April 2018	May 2018

1. Data assessment

An international expert visited Bhutan twice to provide technical support to NSB. Data gathering and arranging meetings with stakeholders was the responsibility of the NSB, while ESCAP as the lead for the initiative was responsible for recruitment of the international expert and managing implementation of the project, in coordination with NSB.

Prior to the first mission, NSB acquired data from DRC and sent it to the consultant for review. The trade data was considered reliable and fit for purpose to compile the XMPIs. However, some inconsistent data were identified and alternative data sources, like the Producer Price Index (PPI) and Import Price Index of the US were recommended for commodities where trade data from internal data sources proved unreliable. The exchange of data and pre-mission communications between the consultant, NSB and ESCAP were helpful in preparing for the first mission.

2. Consultation

In July 2017, the first of the two missions to Bhutan by the international expert took place. The priority was to assess data availability and suitability of trade statistics data to compile the XMPI. The mission also aimed to meet stakeholders and get their support for data and in obtaining enough information to understand their data collection methods which are critical to compile the index. During the first mission, the team met with DRC to inform them about the project and seek their support in supplying data on a regular and timely basis. Prior to the mission, we were using the published data from DRC in pdf format to assess the suitability of the trade data which was a challenge for us. However, through the meeting, we were informed that the data were available in excel format and at more detailed level than the pdf format, which helped in data validation.

There was also a meeting with the NBS National Accounts team, as XMPIs are a key input to the national accounts. This provided an idea of the current compilation system, deflators used for export and import values, and other related issues. National Accounts Team acknowledged the initiative and requested to compile the index back to the year 2000 for a longer time series. They also suggested for services component to be included in the XMPI. However, available trade data does not include export and import of services. The Royal Monetary Authority has data on export and import of services, but it is at an aggregate level and lacks detail required to develop a services index. Given the complicated nature of price collection for services, it could not be included in the planned XMPIs without significantly increasing resources.

3. System development and pre-test

Following the first mission, the consultant produced a detailed report on the sources of data in Bhutan and recommended methodology for compiling the index. An Excel spreadsheet was developed for compiling data and producing the XMPIs. The NSB Prices Team was already using Excel to compile both the CPI and PPI and are familiar with the software. Excel was chosen by the consultant so that NSB team will be able to do the work without further training.

4. Data compilation

As mentioned in an earlier section, good quality administrative data made it relatively easy to produce the XMPIs. In the case of Bhutan, the main source of data is the Department of Revenue and Customs (DRC). The other sources of data for Bhutan's XMPI compilation include: the Druk Green Power Corporation for energy; the producers' price index (PPI) for less reliable unit value trade data; and the US price import index as proxy for Bhutan's import of several durable machinery and equipment. Descriptions of the data gathered and compiled from each source and how they are used are described in this section.

Department of Revenue & Customs

DRC publishes quarterly trades statistics with information on the value and quantity of goods exports and imports. Data for the first three quarters of each calendar year are released as provisional and final annual data provided when releasing data for the last quarter. DRC agreed to provide NSB with quarterly data in a standard Excel format.

Provisional data for the first three quarters and final data for the last are used to derive the quarterly prices (i.e. unit values) as inputs to quarterly price indexes. The final annual data is used to reweight the price baskets annually.

DRC's published data on exports and imports originating from India are valued at free-on-board (FOB) value while imports originating from countries other than India are valued at cost, insurance and freight (CIF) value. Valuation in the National Accounts is at FOB value, and the export and import values need to be consistent with national accounts estimates. DRC agreed to provide the import from countries other than India at FOB value.

Quarterly trade statistics data from DRC has the following details:

- Date

- Destination

- Bhutan Trade Classification code (eight-digit level)

- Full description of the item

- Unit of measurement

- Quantity

- Value (FOB)

Druk Green Power Corporation

Druk Green Power Corporation provides NSB with monthly data on the value and quantity of electricity exports and imports for each plant. This is used to reselect and reweight the price baskets annually.

Producer Price Index

Some export prices collected for and used in Bhutan's Producer Price Index (PPI) are also used in calculating the Export Price Index. PPI prices are used where unit values derived from DRC's trade data are less reliable, and for electricity exports and imports.

United States Import Price Index

The United States Import Price Index (US IPI) is used as a proxy for Bhutan's imports of mechanical machinery (BTC Chapter 84), electrical machinery (BTC Chapter 85) and aircraft and aircraft parts (BTC Chapter 88), as the unit values based on Bhutan's imports are neither sufficiently reliable nor sufficiently representative.

The US IPI is of good quality, covers imports from a wide range of countries including those in Asia, is available at the required level of detail, uses a classification system that aligns with the BTC chapters, and is accessible and timely. It is adjusted for changes in the Ngultrum/US dollar exchange rate.

5. Data processing, estimation and validation

The XMPIs are computed mainly using the unit value prices derived from the trade data. Unit values have both strengths and weaknesses. Unit values are calculated across all products exported under each BTC code and thereby captures the mix of loosely specified products that can change from quarter to quarter. Nevertheless, unit values based on international trade data are less stable than prices for more tightly specified products.

A potential weakness is that part of the movement in unit values may not strictly represent price change. Movement may represent a different mix of two products with different, but unchanged, prices. However, across the basket, over the medium term, the selected price baskets are expected to provide a fit-for-purpose measure of price change, provided unit values are closely monitored, and outlier entries excluded where necessary. A strength of unit values based on international trade data is that they cover all transactions, rather than only the prices of a sample of products.

The coefficient of variation (the ratio of the standard deviation to the mean, expressed as a percentage) is a statistical measure of relative variability. Coefficients of variation were used to assess the stability and reliability of the unit values for BTC codes and hence their suitability for inclusion in the price baskets.

Selecting BTC codes with relatively low coefficients of variation for the price baskets helped give confidence that variation in the unit-value time series of items in the price baskets would not be unduly influenced by change in the mix of products. Following are the factors considered when reselecting and updating the baskets annually:

a. Items with high FOB values

b. Quarterly unit values

c. Coefficients of variation (CVs)

d. Counts of the number of quarters that unit values are present during the latest nine quarters

Assessing the unit value data derived for use in the XMPIs involved:

a. Checking for any missing values/quantities and consistency in unit of measurements

b. Monitoring the quarterly FOB values to ensure they are not too low to support reliable unit values

c. Running checks on the item unit values and, where necessary, investigating the data at the source to determine its quality and identify outliers

d. Adjusting unit values where necessary, to exclude outliers and add cell comments to flag and document any edits

e. Monitoring the coefficients of variation of the basket-item time series (based on the latest nine quarters) to ensure the unit-value time series remain reliable enough to use

6. Training and documentation

The second mission by the expert was conducted in May 2018 to prepare documentation and train NSB staff in computing the index so they have the capacity to work independently moving forward. Preliminary XMPIs for the first quarter 2014 until the third quarter of 2017 was prepared by the international expert and handed over to the NSB team during the second mission in May 2018.

The consultant trained the NSB team in data processing, cleaning and calculation of the index. The NSB Team planned to publish the index officially in first quarter of 2019. This would allow time to get familiar with the process and worksheet, solve any technical issues with the consultant if required and gather the latest data for publishing.

Detailed documentation of the steps and process involved in producing the index was developed. This would support institutionalization and ensure consistency in producing the XMPIs, and continuity when there is staff turnover in the future. The documentation is an important reference and guideline to the compilers as well as to users.

IV. PROJECT RESULTS

Plans to release the XMPIs in early 2019 could not be realized due to data delays and stretched resources. At the time of writing, release of the index is pending, yet the results of the project are already evident.

NSB plans to disseminate and communicate the new XMPIs as a result of the project to its key users, such as the Central Bank and the Ministry of Finance using the existing data sharing mechanism. This will give the users a comprehensive picture of the inflationary trends at different levels of the economy. Being a highly import driven economy, such indices will be of immense use for economic policy making.

Strengthened economic statistics

The project strengthened the economic statistics of Bhutan. The index will contribute to better evidence-based decision making in the country, adding to the already existing price indices such as CPI and PPI.

The XMPIs will serve as a lead indicator of future inflation at the item level consumption, signaling expected inflationary trends in the economy for policy makers and the general public. To illustrate, for imported fuel, the derived import index for fuel (item level) will serve as lead indicator in determining the expected price changes in CPI for fuel.

Improved GDP estimates

One use of the XMPIs is to deflate the GDP by expenditure approach. In the absence of XMPIs, the CPI was used to deflate the export and import component. However, as shown in Figure 2 and 3 below, the movement of export and import indices is different to that of the CPI. This illustrates how the use of these two indices will give different estimates. XMPIs are more appropriate to deflate the export and import component; and to produce more reliable estimates.
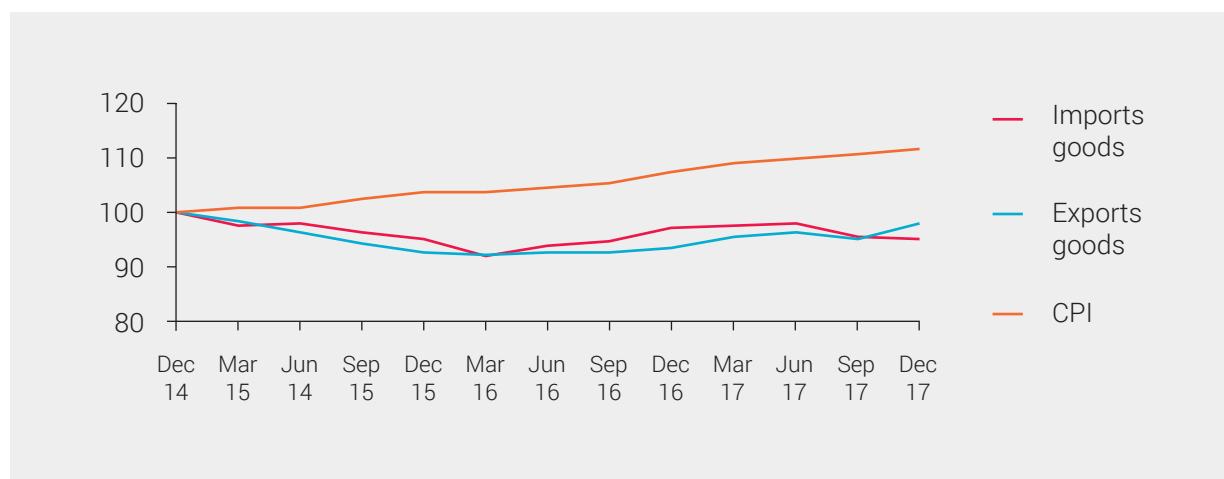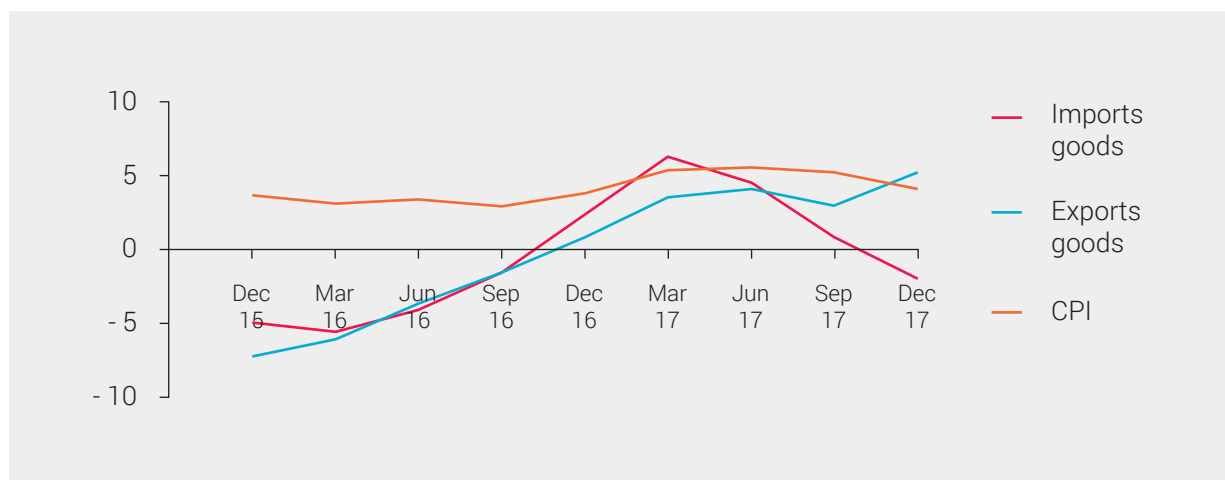
Figure 2. XMPI and CPI

Figure 3. Year-on-year percent change

Enhanced capacity

The project has benefited NSB and its staff by strengthening capacity through learning from an international expert. The NSB Prices Team received practical hands-on training from the consultant on how to process, validate and edit price data which are essential in producing quality statistics. The different computation methodologies introduced have generally enhanced and broadened knowledge and skills.

V. LESSONS LEARNED AND RECOMMENDATIONS

1. Trade statistics from administrative data sources are fit for XMPIs

Given that customs offices in most countries compile trade statistics, statistical offices can make use of these existing administrative data to compile XMPIs. Initially NSB proposed a separate survey be carried out to collect prices on quarterly basis needed to compile XMPIs and intended to use the customs data only for developing weights. A separate survey would have been costly and time consuming for the statistical office to implement. The project opted to explore the existing administrative data to assess the suitability for producing the XMPIs. The initial assessment revealed that the customs data is good enough and fit for purpose to compute XMPIs. This made implementation much easier than a separate survey that was initially thought of, and the data was more sustainable. Considering the resource constraints statistical offices in developing economies face, customs data are a good starting point to compile the XMPIs.

2. Building on existing systems is practical and requires minimal training

Using Excel for compiling the XMPIs was a simple and practical solution. NSB staff are already familiar with and were already using Excel to compute the CPI and PPI. Extending the existing system to XMPIs meant minimal training and learning required to adopt a new system. The downside of Excel is the risk of an error being introduced and not detected. A robust system to avoid such errors and ensure quality needs to be explored in future.

3. Establishing strong relationships and institutional mechanisms among agencies are fundamental to regularly producing the XMPI

Lack of institutional arrangements in sharing data among users and producers in the Bhutan Statistical System is a major challenge to the timely publication of statistics. NSB initially had good support from customs office in sharing

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the trade data. Receiving the data on time is a challenge and creates delays. Establishing a reliable institutional mechanism between the two offices is a must to ensure timeliness and continuity in publishing the XMPIs.

4. Working with experts accelerates capacity development

The international expert was effective and helpful in delivering the expected output and provided opportunities for the local staff to work alongside and learn from them, strengthening the capacity and benefiting the office in the long term.

5. Detailed documentation is necessary to guide institutions in their current and future work

The international expert developed detailed documentation of the processes and methodologies in computing the XMPIs for Bhutan. The manual provides step-by-step explanations of data sources, data processing, validating, editing, computing the index and how to process the weights and select the basket items. It will guide compilers in computing the index and serve as important institutional document for reference in future. NSB does not have good documentation for statistical business processes and faces issues when work shifts from one person to another. Documentation is essential for other statistical products to ensure professional standards and good quality of data.

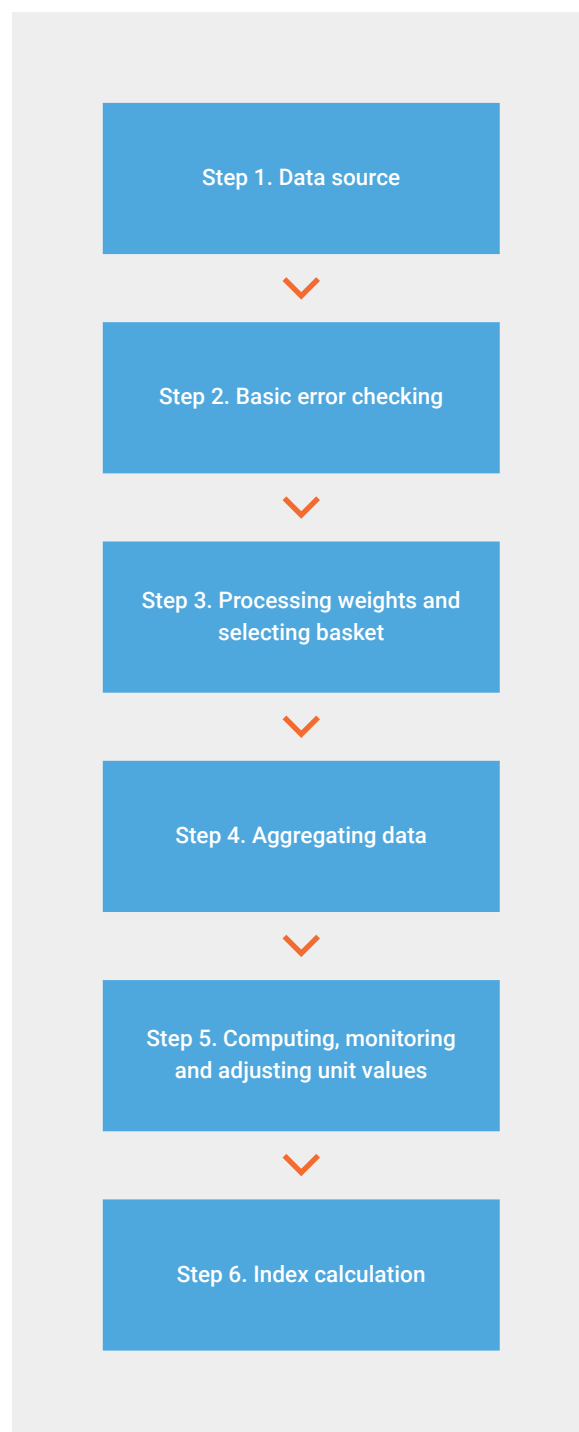**Figure 4. Stepwise approach in documenting XMPI estimation**

Step 1. Data source

Step 2. Basic error checking

Step 3. Processing weights and selecting basket

Step 4. Aggregating data

Step 5. Computing, monitoring and adjusting unit values

Step 6. Index calculation

Figure 4.1. Stepwise approach in documenting XMPI estimation, Example: Step 1. Data sources

Figure 4.2. Stepwise approach in documenting XMPI estimation, Example Step 5: Computing, monitoring and adjusting unit values

Highlight the cell in yellow to flag that it has been imputed and add a comment to the cell.

AC	AD	AE	AF
2016 Q1 UV	2016 Q2 UV	2016 Q3 UV	2016 Q4 UV
18.29	20.55	26.50	26.46
16.86	Chris Pike: No imports. Carried forward	18.11	16.91
24.70		27.07	23.29
52.54		50.77	50.25
81.83		90.25	90.90
88.23	87.98	86.96	90.99
76.37	62.84	63.00	69.85
2,524.10	2,632.09	2,219.40	3,061.89
210.53	214.59	214.59	210.66

6.1.6 Steps 5 & 6: Check and where necessary adjust unit values

The purpose of the 'Import goods prices' worksheet is to assure the quality of the unit values before they are used to calculate the Import Goods Price Index. To help, there are quarterly percentage changes, with percentage changes of greater than 10% in either direction automatically highlighted in red.

BP	BQ	BR
2017 Q1 %	2017 Q2 %	2017 Q3 %
-0.1	2.7	-4.4
0.4	0.3	0.4
1.5	-2.0	2.0
-0.1	-1.1	0.5
-6.7	11.3	2.6

6. Conclusion

Trade statistics from administrative sources are a good starting point for countries planning to develop an export and import index. Although there are issues around the use of unit value prices in measuring the true price change, it can be used provided proper checks and monitoring of the data are done. Since trade data are compiled and produced at regular intervals by the customs office, the statistics office can come up with a quality index with minimal resources. Countries without XMPIs are encouraged to make use of the available trade data to produce them.

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For anyone who wants further detailed information regarding the Import and Export Price Indices (XMPI), please contact the National Statistics Bureau of Bhutan. Their contact details are below:

National Statistics Bureau
Royal Government of Bhutan
Thimphu, Bhutan
Telephone No: +975-2-333296/335848
Fax No: +975-2-323069
PO Box No: 338
office@nsb.gov.bt
ww.nsb.gov.bt