2. Background, Purpose, and Uses of Producer Price Indices

2.1 PPIs are a key economic indicator in most countries. This chapter provides background information on the development of price indices, discusses the role of national and international agencies in price index development, identifies the variety of ways in which PPIs can be compiled, and explains the uses of these different variations.

A. Background and Origins of Price Indices

2.2 PPIs are used for a variety of different purposes (see Section E below). There is a general public interest in knowing the extent to which the prices of goods and services have risen. Also, it has long been customary in many countries to adjust levels of wages, pensions, and payments in long-term contracts in proportion to changes in relevant prices, a procedure known as index linking or contract escalation. Price indices have a long history for this reason.

2.3 A very early example is a simple index compiled by William Fleetwood in 1707, which was intended to estimate the average change in the prices paid by Oxford University students over the previous two and a half centuries. Another 18th-century example is an index compiled by the legislature of Massachusetts in 1780 in order to index the pay of soldiers fighting in the Revolutionary War against England (see Diewert, 1993a, for an account of the early history of index numbers).

2.4 During the 19th century, interest in price indices gathered momentum. In 1823 Joseph Lowe published a study on agriculture, trade, and finance in which he developed the concept of a price index as the change in the monetary value of a selected set, or basket, of goods and services, an approach still used today. He also noted the various uses for a price index, such as the linking of wages and rents, and the calculation of real interest. Diewert (1993a) argues that Lowe can be considered "the father of the consumer price index." Later in the 19th century further important contributions were made, including those of Laspeyres (1871) and Paasche (1874), whose names are associated with particular types of price indices that are still widely used. Marshall (1887) advocated the use of chain indices, in which indices measuring price movements from one year to the next are linked together to measure price movements over longer periods of time.

2.5 During the 1920s several important developments occurred. In 1922, Irving Fisher published his monumental work, *The Making of Index Numbers*. This was prompted by Fisher's interest in inflation and his advocacy of the Quantity Theory of Money, in which changes in the money supply were held to lead to corresponding changes in the price level. A good measure of changes in the price level was needed—that is, a good price index—which led him into a systematic investigation of the properties of hundreds of different kinds of possible formulas for price indices.

2.6 Fisher's preferred index, the geometric average of the indices advocated by Laspeyres and Paasche, is now known as the Fisher index. As explained in detail in Chapters 1 and 17 of this *Manual*, the Fisher index (or the closely related Törnqvist index) remains the preferred measure from a theoretical point of view for most purposes. From the perspective of the *economic approach to index number theory*, these indices have been shown in most circumstances to provide an unbiased estimate of changes in the cost of living for consumers and for price changes for firms that maximize revenue and minimize costs. The full details of the economic approach to the PPI are discussed in Chapter 17. The Fisher index number formula can also be justified from the perspective of averaging two equally plausible fixed-basket index number formulas (the Laspeyres and Paasche formulas), and this justification is presented in Chapter 15. The Fisher index also has a strong justification from the view-

point of the *test approach to index number theory*, which is discussed in Chapter 16. The Törnqvist formula can also be justified from the viewpoint of the *stochastic approach to index number theory*, which is also discussed in Chapter 16.

2.7 In 1924, Konüs published a seminal paper laying down the foundations for the economic theory of the cost-of-living index, or COL index. A COL index is designed to measure the change in the cost of maintaining a given standard of living (or utility or welfare) as distinct from maintaining sufficient purchasing power to buy a fixed set of goods and services. In reality, consumers do not go on purchasing the same set of goods and services over time but adjust their expenditures to take account of changes in relative prices and other factors. The producer counterpart to the consumer's cost-of-living index is the *fixed-input output price index*. This *economic approach* to the theoretical foundations for the PPI was not fully developed until the 1970s: see Fisher and Shell (1972), Samuelson and Swamy (1974), and Archibald (1977). This approach is pursued in Chapter 17.

2.8 In 1926, Divisia published a paper in which he proposed price and quantity indices that factor the change in the monetary value of some aggregate flow of goods and services over time continuously and instantaneously into its price and quantity components. While Divisia's approach to index number theory is not immediately applicable, since price and quantity data are not available on a continuous basis, the Divisia index is useful conceptually when one has to choose between fixed-base indices or chained indices. The Divisia index and its connection with the chain principle for constructing index numbers are discussed in Chapter 15.

2.9 Thus, by 1930 the theoretical foundations (from all of the above perspectives) for the compilation of price indices, including PPIs, had been laid. While there have been many refinements to index number theory from both an economic and statistical viewpoint during the mid- and late 20th century, the essential elements were already in place early in the century. Developments in index number theory and practice over the past few decades are dealt with in detail in various chapters in this *Manual* and will not be summarized here, except to note that all of the above approaches led to a very small number of index number formulas being designated "best." In particular, the Fisher formula emerges as being "best" from the perspectives of the economic, test (axiomatic), and averaging of fixed-basket indices approaches, whereas the Törnqvist formula emerges as being "best" from the perspectives of the economic and stochastic approaches. The purpose of this brief historical survey has been to place the contents of this *Manual* in a longer-term perspective and to show that the measurement of price changes, or inflation, has long been recognized to be theoretically challenging as well as practically important.

B. Official Price Indices

2.10 As noted, there has always been considerable interest in, and demand for, price indices from the general public as well as governments. The 1780 index, referred to in the previous section, was specifically commissioned by a government agency in order to adjust the pay of soldiers in its employment. It is now generally acknowledged that governments have an obligation to provide the community and not merely themselves with information about price movements in the economy. A price index is a public good.

2.11 The practice of index-linking wages has a long history. Index linking means that the wage rate or material costs are adjusted in proportion to the change in some specified price index, the purpose being to maintain the real purchasing power of wages over the kinds of goods and services typically consumed by wage earners. As explained later in this chapter, a major use of the PPI is to make adjustments in long-term contracts for changes in material costs. For such applications the specification of the index that is to be used can be a matter of some controversy. Whatever the exact formula used, index linking has important financial implications both for those making and receiving the payments in question. This in turn implies that there is a need for impartial, independent, objective, reliable, and credible price indices. The responsibility for compiling price indices must therefore be entrusted to a statistical agency that has both sufficient resources and the necessary independence from pressure groups of various kinds. This provides a second reason why governments find themselves under an obligation to compile and publish price indices, or to supervise and monitor whatever agency is entrusted with the responsibility.

2.12 In practice, the government agency that is given the responsibility to compile and publish PPIs is usually either the statistics office or bureau, or the central bank. The reason why the central bank has been entrusted with the task of compiling PPIs is that the PPI is seen as a major indicator of domestically induced inflation, which most central banks want to control using instruments of monetary policy.

2.13 Price indices for industrial commodities also have a long history. In Canada a wholesale price index (WPI) of 89 commodities was compiled using an unweighted geometric mean for the period 1867–90. After that the index was expanded to cover more commodities and to use a Laspeyres index. The first industrial commodities index in the United States was produced in 1902 (covering the period 1890–1901), using an unweighted average of price relatives for about 250 commodities. This index was developed in response to a U.S. Senate Finance Committee request for an investigation into the effects of tariff laws on prices of domestic and foreign agricultural and manufactured products. A system of weighting was first used in 1914. The original index was also referred to as the WPI because it covered commodity prices before they reached retail markets.

2.14 In Europe, the first WPI for the United Kingdom was prepared by the Board of Trade and presented to Parliament in 1903. The price reference year was 1871, and the series covered the years from 1871 to 1902. The prices were mainly derived from the trade accounts, with weights estimated from different commodities used, or consumed, in the country between 1881 and 1890. The index covered 45 commodities, mainly basic materials and foodstuffs. Following World War II, a number of countries also began collection of data on wholesale prices of commodities in an effort to measure price changes at an earlier level in the production process. Around 1970, Eurostat, the Statistical Office of the European Union (EU), began a systematic program to encourage members to collect industrial output prices in an effort to get information on prices as products left producers' factories. These price indices were thus called producer price indices—PPIs—because they attempted to measure the change in prices producers received at the factory gate. In the past 5–10 years, many national statistical agencies have been progressively extending coverage of their national PPIs to measure changes in service industry prices, which in many countries now account for nearly two-thirds of GDP.

2.15 PPIs are usually compiled monthly, although some countries compile them only quarterly. Countries also try to publish them as soon as possible after the end of the month to which they refer, sometime within two weeks of the reference month. Moreover, most countries prefer not to revise them once they have been published. In contrast to many other kinds of statistics, most of the required data, at least on prices, can be collected at the same time.

2.16 PPIs have two characteristics that users find important. They are published *frequently*, usually every month but sometimes every quarter. They are available *quickly*, usually about two weeks after the end of the month or quarter. PPIs tend to be closely monitored and attract a lot of publicity. In many countries the PPI is not revised once it is published, which is viewed as an advantage by many users.[1]

C. International Standards for Price Indices

2.17 Once some statistic is accorded official status and given some prominence, the establishment of international standards usually follows. International standards are needed for several reasons—and not merely in order to compile internationally comparable statistics. The first international standards for PPIs were promulgated in 1979 by the United Nations. The UN Statistical Commission at its 19th session requested the preparation of manuals on the practical aspects of collecting and compiling price and quantity statistics within the overall framework of the *Guidelines on Principles of a System of Price and Quantity Statistics*, which was issued in 1977. The *Manual on Producers' Price Indices for Industrial Goods* was released in 1979 by the UN Statistical Office to provide practical guidance on the preparation of industrial PPIs.

[1] In most countries both the PPI and CPI are not subject to revision once published unless an error is discovered in price collection or compilation. In a number of countries, however, it is standard practice to revise the PPI once more complete information is available. For example, in the United States the PPI is revised with a three-month lag; that is, the most recent three months are preliminary (subject to revision), while the fourth month's data are final.

2.18 This *Manual* discusses revised and updated methods for PPI compilation based on current practice and recent developments in price index number theory.

2.19 Some international statistical standards are developed primarily to enable internationally comparable data to be collected and published by international agencies such as the statistical offices of the UN, the ILO, the IMF, or the OECD. The publication of such data by an international agency is often seen as a guarantee that the data conform to internationally accepted standards even though this may not always be the case in practice. Although national statistical offices actually supply the data to the international agencies, their publication by the international agencies is often interpreted as a public endorsement of their reliability, which enhances their status and credibility even within their own country.

2.20 However, international standards are not developed simply to enable internationally comparable data to be compiled. Many countries choose to use them as norms or standards for their own statistics. In this way, small national offices with limited resources of their own benefit from the collective views and experience of experts from a wide range of countries on which the international standards are based.

C.1 The current revision

2.21 This *Manual* has been developed in response to several factors. A considerable amount of work on the methodology of price indices, covering both theoretical issues and optimal methods of calculation, was undertaken at an international level during the 1990s as a result of the formation of international group of price experts. This group, the International Working Group on Price Indices, established under the auspices of the UN Statistical Commission, met for the first time in Ottawa in 1994 (and is therefore called the "Ottawa Group"). It brought together leading experts on price indices from national statistical offices and universities from around the world. During the course of its seven meetings through 2002, well over a hundred papers on the theory and practice of price indices have been presented and discussed. This collective activity at the international level has inevitably led to some rethinking about, and elaboration of, the current international standards on both CPIs and PPIs as embodied in *Consumer Price Indices: An ILO Manual* (Turvey and others, 1989) and the *Manual on Producers' Price Indices for Industrial Goods* (UN, 1979). The current *PPI Manual* also incorporates approaches to the measurement of output prices in the services sector and, as such, has benefited from review by the International Working Group on Service Sector Statistics (the Voorburg Group).

2.22 Another factor is the high priority accorded to the control of inflation as a policy objective in most countries, after the experience of high, or even hyper, inflation in the past three decades of the 20th century. The slowing down of inflation in many parts of the world in the 1990s, compared with the 1970s and 1980s, far from reducing interest in its measurement, has stimulated a demand for more accurate and reliable measures of inflation. Whereas an error or bias of 1, or even 2, percentage points in the annual rate of inflation may not be considered so important when inflation is running at 10, 20, or more percent, it becomes very significant when the rate of inflation itself is estimated to be only 1 or 2 percent. Inflation may slow down to the point at which it is not even clear whether prices are rising or falling, on average.

2.23 Users of PPIs in some countries have become convinced that the indices are subject to an upward bias, mainly as a result of their failing to make proper allowance for improvements in the quality of many goods and services, especially newer goods, such as computers, that are subject to rapid technological progress. The treatment of changing quality has long been recognized as particularly difficult on both conceptual and practical grounds. This topic has been intensively investigated, with numerous new studies on the subject appearing in the 1990s.

2.24 It has also been realized that, because of the widespread use of price indices for the index linking of social benefits such as pensions and other government payments and as an escalator for price adjustments to long-term contracts, the cumulative effects of even small potential biases can have considerable financial consequences for government budgets and private industry purchases over the long term. This has led to governments themselves scrutinizing the accuracy and reliability of price indices more intensively than in the past.

2.25 Within the EU, the convergence of inflation was deemed to be an important prerequisite for

the formation of a monetary union. This requires precisely defined price indices that are comparable among countries. An intensive and prolonged review of all aspects of the compilation of CPIs was undertaken during the 1990s by all the national statistical offices of the member countries of the EU in collaboration with Eurostat. This work culminated in the elaboration of a new set of international standards for the 29 member and candidate countries of the EU and led to the development of the EU's Harmonised Indices of Consumer Prices, or HICPs. Work on the HICPs proceeded in parallel with that of the Ottawa Group, many of whose experts also participated in the development of the HICPs.

2.26 The need for revising the ILO manual to incorporate these new developments was one of the major recommendations at the 1997 joint UN-ECE/ILO meeting on the CPI. Similarly, the IWGPS came to the conclusion that a new PPI manual was long overdue, as was a manual on external trade price indices.

2.27 Significant developments have taken place in the practice of PPI construction that now necessitate a revision of the 1979 UN manual. Among these are emergence of the economies in transition, increased inflation, reality that PPIs may overstate inflation even when international standards are followed, the need for constructing and publishing more than one index to meet specific requirements, the need for separate PPIs for different stages in the production process, etc.

C.2 Responsibilities of the international agencies

2.28 The traditional practice of index-linking wages and contracts in many countries has meant that, at both a national and an international level, ministries or departments concerned with economic policies and statistics have taken responsibility for PPIs. However, many government departments—especially ministries of finance, economics, industry and trade, and of course central banks—are concerned about inflation and have acquired an interest in a variety of PPIs as key indicators of inflation. The experience of inflation in the past three decades has also increased general public awareness of, and concern about, the PPI.

2.29 Similarly, all the international agencies concerned with general economic policy now attach importance to the PPI and its movements. In addition, the IMF, the World Bank, the regional UN Economic Commissions, the OECD, and the Commission of the EU all have a strong interest in PPIs. All of these agencies have provided technical assistance in the compilation of PPIs to countries in transition as well as to developing countries. The agencies therefore agreed to pool their resources and collaborate in the present *PPI Manual*, establishing an Inter-Secretariat Group to manage the process.

C.3 Links between the new *CPI* and *PPI Manuals*

2.30 One of the first decisions of the IWGPS was to produce a manual on PPIs parallel to the one on CPIs. Movements in producer prices are clearly important for the measurement of inflation and the analysis of the process of inflation within an economy. PPIs have been comparatively neglected, however. Whereas there has been an international manual on CPIs for over 70 years, there has been a manual on the PPI covering industrial output only for about 20 years.

2.31 This new *PPI Manual* was therefore developed and written in conjunction with the *CPI Manual* (ILO and others, 2004). PPIs and CPIs have a lot of methodology in common. Both draw on the same theoretical literature pertaining to index numbers. Whereas CPIs also draw on the economic theory of consumer behavior, PPIs draw on the economic theory of production and the short-term rigidities in the production process. However, the two economic theories are isomorphic and lead to the same kinds of conclusions with regard to index number compilation. It was therefore decided that the two *Manuals* should be similar in form and as consistent as possible, sharing common text when appropriate.

C.4 The Inter-Secretariat Group and the Technical Expert Groups

2.32 Responsibility for the production of both the *CPI* and the *PPI Manuals* rested with the same Inter-Secretariat Group consisting of staff from the statistical offices, departments, or divisions of the ILO, the IMF, the World Bank, the UN, the OECD, and the EU. Expert advice on the contents of the two *Manuals* was provided by two parallel technical expert groups consisting of invited experts on

CPIs or PPIs from national statistical offices and universities together with experts from the international agencies themselves. To ensure consistency, there was overlap of membership between the two expert groups.

2.33 Most members of the two technical expert groups also participated in meetings of the Ottawa Group, which supported the decision to revise the *CPI Manual* and to produce a new *PPI Manual*. The *Manuals* draw on the contents and conclusions of the papers presented at meetings of the Ottawa Group and the Voorburg Group, thus providing the outlets through which the conclusions of the Groups can exert an influence on the actual compilation of price indices.

D. Purpose of a Producer Price Index

D.1 Background

2.34 The PPI provides a weighted average of the price changes in a group of products between one time period and another. The average price change over time cannot be directly observed and must be estimated by measuring actual prices at different points in time. Price index numbers are compiled from the collected price observations through time; their significance lies in a series of index numbers referencing the comparison prices between a particular period and a reference base. For an index to provide information on price changes, at least two index numbers from the same series need to be available, and these index numbers must relate to the same basket of goods.

2.35 The PPI does not attempt to measure the actual level of prices but is limited to the measurement of the average change in prices from one period to another. The PPI does not measure the value of production or cost of production, but it can be used to measure either the change in output prices owing to changes in the basic prices received by producers or, alternatively, the change in prices paid by producers for inputs of goods and services used in the production of output.

2.36 There is no unique PPI, since the prices of different combinations of goods and services do not all change at the same rate. Relative prices are changing all the time, with some prices rising and others falling. Because price changes can vary considerably from product to product, the value of the price index will be dependent on the precise set of goods and services selected. It will also depend on the weights attached to the different kinds of product within the set.

2.37 In general terms a PPI can be described as an index designed to measure the average change in the price of goods and services either as they leave the place of production or as they enter the production process. Thus, producer price indices fall into two clear categories: input prices (that is, at purchaser prices) and output prices (that is, at basic or producer prices). The *1993 SNA* (paragraph 6.205, page 151) defines basic and producer prices as follows:

> The *basic price* is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable, and plus any subsidy receivable, on that unit as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer;
>
> The *producer's price* is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any VAT, or similar deductible tax, invoiced to the purchaser. It excludes any transport charges invoiced separately by the producer.

The difference between basic and producer prices is generally the per unit subsidy that the producer receives and taxes on production. While basic prices are preferred in the PPI because they represent the per unit revenue received by the producer, producer prices may have to be used when information on subsidies is not available. In most cases producers do not receive subsidies, so the basic and producer prices will be the same.

2.38 Thus, *output prices* should be the basic prices received by the producer. The output price index measures the average price change of all covered goods and services resulting from an activity and sold on the domestic market and also on export markets. In constructing a family of output PPIs, export prices are usually collected from a separate source to produce a separate export price index.

2.39 PPI prices should be actual transaction prices, which can be directly recorded. The price should be recorded at the time when the transaction occurs (ownership changes) rather than when the

goods are ordered, which in certain cases can be significantly different. This topic is discussed in more detail in Section B of Chapter 3 and Section B.5 of Chapter 6. Intercompany transfer prices should be used with caution.

2.40 *Input price indices* measure the change in the prices of all intermediate inputs used in production by a specified sector of the economy. *Intermediate inputs* are inputs into the production process of an establishment that are produced elsewhere in the economy or are imported.[2] Thus, an input PPI measures changes in the cost of the basket of purchases required as inputs into the production process, but these inputs must not be primary inputs like land, labor, or capital. Producer input prices should exclude deductible taxes on products (that is, value-added tax, or VAT) but include the retail or wholesale margins of the supplier, since they measure the actual cost of the good or service to the producer. In constructing a family of input PPIs, import prices are usually collected from a separate source to produce a separate import price index.

2.41 The industrial coverage of a producer price index can vary across countries. In some countries, producer price indices refer only to indices related to input and output of the industrial sector, whereas in others the producers of services are also included. For example, in many countries the aggregate PPI includes only industrial activities such as mining, manufacturing, and public utilities (gas, electric, and water supply). In others, agriculture is included along with transport and telecommunication services. Ideally, the PPI would cover all economic activities as presented in Chapter 14 on the framework for price statistics. Many countries are progressively developing service industry PPIs for incorporation within their larger PPI frameworks. These developments are discussed among interested statistical agencies at the annual Voorburg Group meetings.

[2]By convention, purchases of durable capital inputs are not treated as intermediate inputs. A durable input is one that lasts longer than the time period being used in the index. In practice, durable inputs are inputs that last longer than two or three years.

D.2 Sources of inflationary pressure and price change

2.42 Prices for the PPI can be measured at two different points: as inputs into the production process and as outputs produced by the production process. Therefore, the PPI can be split into two key groups. Input prices measure the prices of products purchased for use in the production process at purchasers' prices. Output prices measure the price of products as they are sold to the next stage in the production chain—which could be to a wholesaler, retailer, or another production enterprise—at basic prices. These are often referred to as "factory gate" prices and represent basic prices as defined in the *1993 SNA*. The essential difference between input and output PPIs is that an input PPI measures potential inflation, by indicating the price pressures that producers are facing. The producer faces many other costs such as labor and capital costs and also has to consider how much of any overall price change the market will bear, so it is unusual to see the full effect of an intermediate input price rise being transmitted directly to the output price. Output prices measure the price change that actually takes place and are therefore a more direct measure of inflation. Output prices themselves, however, can also be an input further along in the production process, and as such they represent a measure of potential inflation in further stages of production (for example at the wholesale and retail levels).

2.43 Output prices are usually directly collected, whereas detailed input prices are often a mix of directly collected and output proxies, the structure of which is determined by the aggregation required. Output proxies are often used to avoid having to collect input prices for manufacturers' purchases from other parts of manufacturing—the assumption being that there is a stable profit margin. While all output prices generally measure prices for sale to the domestic market, input prices will also include import prices for imports that are used in the manufacturing process, such as crude oil and agricultural produce.

D.3 Net versus gross indices

2.44 PPIs can be produced on two different weighting concepts—*gross*, or *net of intersectoral sales*. The concept can be more clearly explained by an example. The aggregate weight for gross sectoral output of the motor vehicles industry would include

both the sales of the parts and the sales of the finished cars, even though the value of the parts are included in the value of the finished cars. The net sectoral output of the motor vehicles industry would measure only the sales of motor vehicles to other sectors of the economy and would exclude the sales of parts.

2.45 It is desirable to produce aggregated PPIs on a net sectoral basis. When using gross sectoral indices, there is a problem with multiple counting of price change as products flow through the different production processes—this occurs where the output of one industry is used as an input into another industry within the same sector of PPI aggregation. The net sectoral approach is the measure that best reflects the impact of inflation in a sector, such as manufacturing, on the rest of the economy. Gross sectoral indices, however, also provide valuable information and are useful for deflating the total turnover of industries, which by definition is on a gross basis. To avoid this problem of multiple counting, net sectoral weights are calculated, which involves weighting the index together with sales weights that have intrasectoral sales removed. This is usually achieved through an input-output framework.

2.46 In addition to output and (intermediate) input PPIs, there is another type of PPI that can be constructed from establishment or industry output and input PPIs. This is a sectoral PPI that will act as an appropriate deflator for the *net output* or *value added* of the sector. The value added of a sector is the value of its outputs less the value of the intermediate inputs used to produce those outputs. The issues involved in constructing this type of PPI are considered in Chapter 17.

D.4 Effect of tax switching between direct and indirect taxes

2.47 Taxes on products are generally excluded from PPIs because these are usually deductible as an expense by businesses as they are paid to the government. Taxes such as excise duty on imports are sometimes included, since these are not deductible and have to be paid by the producer. This can lead to changes in the price level owing to changes in tax procedures as import duties are imposed or restricted. To remove this potential inconsistency in an index, it is possible to produce ex-tax/ex-duty indices. These have all of the tax effects removed to allow a clearer comparison of product price changes over time. This is done by weighting revenues with the tax cost removed.

D.5 Export/import prices

2.48 Export and import prices are an important extension of domestic PPIs. These are used in the deflation of external trade. Also, import prices feed into the producer input index, since these are an important contribution to producer costs. In theory, price and quantity data on exports produced and imports used by an establishment could be collected at the establishment level. In practice, this is very difficult to do, and so price and quantity data on imports into the economy and exports produced by the economy are collected by other surveys. Foreign trade price indices will be the subject of a separate manual.

D.6 PPI versus WPI

2.49 The PPI historically is an outgrowth of programs developed to measure wholesale prices. The WPI attempts to measure price changes as they occur at one stage prior to final demand—the wholesale level. The WPI would normally cover the price of products as they flow from the wholesaler to the retailer. It includes products from domestic wholesalers and factories as they are delivered to retailers. As such, the WPI differs from the PPI because it includes both domestically produced products sold in the home market (included in the PPI) and imported products (excluded from the PPI), while excluding prices of exported products. In addition, the WPI measures transactions at purchasers' prices, which include delivery charges and taxes on products such as sales taxes and VAT.

2.50 As Chapter 14 on the system of price statistics explains, the PPI concepts are much more consistent with the *1993 SNA* than are the WPI concepts. The PPI system can be used to develop price indices for all domestically produced products, both for home distribution and export. Within the PPI framework, an index for the output of the wholesaling industries would be the most comparable in coverage to the WPI. However, the differences in pricing concepts still remain. The PPI for the wholesaler would be a double-deflation price index for the gross margin between the wholesaler's revenue at basic prices and its cost of goods bought at purchasers' prices. When the gross margin can be identified on each product (selling price less pur-

chase cost), the PPI is, equivalently, a price index of product gross margins. WPI prices are, in contrast, the purchasers' prices received by the wholesaler.

E. PPI Uses

2.51 Price instability introduces uncertainty into economic analysis and decision making, so the main uses of the PPI relate to efforts to minimize this uncertainty. The PPI therefore has the following main uses:

- Short-term indicator of inflationary trends;
- National accounts deflators;
- Indexation in legal contracts in both the public and private sectors, particularly for more detailed PPI components;
- Required by international organizations such as Eurostat, the OECD, IMF, and European Central Bank (ECB) for economic monitoring and comparison;
- Current cost accounting;
- Compilation of other inflation measure such as the final expenditure price index (FEPI); and
- Analytical tool for businesses/researchers.

E.1 Short-term indicator of inflationary trends

2.52 A monthly or quarterly PPI with detailed product and industry data allows short-term price inflation to be monitored through different stages of production and is a key use of the PPI. The key users of the PPI as a short-term indicator are central banks and government finance ministries or departments. Also, many companies (including investment banks and brokerage firms) and government agencies require the data for macroeconomic forecasting. These users also need the data to build models to look at the price pressures that different sectors of the economy are facing, with the aim of helping their investment clients to achieve better stock market returns.

E.2 National accounts deflator

2.53 Although PPIs are an important economic indicator in their own right, a vital use of the PPIs is as a deflator of output or sales data for the compilation of production volumes and the deflation of capital expenditure and inventory data for use in the national accounts. As a result, the concepts underlying the PPI are often conditioned by those underlying the national accounts. This can lead to conflicts in the requirements; for example, for contract escalation, users would like weights to be fixed for a long period. However, for deflation of national accounts, current-weighted indices and fine aggregations are required, since in theory deflation is best done at the lowest level of disaggregation, possibly using Paasche price indices. (See paragraphs 16.16–16.19 of the *1993 SNA*, pages 382–83.) Only a few countries are actually able to use pure Paasche indices for this purpose. In many countries the objective of getting as close as possible to a Paasche index is achieved by using chain-linked indices. Chain linking is discussed in more detail in Chapters 9 and 15.

E.3 Indexation of contracts

2.54 Indexation of contracts is a procedure whereby long-term contracts for the provision of goods and services include an adjustment to the value of monetary amounts for the goods or services based on the increase or decrease in the level of a price index. The purpose of the indexation is to take the inflationary risk out of the contract. A PPI offers an independent measure of the change in prices of the good or service being considered. Indexation is common in long-term contracts, where even relatively small levels of inflation can have a substantial effect on the real value of the revenue flows (such as from the building of ships and aircraft).

2.55 It is important that parties to the contract understand the exact makeup of the index to ensure that it is suitable for the purpose. Also, parties should be aware of the impact of rebasing on the long-term index values. Often users expect the same product weights to apply throughout the length of the contract, even if this spans several rebasing periods.

E.4 International organizations

2.56 Members of the EU are required to provide PPI data under the Short-Term Indicators Regulation, which specifies monthly delivery and at a detailed level of aggregation. Other international organizations using PPIs include the ECB, IMF, and OECD. The PPI is a required indicator for countries subscribing to the IMF Special Data Dissemination Standard (SDDS), and it is recommended as a useful extension of inflation measurement to all mem-

ber countries participating in the IMF General Data Dissemination System (GDDS).[3]

E.5 Current cost accounting

2.57 Current cost accounting is a method of accounting for the use of assets in which the cost of using the assets in production is calculated at the current price of those assets rather than by using the historic cost (the price at which the asset was originally purchased). The price index used should not be a general price index but should be specific to the asset being used. Although current cost accounting is no longer commonly used in low-inflation countries, these data are still relevant to the needs of high-inflation countries, in which there are still users requiring indices for estimating the current value of their capital assets.

E.6 Analytical tool for business researchers

2.58 Detailed PPIs can be useful to businesses and researchers looking at specific products and markets. Companies can use PPIs to compare the growth rate of their own prices with those of the representative index for the industry or the commodity. This can be done at a very detailed level, where fine PPI aggregations are published. Researchers looking at specific markets can also gain an understanding of conditions in the market by examining PPIs. This can be done in conjunction with other economic data such as output figures to identify pressures on margins, for example. Similarly, competition and monopoly authorities can use PPIs as a tool in examining whether competitive pressures are evident or not.

F. A Family of PPIs

2.59 PPIs can be calculated in a number of different combinations. As already mentioned, PPIs can represent either input and output prices, with differing levels of aggregation. They can also be calculated as net output price indices by industry, which adjust for intraindustry use of products to avoid the effects of double-weighting both final output and intermediate usage. These net output PPIs can be used in order to deflate the nominal value added of an industry, thus constructing an index of *real value added*. PPIs can also be calculated by the stage of the production cycle to which they relate—such as raw materials, intermediate products, and products for final demand. PPIs can be calculated for the country as a whole or on a regional basis, if significant price differences occur among regions. This topic is considered in more detail in Chapter 3.

F.1 Industry aggregation

2.60 The most basic indices are output indices classified by a standard industrial classification system. A range of aggregation possibilities exists for different users. The lowest level of index form is determined by the level of sampling. In the United Kingdom, for example, the sample is based on the six-digit CPA (Classification of Products by Activity) codes, and indices are calculated at this level. The indices are then weighted up into ISIC or NACE four-digit, two-digit group, or higher-level totals. Classification systems are discussed in more detail in Chapter 3.

F.2 Macroeconomic aggregations

2.61 High-level aggregations, such as all manufacturing, are important for monitoring macroeconomic trends. To aid interpretation it is possible to produce high-level series with certain industries excluded—for example, all manufacturing excluding food, drink, tobacco, and petroleum. This enables users to analyze trends without the influence of the most volatile industries. Another possibility is to produce indices with and without excise duty. This is done by developing separate weights to reflect the lower value of ex-duty sales and by either collecting data with and without duty or estimating the duty content of prices. This enables analysts to monitor inflationary trends before government intervention and also to identify the direct effect of government intervention.

F.3 Commodity analysis

2.62 Input prices at manufacturers' purchaser prices can be aggregated and analyzed by commodity. Analysis by commodity reveals the impact of inflationary pressure from raw materials, which are often priced on international markets and are out-

[3]Required data series for the two data standards can be found in the *Guide to Data Dissemination Standards, Module 1: The Special Data Dissemination Standard* and *Module 2: The General Data Dissemination System*. A brief overview of these standards can be found on the IMF Dissemination Standards Bulletin Boar*d* (http://dsbb.imf.org/).

side the control of domestic agencies. A particularly important example is the price change of crude oil. Aggregations of commodities can also be constructed to show the total impact of commodity price change on the economy.

F.4 Stage of processing

2.63 Another method for analysis is to aggregate by stage-of-processing indices. This concept classifies goods and services according to their position in the chain of production—that is, primary products, intermediate goods, and finished goods. This method allows analysts to track price inflation through the economy—for example, changes in prices in the primary stage could feed through into the later stages, so the method gives an indicator of future inflation further down the production chain. However, each commodity is allocated to only one stage in the production chain even though it could occur in several stages. This topic is considered further in Chapter 14.

F.5 Stage of production

2.64 A further method for analysis is to aggregate by stage of production, in which each commodity is allocated to the stage in which it is used. This differs from stage of processing because a product is included in each stage to which it contributes and not assigned solely to one stage. The classification of products to the different stages is usually achieved by reference to input-output (I/O) tables in order to avoid multiple counting of the stages that are not aggregated. There is a growing interest in this type of analysis—for example, these types of indices are already compiled on a regular basis in Australia.[4] This topic is also considered in Chapter 14.

F.6 Final expenditure price index

2.65 A further variant is the FEPI. This measures prices paid by consumers, businesses, and government for final purchases of goods and services. Intermediate purchases are excluded. PPIs are used as proxies for the final prices paid for investment goods by businesses and government in the FEPI model used in the United Kingdom and Australia. This is because most PPIs reflect changes in basic prices or producers' prices (not purchasers' prices). This topic is further considered in Chapter 5.

F.7 Regional PPIs

2.66 In general, states and provinces of countries are very interested in having regional measures of domestic products and also prefer to measure changes in the real output of the state or province. For this reason, it is possible to produce regional PPIs within a country to use as deflators. Countries would generally develop regional PPIs only if they are particularly meaningful—for example, when there is regional price dispersion and regional markets for produced goods.[5] The main difficulty in many countries is that producers are unlikely to be producing just for users within their region but are likely to be selling to the whole domestic economy for which there is usually a single market. In a competitive marketplace the purchaser will look to achieve the lowest price per given quality, and so producers have to be able to sell at a competitive price regardless of location, except for products or regions with high transport and distribution costs.

2.67 Regional PPIs are produced in Thailand, for example, where certain industries and products such as food production and construction materials exhibit significant variability across regions and for which regional information is available through the regional offices of the national statistical office. In this instance the information is informative to the authorities and is done at relatively low incremental cost by regional offices with the same software package used by the national office. Indonesia also produces regional indices.

F.8 Productivity analysis

2.68 A final use for PPIs is in deflating the nominal value added of an industry into a real value added. These industry measures of real value added are then divided by labor input to the industry to form estimates of *industry labor productivity*, or are

[4]See, for example, Australian Bureau of Statistics (2001b).

[5]If a country is producing regional accounts, regional PPIs would be used for deflators assuming they are available in enough industry and product detail.

divided by an index of industry primary input usage to form estimates of *industry total factor productivity*. Productivity increases act as a primary driver of increases in the standard of living of a country, so it is of some interest to try to determine which Industries are the main drivers of productivity improvements. (See OECD [2001] for additional material on productivity.)