

Preface

Export and Import Price Indices (XMPIs) for a country measure the rate of change over time in the prices of exported and imported goods and services. An *export* price index (XPI) measures the rate of change in the prices of goods and services sold by residents of that country to, and used by, foreign buyers. An *import* price index (MPI) measures the rate of change in the prices of goods and services purchased by residents of that country from, and supplied by, foreign sellers.

This *Export and Import Price Index (XMPI) Manual* provides a detailed account of the theory and practice of compiling such indices. The *Manual* is the result of collaborative work by the International Labour Office (ILO); the International Monetary Fund (IMF); the Organization for Economic Co-operation and Development (OECD); the Statistical Office of the European Communities (Eurostat); the UN Economic Commission for Europe (UNECE); and the World Bank, together with experts from a number of national statistical offices, universities, and other international organizations. In addition, these organizations have consulted with a large number of potential users of the *XMPI Manual* to get practical input. The organizations responsible for the *Manual* endorse its principles and recommendations as good practice for statistical agencies in conducting XMPI programs. *Because of practical constraints, however, some of the current recommendations may not be immediately attainable by all statistical offices and, therefore, should serve as guideposts for agencies as they revise and improve their programs.* In some instances, there are no clear-cut answers to specific index number problems such as making adjustments for particular types of quality changes, treatment of seasonal goods and services, and handling the appearance of new products. The *Manual* provides detailed accounts of the underlying principles and economic and statistical theory that should allow Statistical Offices to derive practical solutions.

A. Export and Import Price Indices and Unit Value Indices

Many statistical agencies do not use establishment survey-based price indices of well specified representative items as the building blocks of their XMPIs but compile unit value indices from the more convenient customs source as surrogates for them. There are common index number compilation issues that arise for both unit value indices and XMPIs, including the choice of formulas; treatment of seasonal goods, missing values, quality changes, and new goods; organization and management of the index compilation process; and publication and dissemination of the index. There are also commonalities in the needs of valuation, classification, and the scope of the indices, and use of the same data source for weights, that is relative nominal value shares based on administrative customs documentation. The analysis of, and recommendations for, appropriate formula at the higher level of aggregation, the subject of Chapters 16 to 18, applies to XMPIs based on both unit value indices and price survey indices. The *Manual* considers all of these issues in detail. The *Manual* treats the component unit value indices as surrogates for price indices and as a result, the issues discussed in the context of XMPIs apply equally to unit value indices. The main difference between the two indices is the source of data and aggregation methods used for the measures of price changes at the elementary level. The distinction between the two approaches appears

for the large part in Chapter 7 on price collection and the use of unit value indices is addressed directly in Chapter 2.

International guidelines on choosing between unit value- and price index-based XMPs were provided by the United Nations (1981)—*A Strategy for Price and Quantity Measurement in External Trade*. The strategic case for customs-based unit value indices in United Nations (1981) was based on the relatively low cost of such data. Unit value indices were advised for countries with a tight or medium budget and well-endowed countries were advised to base their external trade price indices on establishment survey data. The preference for price survey indices was, for the large part, due to bias in unit value indices mainly attributed to changes in the mix of the heterogeneous items recorded in customs documents, but was also attributed to the often poor quality of recorded data on quantities.¹ The former is particularly important in modern product markets given the increasing differentiation of products and turnover of differentiated products. Unit value indices may suffer further in recent times due to an increasing irrelevance of the source data with first, increasing proportions of trade being in service, second, countries in customs and monetary unions are unlikely to have intra-union trade data as a by-product of customs documentation, and finally, some trade may not be covered by customs controls, such as electricity, gas, and water, or be of “unique” goods, such as ships and large machinery, with profound measurement problems for unit values.

Few deny, including United Nations (1981), that narrow specification price indexes provide the best measures of relative price change and that, *a priori*, there are potentially significant biases in using customs unit value indices to measure export and import price changes. Yet, unit value proxies are still used because they are by-products of existing customs administration systems and have relatively low incremental cost compared with the price surveys of establishments needed for narrow specification prices. In view of the low cost of the data, the bias in unit value was judged by United Nations (1981) to be tolerable enough that countries were advised to continue compiling them if they do not produce narrow specification price indices. Notwithstanding the putative low cost of obtaining unit values, the *Manual* in Chapter 2 revisits this strategic advice.

The *Manual* recommends that countries using unit value indices with limited resources undertake a staged progression to price indices primarily based on establishment surveys. The initial stage will be to collect price data from establishments responsible for relatively high proportions of exports and imports, particularly those with a relatively large weight and whose unit value indices are *prima facie* inadequate measures of price changes, largely because of the churn in highly differentiated products, or the custom-made nature of the products, such as shipbuilding and oil platforms. It may be that the progression is much quicker, to prepare for the formation of a customs union and loss of intra-union trade data. If the country compiles a producer price index (PPI) much of the technical skills required, and

¹ The advent of computerized systems under the Automated System for Customs Data (ASYCUDA) project of United Nations Conference on Trade and Development (UNCTAD) makes this largely unproblematic.

the basis for data collection, will be in place. The rationale for this strategic advice is given in Chapter 2 of the *Manual*.

B. The Export and Import Price Index Manual

The XMPI Manual serves the needs of different audiences. On the one hand are the compilers of XMPIs. This *Manual* and other manuals, guides, and handbooks are important to compilers for several reasons. First, there is a need for countries to compile statistics in comparable ways so they can make reliable international comparisons of economic performance and behavior using the best international practices. Second, statisticians in each country should not have to decide on methodological issues alone. The *Manual* draws on a wide range of experience and expertise in an attempt to outline practical and suitable measurement methods and issues. Such measurement methods and issues are not always straightforward, and the *Manual* benefits from recent theoretical and practical work in the area. Third, much of the written material in some areas of XMPI measurement covers a range of publications. This *Manual* brings together a large amount of what is known on the subject. It may therefore be useful for reference and training. Fourth, the *Manual* provides an independent reference on methods against which a statistical agency's current methods, and the case for change, can be assessed. The *Manual* should serve the needs of users. Users should not only be aware of the methods employed by statistical offices in collecting data and compiling the indices, but also of the potential such indices have for errors and biases, so that users can properly interpret the results. For example, index number theory presents many issues on formula bias, and the *Manual* deals extensively with the subject.

Collecting data for XMPIs is not a trivial matter. Unit-value indices are a readily available by-product of the collection of trade data by customs authorities and, because of this, have served as surrogates for price indices. However, as noted above, unit-value indices are recognized as being prone to bias. Survey-based XMPIs are the preferred alternative. Yet in practical terms, these require sampling, from a representative sample of establishments, a set of well-defined commodities whose overall price changes are representative of those of the millions of transactions taking place. Statistical offices then monitor the prices of these same commodities on a periodic basis (usually monthly) and weight their price changes according to their trade shares, primarily based on nominal trade value shares from customs data. However, the quality of the commodities produced may be changing, with new establishments and commodities appearing and old ones disappearing on both a seasonal and permanent basis. Statistical offices need to closely monitor potential changes in quality. Yet the index compilers must complete the task of producing a representative index in a timely manner monthly.

It is also important to have a well-developed theoretical basis for compiling such indices that is readily accessible for practitioners and users alike. There should be a firm understanding of user needs and how the index delivered fits both. Fortunately, there is a great body of research in this area, much of which is fairly recent. This *Manual* covers the theoretical basis of index numbers to help support some of the practical considerations.

This *Manual* provides guidelines for statistical offices or other agencies responsible for compiling XMPIs, bearing in mind the limited resources available. *Calculating an XPI or MPI cannot be reduced to a simple set of rules or a standard set of procedures that can be mechanically followed in all circumstances.* Although there are certain general principles that may be universally applicable, the procedures followed in practice have to take account of country-specific circumstances. Statistical offices have to make choices. These include procedures for the collection or processing of the price data and the methods of aggregation. Other important factors governing methodology are the main use of the index, the nature of the markets and pricing practices within the country, and the resources available to the statistical office. The *Manual* explains the underlying economic and statistical concepts and principles needed to enable statistical offices to make their choices in efficient and cost-effective ways and to recognize the full implications of their choices.

The *Manual* draws on the experience of many statistical offices throughout the world. The procedures they use are not static, but continue to evolve and improve, for a variety of reasons. First, resource constraints and custom and practice can inhibit innovation; the bias in unit-value indices as surrogates for price indices has been well understood for many years. However, the transition of countries to survey-based price indices has been gradual, and is still underway. Second, research continually refines the economic and statistical theory underpinning XMPIs and strengthens it. For example, recent research has provided clearer insights about the relative strengths and weaknesses of the various formulas and methods used to process the basic price data collected for XMPI purposes. Third, recent advances in information and communications technology have affected XMPI methods. Both theoretical and data developments can impinge on all the stages of compiling a XMPI. New technology can affect the methods used to collect prices and relay them to the central statistical office. It can also improve the processing and checking, including the methods used to adjust prices for changes in the quality of the goods and services covered. Fourth, improved formulas help in calculating more accurate higher-level indices.

C. Background to the Present Revision

Some international standards for economic statistics have evolved mainly to compile internationally comparable statistics. However, standards may also be developed to help individual countries benefit from the experience and expertise accumulated in other countries. All countries stand to gain by exchanging information about index methods. The UN published the *Manual on Producers' Price Indices for Industrial Goods*, Series M, No. 66 (United Nations, 1979), and *Strategies for Price and Quantity Measurement in External Trade*, Series M, No. 69 (United Nations, 1981) about 30 years ago. The methods and procedures presented then are now outdated. Index number theory and practice and improvements in technology have advanced greatly over the past two decades.

C.1 Concerns with Current Index Methods

The *XMPI Manual* takes advantage of the wealth of recent research on index number theory. It identifies many concerns and recommends many new practices instead of just codifying existing statistical agency practices, some of which are listed below.²

First, it provides a detailed, if somewhat critical, outline of the use of **unit value indices** based on customs data for XMPI compilation and provides a strategy for countries wishing to establish or develop their XMPIs by making use of price data from establishment surveys (Appendix 1 to Chapter 1 and Chapter 2).

Second, it outlines how different perspectives—the **resident's and nonresident's perspectives**—are required for different uses. For XMPIs as price deflators, a major use, to fit into the *1993 System of National Accounts Rev.1 (1993 SNA Rev.1)*. It distinguishes between two perspectives:

- exports of an economic territory are viewed from the *resident* producer's or supplier's perspective as an output, and imports of an economic territory viewed from the *resident* establishment or household user's perspective as an input;
- exports of an economic territory are viewed from the *nonresident* establishment or household user's perspective as an input, and imports of an economic territory are viewed from the *nonresident* supplier's perspective as an output.

Valuation principles follow from these perspectives: from the *resident's approach* that exports should be valued at basic prices and imports at purchasers' prices, and from the *nonresident's approach* that exports should be valued at purchasers' prices and imports at basic prices.

The *1993 SNA Rev.1* effectively defines the standard export and import aggregates that appear in the familiar expression for gross domestic product (GDP) by expenditure: $GDP = \text{final consumption} + \text{gross capital formation} + \text{exports} - \text{imports}$ according to the *nonresident* approach. This nonresident approach and its implications for valuation is thus appropriate for the use of XMPIs for deflating nominal values of exports and imports to estimate volume GDP-expenditure series. However, if XMPIs are to be used to analyze the transmission of inflation, terms of trade changes and their effect, and productivity changes, it is the resident's perspective that is appropriate. Chapter 15 outlines how the nonresidency issue has primacy within *1993 SNA Rev.1* and, more generally, Chapters 3 and 4 outline the different uses of XMPIs and implications for valuation. While the niceties of different valuation systems can be largely observed when using establishment-based survey data, this is not true of the f.o.b. and c.i.f. valuations mainly used in customs data for merchandise trade exports and imports; Chapter 4 considers how such customs valuations relate to the desired valuation methods. The implications of adopting either of the two approaches are addressed in further chapters, particularly, Chapters 18 and 20.

² These problems are not ranked in order of importance; they all seem equally important.

Third, is a concern with appropriate **index number formula**. The standard methodology for a typical XMPI is based on a Laspeyres price index with fixed quantities from an earlier base period. The construction of this index can be thought of in terms of selecting a basket of goods and services representative of base-period trade values (exports or imports), valuing this at base-period prices, and then repricing the same basket at current-period prices. The target XMPI in this case is defined to be the ratio of these two trade values. Practicing statisticians use this methodology because it has at least three practical advantages. It is easily explained to the public, it can use often expensive and untimely weighting information from the date of the last (or an even earlier) survey or administrative source (rather than requiring sources of data for the current month), and it need not be revised if users accept the Laspeyres premise. One notable advantage of the Laspeyres approach under the ease of explanation heading is its consistency in aggregation. It produces various breakdowns or subaggregates related to one another in a particularly simple way.

Statistical agencies implement the Laspeyres index by putting it into price-relative (price change from the base period) and trade value-share (from the base period) format. In this form, the Laspeyres index can be written as the sum of base-period trade value shares of the items in the index times their corresponding price relatives. Unfortunately, simple as it may appear, there still are a number of practical problems with producing the Laspeyres index exactly. Consequently, statistical agency practice has introduced some approximations to the theoretical Laspeyres target.

- Accurate trade value shares for the base period down to the finest level of commodity aggregation are not always available, so statistical agencies are often forced to settle for getting base-period trade value weights at a higher than desirable level of aggregation.
- For each of the chosen commodity category aggregates, agencies collect a sample of representative prices for specific transactions from establishments rather than attempting to enumerate every possible transaction. They use equally weighted (rather than traded value-weighted) index formulas to aggregate these elementary product prices into an elementary aggregate index, which will be used as the price relative for each of the commodity category groups in the final Laspeyres formula. Practitioners recognize that this two-stage procedure is not exactly consistent with the Laspeyres methodology (which requires weighting at each stage of aggregation). However, for a number of theoretical and practical reasons, practitioners judge that the resulting elementary index price relatives will be sufficiently accurate to insert into the Laspeyres formula at the final stage of aggregation.

The above standard index methodology dates back to the work of Mitchell (1927) and Knibbs (1924) and other pioneers who introduced it about 80 years ago, and it is still used today.

Although most statistical agencies have traditionally used the Laspeyres index as their *target index*, both economic and index number theory suggest that some other types of indices may be more appropriate target indices to aim for: namely, the Fisher, Walsh, or Törnqvist-Theil

indices. As is well known, the Laspeyres index has an upward bias compared with these target indices. Of course, these target indices may not be achievable by a statistical agency, but it is necessary to have some sort of theoretical target to aim for. Having a target concept is also necessary, so that the index that is actually produced by a statistical agency can be evaluated to see how close it comes to the theoretical ideal. In the theoretical chapters of the this *Manual*, it is noted that there are four main approaches to index number theory:

- (1) Fixed-basket approaches and symmetric averages of fixed baskets (Chapter 16);
- (2) The stochastic (statistical estimator) approach to index number theory (Chapter 17);
- (3) Test (axiomatic) approaches (Chapter 17); and
- (4) The economic approach (Chapter 18).

Approaches 3 and 4 will be familiar to many price statisticians and expert users of the XMPI, but perhaps a few words about approaches 1 and 2 are in order.

The Laspeyres index is an example of a fixed-basket index. The concern from a theoretical point of view is that it has an equally valid “twin” for the two periods under consideration—the Paasche index, which uses quantity weights from the current period. If there are two equally valid estimators for the same concept, then statistical theory tells us to take the average of the two estimators in order to obtain a more accurate estimator. There is more than one way of taking an average, however, so the question of the “best” average to take is not trivial. The *Manual* suggests that the “best” averages that emerge for fixed-base indices are the geometric mean of the Laspeyres and Paasche indices (Fisher ideal index) or using the geometric average of the quantity weights in both periods (Walsh index). From the perspective of a statistical estimator, the “best” index number is the geometric average of the price relatives weighted by the average revenue share over the two periods (Törnqvist-Theil index). It is usually the case that current period weights are unavailable in real time so a Laspeyres-type index is compiled. The *Manual* allows us to understand the nature of the bias arising from not using the best formula. It also recommends compiling retrospective analytical series using a Fisher or Törnqvist-Theil price index formula to provide an estimate of the magnitude of the index number formula bias.

At the final stage of aggregation, the standard XMPI index is *not* a true Laspeyres index, since the trade value weights pertain to a reference base *year* that is different from the base *month* (or quarter) for prices. Thus the trade value weights are chosen at an annual frequency, whereas the prices are collected at a monthly frequency. To be a true Laspeyres index, the base-period trade value should *coincide* with the reference period for the base prices. In practice, the actual index used by many statistical agencies at the last stage of aggregation has a weight reference period that precedes the base-price period. Indices of this type are likely to have some upward bias compared with a true Laspeyres index, as are indices compiled using trade value weights that are price-updated from the weight reference period to the Laspeyres base period. It follows that they must have definite upward biases compared with theoretical target indices such as the Fisher, Walsh, or Törnqvist-Theil indices.

At the early stages of aggregation, unweighted averages of prices or price relatives are used. Until relatively recently, when enterprise data in electronic form have become more readily

available, it was thought that the biases that might result from the use of unweighted indices were not particularly significant. However, recent evidence suggests that there is potential for significant upward bias at lower levels of aggregation compared with results that are generated by the preferred target indices mentioned above.

There is one additional result from index number theory that should be mentioned here—the problem of defining the price and quantity of a commodity that should be used for each period in the index number formula. The problem is that the establishment may have purchases/sales *within* a particular product specification in the period under consideration for many transactions at a number of different prices. So the question arises, what price would be most representative of the purchases/sales of these transactions for the period? The answer to this question is obviously the *unit value* for the transactions for the period, since this price will match up with the quantity sold during the period to give a product that is equal to the trade value. Note that the *Manual* does *not* endorse taking unit values over *heterogeneous* items at this first stage of aggregation; it endorses only taking unit values over *identical* items within each period.

The fourth major concern with the standard XMPI methodology is that, although statistical agencies generally recognize that there is a problem with the treatment of **quality change and new goods**, it is difficult to work out a coherent methodology for these problems in the context of a fixed-base Laspeyres index. The most widely recognized good practice in quality-adjusting price indices is “hedonic regression,” which characterizes the price of a product at any given time as a function of the characteristics it possesses relative to its near substitutes. However, there is a considerable amount of controversy on how to integrate hedonic regression methodology into the XMPI’s theoretical frameworks. The theoretical and practical chapters in the *Manual* devote a lot of attention to these methodological problems. The problems created by the disappearance of old goods and the appearance of new models are now much more severe than they were when the traditional XMPI methodology was developed some 30 years ago. For many categories of products, those priced at the beginning of the year are simply no longer available by the end of the year. Thus, there is a tremendous concern with *sample attrition*, which impacts on the overall methodology; i.e., at lower levels of aggregation, it becomes necessary (at least in many product categories) to switch to chained indices rather than use fixed-base indices. Certain unweighted indices have substantial bias when chained.

A fifth major area of concern is related to the first concern: the **treatment of seasonal commodities**. The use of an annual set of products or the use of annual revenue shares is justified to a certain extent if one is interested in the longer-run trend of price changes. If the focus, however, is on short-term, month-to-month changes (as is the focus of central banks), then it is obvious that the use of annual weights can lead to misleading signals from a short-run perspective, since monthly price changes for products that are out of season (i.e., the seasonal weights for the product class are small for the two months being considered) can be greatly magnified by the use of annual weights. The problem of seasonal weights is a big one when the products are not available at all at certain months of the year. There are solutions to these seasonality problems, but the solutions involve the construction of *two* indices: one for the short-term measurement of price changes and another (more accurate) longer-term index

that is adjusted for seasonal influences. This may give rise to confusion among users as to which index is correct and thus does not appeal to traditional index number statisticians.

A sixth concern is that the typical XMPI currently produced will generally **exclude services**. A typical XMPI will include merchandise trade, and possibly, electricity, gas supply, and water supply activities. Many countries will also include, or have separate indices for, agricultural and commodity prices. Thus, XMPI coverage includes many more goods-producing activities than services. In a way, this just reflects the historical origins of existing index number theory. Trade in goods was very much more significant than services. Hence, there was not much focus on the problems involved in measuring trade in services. It is only over the past 30 or so years that trade in has become significant. In addition to inertia, there are some serious conceptual problems involved in measuring the prices of many services, such as insurance, financial, and entertainment services. In many cases, statistical agencies simply do not have appropriate methodologies to deal with these difficult conceptual measurement problems.³ It is further the case that the source data on weights and unit value indices has been administrative customs documentation based on merchandise trade with a methodology initially dedicated to the collection of merchandise trade statistics and then subsequently, and separately extended to services.⁴ Thus, import and export prices for these service sectors are not widely measured.

A seventh concern arises because the value that multinational enterprise accord to international transactions between divisions operating in different countries, **transfer prices**, may not be market driven prices, but dictated by a strategic decision to minimize taxes, given rates of business income taxation differ across countries. Chapter 19 discusses the issues related to transfer prices and offers solutions. The best alternative to the firm's listed transfer price are internal comparable prices for the two periods compared; that is, the average price paid to (for an imported commodity) or received from (for an exported commodity) unaffiliated firms for the same commodity during the reference period, if such unaffiliated purchases or sales exist.

Terms of trade

Many of the above areas of concern are addressed in this *XMPI Manual*. Frank discussions of these concerns should stimulate the interest of academic economists and statisticians to address these measurement problems and to provide new solutions that can be used by statistical agencies. Public awareness of these areas of concern should lead to a willingness

³ The Voorburg Group, which meets annually, has included the expansion of PPIs to services as part of its work program. The OECD, as part of its contribution to this program, conducts periodic surveys on the extension of PPIs in services activities. The latest survey results along with developments in services statistics are available at http://www.oecd.org/document/43/0,2340,en_2649_34355_2727403_1_1_1_1,00.html.

⁴ At its thirty-second session, in March 2001 the United Nations Statistical Commission adopted the draft *Manual on Statistics of International Trade in Services*, Statistical Papers Series M, No. 86 (New York: United Nations, 2002). A revised version is planned for adoption in 2010.

on the part of governments to allocate additional resources to statistical agencies so that economic measurement will be improved. In particular, there is an urgent need to fill in some of the gaps that exist in the measurement of service sector imports and exports.

C.2 Efforts to Address the Concerns in Index Number Methods

Several years ago it became clear that the outstanding and controversial methodological concerns related to price indices needed further investigation and analysis. An expert group consisting of specialists on price indices from national and international statistical offices and universities from around the world formed to discuss these concerns. It met for the first time in Ottawa in 1994. During ten meetings between 1994 and 2009, the Ottawa Group presented and discussed over a hundred-and-sixty research papers on the theory and practice of price indices. While much of the research related to consumer price indices (CPIs), many of the issues carry across to XMPIs. It became obvious there were ways to improve and strengthen existing XMPI and CPI methods.

In addition, the Voorburg Group on Service Sector Statistics, with members from many national statistical offices, has held annual meetings for over a decade. Many agenda topics of the Voorburg Group related to expanding country PPIs to cover service industries and products, though the principles extend readily to XMPIs. The Group has provided many technical papers on concepts and methods that serve as documentation that other countries can follow.

At the same time, the control of inflation had become a high-priority policy objective in most countries. Policymakers use the CPI, Producer price index (PPI) and XMPIs widely to measure and monitor inflation. The slowing down of inflation in many parts of the world in the 1990s, compared with the 1970s and 1980s, increased interest in XMPI and PPI and CPI methods rather than reduce it. There was a heightened demand for more accurate, precise, and reliable measures of inflation. When the rate of inflation slows to only 2 or 3 percent each year, even a small error or bias becomes significant.

Recent concern over the accuracy of price indices led governments and research institutes in a few countries to commission experts to examine and evaluate the methods used, particularly for the CPI. The methods used to calculate CPIs, PPIs and XMPIs have been subject to public interest and scrutiny of a kind and level that were unknown in the past. One conclusion reached is that existing methods might lead to some upward bias in CPIs, PPIs and XMPIs. One reason for this was that the methods employed by many statistical agencies made inadequate allowance for changes in the quality of the goods and services priced. The direction and extent of such bias will, of course, vary between commodity groups, and its total effect on the economy will vary among countries. However, the upward bias has the potential to be large, so this *Manual* addresses adjusting prices for changes in quality in some detail, drawing on the most recent research in this area. There are other sources of bias including that arising from no allowance, or an inappropriate one, made for changes in the bundle of items produced, when purchases/production switches between commodities with different rates of price change. Further, different forms of bias might arise from the sampling and price collection system. Several chapters deal with these subjects, with an overall summary of possible errors and biases given in Chapter 13.

CPIs are widely used for the index linking of social benefits such as pensions, unemployment benefits, and other government payments. The cumulative effects of even a small bias could have notable long-term financial outcomes for government budgets. Similarly, a major use of XMPIs is as an escalator for price adjustments to long-term contracts. Agencies of government, especially ministries of finance, and private businesses have taken a renewed interest in price indices, examining their accuracy and reliability more closely and carefully than in the past.

Developments were also being made in statistics on international trade derived from customs documentation. The United Nations (1998) guidelines on *Concepts and Definitions* for international merchandise trade statistics was followed by a *Compilers Manual* in 2004—a draft supplement to the *Compilers Manual* is being prepared at the time of writing. A further revision (Rev. 3) to *Concepts and Definitions* is planned for 2010.⁵

D. The Organization of the Revision

D.1 Background

In response to the various developments outlined above, the need to revise, update, and expand the UN price statistics manuals was gradually recognized and accepted during the late 1990s. The joint UNECE/ILO Meeting of national and international experts on CPIs held at the end of 1997 in Geneva made a formal recommendation to revise *Consumer Price Indices: An ILO Manual* (ILO, 1989). The main international organizations interested in measuring inflation agreed to take responsibility for the revision. The United Nations Statistical Commission in 1998 approved this strategy and agreed to set up the *Intersecretariat Working Group on Price Statistics* (IWGPS). The terms of reference of the IWGPS presented to the United Nations Statistical Commission in 1999 at its thirtieth session, emphasized the development of standards and manuals on consumer price indices (CPIs), producer price indices (PPIs), and export-import price indices (XMPIs). In its report to the 34th (2003) session of the Statistical Commission, the Task Force on International Merchandise Trade Statistics stated the need for a manual on international trade price indices to be developed through an inter-agency effort. One of the first decisions of the IWGPS was to produce a new international *PPI Manual* at the same time as the *CPI Manual*. Both Manuals were published in 2004, the *CPI Manual* by the ILO and *PPI Manual* by the IMF. The IWGPS decided at its fifth meeting, held in December 2003, to follow on with the production of a *XMPI Manual*. The first meeting of the Technical Expert Group for this *Manual* was in June 2004.

⁵ United Nations, Department of Economic and Social Affairs, Statistics Division, (1998) *International Merchandise Trade Statistics: Concepts and Definitions*, Studies in Methods, No. 52, Rev.2 and to assist in the implementation of the recommendations: United Nations, Department of Economic and Social Affairs, Statistics Division, (2004) *International Merchandise Trade Statistics: Compilers Manual*, Statistical Papers Series F, No. 87 (New York: United Nations)—a draft supplement had been prepared at the time of writing (Statistical Papers Series F, No. 87, Add. 1).

The IMF coordinated the work on the XMPI Manual with a view of fostering coherence in structure and style with the *CPI* and *PPI Manuals* developed by the IWGPS and adopt, wherever appropriate, consistent contents, terminology, and methodology. A draft version of the *XMPI Manual* was completed in 2006. This initial draft *XMPI Manual* was adapted from the *PPI Manual* (by IMF staff and a few other specialists) and posted on the IMF web site <http://www.imf.org/external/np/sta/tegeipi/index.htm>.

The Statistics Division of the IMF (STA) wrote in 2006 to each national statistical office and other interested organizations, including the OECD and World Trade Organisation (WTO), requesting comments on the draft chapters. As a further part of the *XMPI Manual* review process STA organized a seminar on the draft manual held in Washington DC during September 25–29, 2006. Participants included a focus group of compilers from selected national statistical offices and experts in the field that included many IWGPS members. Aside from reviewing individual chapters, participants discussed comments from the United Nations Statistics Division (UNSD) and WTO on the need to further embrace unit value indices and the need for evidence-based comments on the subject. An IMF discussion paper was prepared in response to this concern⁶ and presented at a meeting hosted by the WTO of the Task Force on Merchandise Trade Statistics in May 2007. At the meeting the IMF agreed to include a new chapter 2 on unit value indices. The IMF seminar also included an active discussion of the resident's and non-resident's perspectives to XMPIs. Following the seminar written comments on each chapter were sent to the originating PPI authors who were asked to update the current versions of their chapters. Further reviews were sought and obtained as relevant, including comments on earlier chapters by the WTO and UNSD. A revised draft was posted on the IMF web site in April 2008 and discussed with IWGPS members.

D.2 Agencies Responsible for the Revision

The following international organizations—concerned with measuring inflation, with policies designed to control inflation, and with measurement of deflators for national accounts, have—collaborated on revising the *CPI*, *PPI* and *XMPI Manuals*.

- The International Labour Office;
- The International Monetary Fund;
- The Organization for Economic Co-operation and Development;
- The Statistical Office of the European Communities;
- The UN Economic Commission for Europe; and
- The World Bank.

These organizations have provided, and continue to provide, technical assistance on CPIs, PPIs and XMPIs both to developing countries and to countries in transition from planned to market economies. The group's role was to appoint various experts as authors and to provide

⁶ <http://www.imf.org/external/pubs/cat/longres.cfm?sk=20943.0>

substantive advice on the contents of the chapters of the draft Manual and organize and manage the process of writing, publishing, and disseminating the *XMPI Manual*.

The experts taking part were invited in their personal capacity as experts and not as representatives, or delegates, of the national statistical offices or other agencies that employed them. Participants were able to give their expert opinions without in any way committing the offices from which they might have come.

D.3 Links with the New Consumer and Producer Price Index Manuals

The *XMPI Manual* was a natural progression from the *CPI* and *PPI Manuals* (2004) and it thus benefited from shared conceptual and practical issues. The manuals have similar contents and are, where applicable, fully consistent with each other conceptually, sharing common text when suitable. The three Manuals are each self-contained but share common approaches and conceptual groundings and, as a set, benefit from an internal coherency. However, there are of course features of XMPI compilation that are distinct from their CPI and PPI counterparts and the *XMPI Manual* departs from the *CPI* and *PPI Manuals* in a number of respects, the most notable being.

- It includes a new Chapter on unit value indices (Chapter 2);
- It includes a new Chapter on transfer pricing (Chapter 19);
- It includes a new Chapter on terms of trade measurement (Chapter 24);
- The resident's versus nonresident's approach to XMPI measurement, to serve different uses, is particular to XMPIS (Chapters 4, 15, 18, and 20);
- The primary source data for weights is administrative data that has particular merits for the frequent updating of weights if sufficiently timely and reliable (Chapters 5, 16, and 20).

E. Acknowledgments

The *XMPI Manual* is the result of a three year process that involved multiple activities. The starting point was an adaptation of the *PPI Manual* primarily by Kim Zieschang (IMF) and Mick Silver (IMF), posted on the IMF web site in 2006. Thomas Alexander (IMF) and Maria Mantcheva (IMF) also contributed by respectively redrafting Chapters 4 and 5 and undertaking additional calculations for some of Chapter 20. Following the September, 2006 Washington DC seminar on the draft manual, and request and receipt of comments from national statistical offices and other interested organizations and individuals on the draft, the originating *PPI Manual* authors for each chapter, for the large part, were asked to adapt their chapters to take account of the comments received. The posted chapters were substantially revised and reposted on the IMF web site in April 2008.

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Members of the Intersecretariat Working Group on Price Statistics (IWGPS), under whose aegis this manual was written, were:⁷

Paul Armknecht (Expert-*PPI Manual* editor), Bert Balk (Statistics Netherlands), Pam Davies (ONS),* Erwin Diewert (University of British Columbia), Yuri Dikhanov (World Bank),* David Fenwick (ONS), Tarek Harchaoui (Statistics Canada),* Carsten Hansen, (UNECE), Keith Hayes (Eurostat),* Joaquim Oliveira (OECD),* Peter Hill (expert-*CPI Manual* editor), Walter Lane (BLS),* Alexandre Makaronidis (Eurostat),* David Roberts (OECD), Paul Schreyer (OECD),* Mick Silver (IMF), Valentina Stoevska (ILO), Keith Woolford (ABS), Kimberly Zieschang (IMF).

The final copy editing of the Manual in the IMF External Relations Department was by.....

The editor of the *XMPI Manual* is Mick Silver (IMF).

⁷ Individuals with an asterisk (*) after their name only served for part of the period.

The author, or authors, of the chapters are a moving feast with, to maintain internal coherency between the manuals, text from the *CPI Manual* carrying over to the *PPI Manual* and, again, to the *XMPI Manual*, as applicable. The attribution of authorship recognises this and that given below is for, for the large part, that of the *PPI Manual*, edited by Paul Armknecht (which carried over from the *CPI Manual*, edited by Peter Hill), with the addition of any authors who made substantive contributions to chapters in the writing of this manual. Generally, the originating PPI authors were responsible for much of the often substantial adaptation of material necessary for the *XMPI Manual*. Chapters 2, 19, and 24 are new to the *XMPI Manual*.

Erwin Diewert merits a special note of appreciation. He has been either sole or joint author of all the chapters concerning theoretical issues that provide the underpinnings of much of the manual.

Preface Paul Armknecht, W. Erwin Diewert, Peter Hill, and Mick Silver.

Reader's Guide Paul Armknecht, Peter Hill, and Mick Silver.

Chapter 1 *A summary of export and import price index methodology*, Paul Armknecht, David Collins, Peter Hill, and Mick Silver.

Chapter 2 *Unit value indices*, Mick Silver.

Chapter 3 *The price and volume of foreign trade: background, purpose, and uses of export and import price indices*, Andrew Allen (ONS), Paul Armknecht, and David Collins.

Chapter 4 *Valuation, timing, coverage, and classification* Thomas Alexander and Paul Armknecht.

Chapter 5 *Data sources*, Maria Mantcheva.

Chapter 6 *Sampling issues in price collection*, Paul Armknecht and Fenella Maitland-Smith (ONS).

Chapter 7 *Price collection*, Andrew Allen, Paul Armknecht, Matthew Berger (ABS), David Collins.

Chapter 8 *Treatment of quality change*, Mick Silver.

Chapter 9 *Item substitution, sample space and new goods*, Mick Silver.

Chapter 10 *An overview of XMPI calculation*, Erwin Diewert, Carsten B. Hansen, Peter Hill, Robin Lowe (Statistics Canada), and Mick Silver.

Chapter 11 *Treatment of specific products*, Dennis Fixler (US Bureau of Economic Analysis) and Michelle Vachris (Christopher Newport University); contributions from Australian Bureau of Statistics, Statistics Canada, Statistics Singapore, and U.S. Bureau of Labor Statistics..

Chapter 12 *Errors and bias in XMPIs*, Mick Silver.

Chapter 13 *Organization and management*, Bill Alterman (US Bureau of Labor Statistics (BLS)), David Fenwick, and Yoel Finkel (Israel Central Bureau of Statistics).

Chapter 14 *Publication, dissemination and user relations*, Paul Armknecht, Tom Griffin (expert), and David Mead (BLS).

Chapter 15 *The system of price statistics*, Kim Zieschang.

Chapter 16 *Basic index number theory*, W. Erwin Diewert and Paul Armknecht.

Chapter 17	<i>Axiomatic and stochastic approach</i> , W. Erwin Diewert.
Chapter 18	<i>Economic approach</i> , W. Erwin Diewert.
Chapter 19	<i>Transfer pricing</i> , W. Erwin Diewert.
Chapter 20	<i>Exports and imports from production and expenditure approaches and associated price indices using an artificial data set</i> , W. Erwin Diewert.
Chapter 21	<i>Elementary indices</i> , W. Erwin Diewert and Mick Silver.
Chapter 22	<i>Quality change and hedonics</i> , Mick Silver and W. Erwin Diewert.
Chapter 23	<i>Treatment of seasonal products</i> , W. Erwin Diewert and Paul Armknecht.
Chapter 24	<i>The measurement of terms of trade</i>, W. Erwin Diewert
Glossary	David Roberts (OECD) and Paul Schreyer (OECD).
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