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A Framework for Price Statistics

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A Framework for Price Statistics¹

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Abstract

This paper describes the primary framework associating the four principal price indices in the system of economic statistics—the Producer Price Index (PPI), the Consumer Price Index (CPI), and the Export and Import Price Indices (XPI and MPI)—with the macroeconomic value aggregates they decompose into price and volume components. The paper begins by defining the basic algebra of price indices. It then discusses the definition of value aggregates and provides an overview of the goods and services components of the *System of National Accounts 1993 (1993 SNA)*. The paper establishes the relationships among the four major price series by associating them with certain of the interlocking aggregates defined in the *1993 SNA*, and concludes by briefly considering purchasing power parities and labor compensation indices.

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THE SYSTEM OF PRICE STATISTICS

Introduction

1. The four principal price indices in the system of economic statistics—the Producer Price Index (*PPI*), the Consumer Price Index (*CPI*), and the Export and Import Price Indices (*XPI* and *MPI*)—are well-known and closely watched indicators of macroeconomic performance. They are direct indicators of the purchasing power of money in various types of transactions and other flows involving goods and services. As such, they are also used as deflators in providing summary measures of the volume of goods and services produced and consumed. Consequently, these indices are important tools in the design and conduct of the monetary and fiscal policy of the government, but they are also of great utility in informing economic decisions throughout the private sector. They do not, or should not, comprise merely a collection of unrelated price indicators, but provide instead an integrated view of price developments pertaining to production, consumption, and international transactions in goods and services. By implication, the meaningfulness of all of these indices derives in no small measure from the meaningfulness of the value aggregates to which each refers.

2. Section I begins by defining and introducing the basic algebra of price indices, emphasizing the dual nature of price and volume indicators by deriving them from a value aggregate. The definition of value aggregates is then discussed and an overview provided of the goods and services components of the *System of National Accounts 1993 (1993 SNA)*, the principal international system defining and interrelating micro and macroeconomic value aggregates. In Section II the relationships among the four major price series are established by associating them with certain of the interlocking aggregates defined in the *1993 SNA*. Section III briefly considers the position of purchasing power parities and labor compensation indices in the system of economic statistics.

I. BASIC DEFINITION OF A PRICE INDEX

Price indices and value aggregates

3. A price index is a measure summarizing the changes in the prices of many good and/or service items from one situation—time period or place—to another. For practical purposes, it can be seen as a weighted mean of the relative change in prices in the two situations. To determine a price index we need to know

- What items to include in the index
- How to determine the item prices
- What transactions that involve these items to include in the index
- From what source to draw the weights used in the selected formula.
- What formula or type of mean to use to average the changes in the prices together

4. All of the above price index definition questions except the last can be answered by appealing to the definition of the value aggregate to which the price index refers. A value aggregate V for a given collection of items is computed as

$$V = \sum_{i=1}^n p_i q_i \quad (1)$$

where p represents price measured in national currency units, q represents quantity, and the subscript i identifies the various elementary items in the group to which the value aggregate V refers. Included in this definition is specification of the group of included products (Items to include) and of the economic agents engaging in transactions involving those products (Transactions to include), as well as the valuation and time of recording principles motivating the behavior of economic agents undertaking transactions in the group (Determination of prices). The included elementary items, their valuation, eligible transactions, and the item weights in the index therefore are all within the domain of definition of the value aggregate. We will return to a further consideration of these attributes of the value aggregate in section II. In the remainder of this section, we illustrate how commonly used approaches for deriving price and volume indices directly from the value aggregate produce price indices that are various types of weighted means of price relatives. This illustration introduces some algebra that will be revisited and built upon in subsequent articles in this series.

Decomposing the change in a value aggregate into price and volume components

5. The purpose of a price index is to determine what part of the relative change in a particular value aggregate from situation s to situation t —

$$\frac{V^t}{V^s} = \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^s q_i^s} \quad (2)$$

—is due to changes in the prices of the elementary items i . The simplest approach to making this determination is to consider revaluing the quantities of one period or location in terms of the prices of the other period or location. The *Laspeyres* price decomposition of V is

$$\frac{V^t}{V^s} = \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^s q_i^s} = \frac{\sum_{i=1}^n p_i^t q_i^s}{\sum_{i=1}^n p_i^s q_i^s} \times \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^t q_i^s}, \quad (3)$$

where the first factor of the expression to the right of the second “=” is the *Laspeyres* price index and the second factor is the *Pasche* volume index

$$P_L^{s,t} = \frac{\sum_{i=1}^n p_i^t q_i^s}{\sum_{i=1}^n p_i^s q_i^s}, \quad Q_P^{s,t} = \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^t q_i^s} \quad (4)$$

This decomposition is derived by dividing and multiplying the right-hand side of the value change identity (2) by the quantity

$$\sum_{i=1}^n p_i^t q_i^s \quad (5)$$

which revalues the quantities of situation s in terms of the prices of situation t .

6. The *Paasche* price decomposition is:

$$\frac{V^t}{V^s} = \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^s q_i^s} = \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^s q_i^t} \times \frac{\sum_{i=1}^n p_i^s q_i^t}{\sum_{i=1}^n p_i^s q_i^s} \quad (6)$$

where the first factor of the expression to the right of the second “=” is the *Paasche* price index and the second factor is the *Laspeyres* volume index

$$P_P^{s,t} = \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^s q_i^t}, \quad Q_L^{s,t} = \frac{\sum_{i=1}^n p_i^s q_i^t}{\sum_{i=1}^n p_i^s q_i^s} \quad (7)$$

This decomposition is derived by dividing and multiplying the right-hand side of the value change identity (2) by the quantity

$$\sum_{i=1}^n p_i^s q_i^t \quad (8)$$

which revalues the quantities of situation t in terms of the prices of situation s .

7. Finally, taking the geometric average of the alternative *Laspeyres* and *Paasche* decompositions of value change—

$$\begin{aligned}
 \frac{V^t}{V^s} &= \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^s q_i^s} = \sqrt{\frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^s q_i^s} \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^t q_i^s} \times \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^t q_i^s} \frac{\sum_{i=1}^n p_i^s q_i^s}{\sum_{i=1}^n p_i^s q_i^s}} \\
 &= \sqrt{\frac{\sum_{i=1}^n p_i^t q_i^s}{\sum_{i=1}^n p_i^s q_i^s} \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^t q_i^s} \times \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^t q_i^s} \frac{\sum_{i=1}^n p_i^s q_i^s}{\sum_{i=1}^n p_i^s q_i^s}} \\
 &= \sqrt{\frac{\sum_{i=1}^n p_i^t q_i^s}{\sum_{i=1}^n p_i^s q_i^s} \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^t q_i^s}} \times \sqrt{\frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^t q_i^s} \frac{\sum_{i=1}^n p_i^s q_i^s}{\sum_{i=1}^n p_i^s q_i^s}}
 \end{aligned} \tag{9}$$

—we can derive the *Fisher Ideal* price and quantity indices, which are the first and second factors of the expression following the fourth “=” sign above, or

$$P_F^{s,t} = \sqrt{\frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^s q_i^s} \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^t q_i^s}} = \sqrt{P_L^{s,t} P_P^{s,t}}, \quad Q_F^{s,t} = \sqrt{\frac{\sum_{i=1}^n p_i^s q_i^s}{\sum_{i=1}^n p_i^s q_i^s} \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^t q_i^s}} = \sqrt{Q_L^{s,t} Q_P^{s,t}} \tag{10}$$

8. The residual factors in the above Laspeyres (3), Paasche (6), and Fisher Ideal (10) price decompositions of value change are therefore quantity or volume indices. To recapitulate, the volume index corresponding to the Laspeyres price decomposition of value change in (3) is the Paasche quantity index, because it values quantities at the prices of period t . The volume index corresponding to the Paasche price index is the Laspeyres quantity index in (6), because it values quantities in the prices of period s . Finally, the volume index corresponding to the Fisher price index in (10) is itself a Fisher quantity index. We can also see from the above Laspeyres, Paasche, and Fisher decompositions of value change that the volume index can be obtained by dividing the price index into the index of value change. When a price index is divided into a value aggregate to obtain a quantity index, the value aggregate is said to have been *deflated* and the price index is referred to as the *deflator*.

9. To show that price indices are averages of the relative changes of the elementary items comprising them, define the *price relative between situation s and situation t for elementary item i* as

$$r_i^{s,t} \equiv \frac{p_i^t}{p_i^s} \tag{11}$$

and the *weight for elementary item i* as

$$w_i^t \equiv \frac{p_i^t q_i^t}{\sum_{i=1}^n p_i^t q_i^t} \quad (12)$$

We can then rewrite the Laspeyres price index as

$$P_L^{s,t} = \sum_{i=1}^n w_i^s r_i^{s,t} \quad (13)$$

which is a *situation s-weighted linear mean* of the price relatives r , and the Paasche price index as

$$P_P^{s,t} = \frac{1}{\sum_{i=1}^n w_i^t \left(\frac{1}{r_i^{s,t}} \right)} \quad (14)$$

which is a *situation t-weighted harmonic mean* of the price relatives r . By implication, the Fisher Ideal index is the geometric mean of a situation s -weighted linear mean and a situation t -weighted harmonic mean of price relatives between situations s and t . This demonstrates with three commonly used formulas the point made above that price indices are weighted means of measures of change in the prices of elementary items (price relatives), and further, that the weights of the price index are the elementary items' shares of the referenced value aggregate:

$$w_i \propto p_i q_i \quad (15)$$

10. Beyond this introduction to the basic algebra of price indices, there are other index formulae that can be considered in decomposing relative value change into price and volume components. We will consider the most important of these in a subsequent article in this series.

The System of National Accounts as a General Framework for a System of Price Indices

11. An important inference to take from the section on the Basic Definition of a Price Index above is that a price index is only meaningful in relation to the value aggregate to which it refers, and is thus only of interest if its referent value aggregate is of interest.² We

² Price indices may be used for various purposes as deflators and general economic indicators, but also in the calculation of escalators for the adjustment of payments in contracts and of government pensions and transfer payments. In this article, we distinguish between a price index, which is defined in this chapter as the price component of relative change in a value aggregate, and an escalator, which is considered in a subsequent article in this series as one of the uses of a price index. While an escalator may be chosen as equal to a selected price

(continued...)

now consider a core system of value aggregates for transactions in goods and services that is clearly of broad economic interest: the system of national accounts. The major price and quantity indices should, in principle, cover those value aggregates in the national accounts system representing major flows of goods and services and levels of tangible and intangible stocks.

12. The national accounts system offers a systematic and consistent framework that is essential to the design of price statistics because it (i) covers essentially all goods and services flows and accumulations of stocks for which indices should be compiled; (ii) adopts consistent classifications that ensure conceptual linkages are maintained among data; (iii) maintains the accounting identities (e.g., total resources = total uses) among these flows; and, consequently, (iv) allows an efficient use of compilation resources because certain price indices may simply be derived from others.

13. In this overview of price indices in the system of economic statistics, we will identify these major national accounts aggregates and their associated price indices. We first take a top-level view of the major national accounts aggregates. We then begin a review of the underlying construction of these aggregates by considering first the types of economic agents in the economy that are recognized in the national accounting system, and second, the economic accounts kept on them involving goods and services flows that build up to the main aggregates. As these accounts are built up from their foundations, precise relationships emerge between the well known headline price indicators—the *PPI*, *CPI*, *XPI*, and *MPI*—and the closely-watched national accounts aggregates.

The supply and use of goods and services in the aggregate

14. At the most aggregate level, the supply and use of goods and services in the national accounts is the simple textbook macroeconomic identity equating total supply with total uses. Total supply is the sum of output Y , imports M , and taxes less subsidies on products T . Total uses is the sum of intermediate consumption Z , the final consumption of households C and government G , capital formation K , and exports X :³

$$Y + M + T = Z + C + G + K + X . \quad (16)$$

15. Rearranging this identity by subtracting intermediate consumption and imports from both sides, we arrive at the familiar alternative expressions for *Gross Domestic Product (GDP)* from the production (*Value added*) and expenditure approaches:

$$(Y - Z) + T = \text{Value added} + T \equiv C + G + K + X - M = \text{Gross Domestic Product} . \quad (17)$$

index, the optimal determination of escalators can lead to more complex functions of price indices than a simple identity relationship.

³ Readers familiar with textbook macroeconomics will note a minor variation in the conventional notation for the capital formation component of expenditure on GDP. In the conventional notation, capital formation is designated as I for *Investment*. This article adopts the international standard nomenclature of the 1993 *SNA*, which uses the term *Capital formation* rather than *Investment*, and the symbol K for non-financial accumulation flows rather than I .

GDP is, of course, internationally recognized as the central national accounts aggregate for measuring national economic performance. Compiling indices for tracking the parts of relative change in *GDP* and its components that can be attributed to price and volume change is perhaps the primary objective for the development of price statistics in modern statistical systems.

Economic agents and units of analysis in the national accounts

16. In building the accounting system and the major aggregates, the *System of National Accounts 1993 (1993 SNA)* first organizes the economy of a country into the kinds of entities or agents that undertake economic activity. These agents are called *institutional units* and comprise five types of units that are resident in the economy, as well as a single nonresident category, the rest of the world. An institutional unit is said to be *resident* in an economy if its primary center of economic interest is located there.⁴ The five types of resident institutional units are non-financial corporations, financial corporations, general government, households, and non-profit institutions serving households (NPISHs). Generally speaking, the *1993 SNA* associates with institutional units the ability to hold title to productive assets, and thus they represent the smallest units on which complete balance sheets can be compiled.⁵

17. For analyzing production, the *1993 SNA* identifies a smaller unit or agent than an institutional unit, called an *establishment* or *local kind of activity unit (LKAU)*. Within an institutional unit, the establishment is the smallest unit organized for production whose costs and output can be separately identified. Generally, establishments specialize in the production of only a few types of output at a single geographical location.

18. In addition to production activity, institutional units may engage in final consumption of goods and services and in capital formation, represented by the accumulation of goods and services as productive assets. The *1993 SNA* classification of institutional units into sectors is shown in Box 1. The observant reader will notice that the *1993 SNA* institutional sectors represent the units typically covered in economic and household censuses and surveys. In subsequent articles, we will revisit this classification of economic agents in the coverage, design, planning, and collection of surveys to obtain the price and weighting data for the major price indices. The *1993 SNA*, as indicated by its name, focuses on the activities of institutional units that are resident in a nation. Provision for the Rest of the world (S.2 in Box 1) is made in order to capture the transactions of resident institutional units with nonresidents. Transactions of nonresidents with other nonresidents are out of scope for the

⁴ For example, this is determined by physical domicile for households, according to whether the household has been living within the geographic boundaries of a country for a year or more.

⁵ The *1993 SNA* classification or sectoring of institutional units does not strictly follow the legal status of institutional units, but rather their function. Hence, a government-owned non-financial enterprise producing output sold at prices substantially covering its costs and for which a balance sheet can be compiled would be classified as a *non-financial corporation*, along with non-financial legal corporations. For further details, see *1993 SNA*, Chapter IV.

national or regional accounts of a given country or region. They are considered, instead, in the accounts of the residents of other nations.

BOX 1. INSTITUTIONAL SECTORS IN THE *SYSTEM OF NATIONAL ACCOUNTS 1993*

S.1 Total economy

S.11 Non-financial corporations

Ultimate subdivisions Public, National private, and Foreign controlled

S.12 Financial corporations

Ultimate subdivisions Public, National private, and Foreign controlled

S.121 Central bank

S.122 Other depository corporations

S.1221 Deposit money corporations

S.1222 Other depository corporations, except deposit money corporations

S.123 Other financial intermediaries, except insurance corporations and pension funds

S.124 Financial auxiliaries

S.125 Insurance corporations and pension fund

S.13 General government

Alternate scheme n=1, social security funds shown as a separate branch of government S.1314

Alternate scheme n=2, social security funds included as components of central, state, and local branches, and S.1314 deleted

S.13n1 Central government

S.13n2 State government

S.13n3 Local government

S.1314 Social security funds

S.14 Households

Classified according to the largest source of income received

S.141 Employers (*Mixed income*⁶, owning an unincorporated enterprise with paid employees)

S.142 Own account workers (*Mixed income*, owning an unincorporated enterprise without paid employees)

S.143 Employees (*Compensation of employees*)⁷

S.144 Recipients of property and transfer income⁸

S.1441 Recipients of property income

S.1442 Recipients of pensions

S.1443 Recipients of other transfers

S.15 Non-profit institutions serving households (NPISHs)

S.2 Rest of the world

⁶ To understand how subsectors S.141 and S.142 of households are formed, an explanation of the term *Mixed income* is in order. This, in turn, requires consideration of the national accounts income concept of *Operating surplus*. The *Operating surplus* of an enterprise is the residual of the value of output less purchases of goods and services inputs, wages and salaries, employers' social contributions (social security and pension payments), and taxes net of subsidies payable on production that are unrelated to products. The *Mixed income* of household unincorporated enterprises is algebraically defined identically with the *Operating surplus* of other enterprises. However, for unincorporated household enterprises, the compensation of the owners or proprietors of the enterprise may not be included in the recorded compensation of employees item, and thus the difference between output and operating cost will include compensation for the owners' labor. The distinct terminology merely recognizes that the owners' wages are often inextricably *mixed* with the operating surplus for these units.

⁷ Compensation of employees comprises wages and salaries and the employer-provided benefits comprising employers' social contributions.

⁸ Property income comprises interest, dividends, and rent.

Constructing the system of supply and use flows from accounting data on institutional units

19. In equations (2.I.16) and (2.I.17), we have identified the basic aggregates comprising the total supply and uses of goods and services in the economy, and derived *GDP* in terms of these aggregates. To see how to separate the price and volume components of supply and use, it is necessary to build these basic aggregates up from the institutional sector accounts of the economy's economic agents. Important in this process is to detail the production and consumption activities of these agents as well as the types of goods and services they produce and consume. The framework within which this information is organized is called the Supply and Use Table (SUT) in the national accounts. As it is built up, we effectively also begin to accumulate data on the price (or quantity/volume) index weights w identified in the first section of this article. The basic tables of the 1993 *SNA* in which all of these aggregates are recorded at the level of institutional units are the *production*, *use of income*, *capital*, and *external goods and services* accounts. These accounts organize the information for the following top-level aggregates

- Production account: Output Y , Intermediate consumption I , and Value added $Y - Z$
- Use of income account: Household consumption C and Government consumption G
- Capital account: Capital formation K
- External goods and services account: Exports X and Imports M .

Recording transactions in goods and services

20. Before turning to further elaboration on these four goods and services accounts, it is important to specify how each entry in the value aggregates comprising them is to be recorded. The items i in the value aggregate equation (1) represent detailed goods and services flows that are classified into categories of transactions. There are two defining aspects of recording transactions: timing and valuation.

Timing of transactions covered.

21. To associate each transaction with a date, the national accounts consider a transaction to have been consummated when a change of ownership has occurred. When change of ownership occurs, a transaction is said to have *accrued*.

Valuation.

22. There are two valuation principles in the national accounts, one for suppliers and one for users. For suppliers, transactions in goods and services are to be valued at *basic prices*. The basic price is the price per unit of good or service *receivable* by the producer.⁹ As the producer does not receive taxes (if any) on products, but does receive subsidies (if any) on products, taxes on products are excluded from the basic price, while subsidies on products

⁹ We use the term *receivable* to indicate that the price refers to an *accrued* transaction for the seller, and the term *payable* to indicate a transaction that has *accrued* to the purchaser.

are included.¹⁰ The producer also does not receive invoiced transportation and insurance charges provided by other suppliers, or any distribution margins added by other, retail/wholesale service producers, and these are also excluded from the basic price. On the other hand, the user, as purchaser, pays all of these charges, and users' purchases are therefore valued at *purchasers' prices*, which add taxes net of subsidies on products and margins for included transportation, insurance, and distribution services to the basic price.

23. Accordingly, output Y and imports M in equations (16) and (17) are valued at *basic prices*, to which are added taxes less subsidies on products T to arrive at total supply.¹¹ The components of total uses are valued at *purchasers' prices*. This is straightforwardly interpreted for the final consumption of households and government. For capital formation expenditures, the notion of purchasers' prices also includes the costs of "setting up" fixed capital equipment. For exports, purchasers' prices include export taxes net of subsidies, according to the "free on board" (fob) value at the national frontier.

We now discuss each of the four major goods and services accounts in turn.

Production

24. An institutional unit engaged in production is said to be an *enterprise*. By implication, any of the five types of resident institutional units can be an enterprise. The *Production account* for enterprises in the 1993 SNA appears, with minor reordering of elements, essentially as shown in Table 1. An identical presentation also applies to the establishments/LKAUs owned by enterprises, and, in fact, an establishment can be defined operationally as the smallest unit for which a production account can be constructed. There are cases in which an establishment/LKAU is synonymous with or at least inseparable from the institutional unit that owns it. This is true of single establishment corporations and of household unincorporated enterprises, for example. In other cases, an enterprise may own multiple establishments. The production account can also be produced for various establishment and enterprise groupings, including, of course, institutional sectors, but also for establishment industry/activity groups. In the Production account and throughout the 1993

¹⁰ The 1993 SNA distinguishes between *taxes on products* and *other taxes on production*. Taxes net of subsidies on products T includes all taxes payable per unit or as a fraction of the value of goods or services transacted. Included in T are excise, sales, and the non-refundable portion of value added taxes, duties on imports, and taxes on exports. Subsidies on products include all subsidies receivable per unit or as a fraction of the value of goods or services produced, including in particular subsidies paid on imports and exports. *Other taxes on production* comprise, for example, taxes on real property and taxes on profits. *Other subsidies on production* include, for example, regular payments by the government to cover the difference between the costs and revenues of loss-making enterprises. Of total taxes and subsidies on production, only taxes and subsidies on *products* are considered in defining basic and purchasers' prices. By implication, there are no taxes payable on products included in either of the aggregates Y or M , while subsidies receivable on products are included in these aggregates.

¹¹ The alert reader will note that transportation, insurance, and distribution margins have somehow disappeared after having been introduced. Whether these services are included with the good or invoiced separately does not affect the total expenditure on goods and services by the purchaser. For the economy as a whole, these transactions cancel out, but when we consider industry/activity and product detail, they will have redistributive effects among goods and services products. This point is revisited in the discussion of the Supply and Use Table below.

TABLE 1. PRODUCTION ACCOUNT FOR AN ESTABLISHMENT,
 INSTITUTIONAL UNIT, OR INSTITUTIONAL SECTOR
1993 SNA items in bold refer to flows in goods and services

<i>Uses</i>		<i>Resources</i>	
P.2	Intermediate consumption (purchasers' prices)	P.1	Output (basic prices)
B.1	<i>Gross value-added (balances the account; that is, it is the difference between output P.1 and Intermediate consumption P.2)</i>		
			<i>Of which, memorandum items breaking down total output for classifying the market/non-market status of the producer unit:</i>
		P.11	Market output
		P.12	Output for own final use
		P.13	Other non-market output

25. *SNA*, the transaction codes beginning with 'P.' refer to entries for transactions in goods and services. The codes beginning with 'B.' refer to so-called "balancing items" which are defined residually as the difference between a resources total and the sum of itemized uses of those resources.

26. For the purpose of classifying an establishment/LKAU, output is broken down into market output (P.11), which is sold at "economically significant prices" substantially covering the cost of production, and two types of non-market output that are provided without charge or at prices so low they bear no relationship to production cost. The two types of non-market output are Output for own final use (P.12) and Other non-market output (P.13). Output for own final use includes the production of, for example, machine tools and structures (fixed capital formation items) by an establishment for the sole use of the establishment itself or other establishments in the same enterprise, the imputed rental value of certain productive assets owned by households, such as (and currently limited to) owner-occupied dwellings, and the production of certain other unincorporated household enterprises, such as agricultural products produced by a farmer for consumption by his own family or his employees. Other non-market output comprises the output of General government and Non-profit institutions serving households distributed free of charge or sold at prices that are not economically significant. For price index construction, we necessarily will be focussing on those transactions of establishment units that involve economically significant prices, and thus on market output P.11. However, the prices collected for market output items may also be used to value the Own final use portion of non-market output, P.12. Our scope of coverage for price indices thus extends to cover this component of non-market output as well.

27. A production unit's resources derive from the value of its output, and its uses of resources are the costs it incurs in carrying out production. The production account therefore uses both the basic price and purchasers' price methods of valuation, as appropriate to a production unit in its roles as a supplier and a user of products. For the *supply (resources)* of goods and services, products are valued at *basic prices*, the national currency value *receivable* by the producer for each unit of a product. They *include* subsidies, and *exclude* the taxes on products and additional charges or margins on products to pay for included retail and wholesale trade services, and for included transportation and insurance. For *uses* of goods and services, products are valued at *purchasers prices*, the national currency value *payable* by the user for each unit of a product, *including* taxes on products, trade and transport margins, and *excluding* subsidies on products.

Product detail in the Production account

28. In addition to breaking Output down into its market and non-market components, Output and Intermediate consumption can also be broken down by type of product. Classifying product types using, for example, the international standard Central Product Classification (CPC, version 1.0), the production account for each establishment could be arranged to appear as in Table 2.

TABLE 2. PRODUCTION ACCOUNT WITH PRODUCT DETAIL FOR AN ESTABLISHMENT/LKAU

1993 SNA items in bold refer to flows in goods and services

*Establishment ID: eeeeeee
Activity/Industry code (ISIC): aaaa*

*Institutional unit ID: uuuuuuu
Institutional sector code: S.nnnnn
Market status: P.1n*

<i>Uses</i>	<i>Resources</i>
<p>P.2 Intermediate consumption (purchasers' prices), of which</p> <p>CPC 0 Agriculture, forestry and fishery products</p> <p>CPC 1 Ores and mineral; electricity, gas, and water</p> <p>CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products</p> <p>CPC 3 Other transportable goods, except metal products, machinery and equipment</p> <p>CPC 4 Metal products, machinery and equipment</p> <p>CPC 5 Intangible assets; land; constructions; construction services</p> <p>CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services</p> <p>CPC 7 Financial and related services; real estate services; and rental and leasing services</p> <p>CPC 8 Business and production services</p> <p>CPC 9 Community, social and personal services</p>	<p>P.1 Output (basic prices), of which</p> <p>CPC 0 Agriculture, forestry and fishery products</p> <p>CPC 1 Ores and mineral; electricity, gas, and water</p> <p>CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products</p> <p>CPC 3 Other transportable goods, except metal products, machinery and equipment</p> <p>CPC 4 Metal products, machinery and equipment</p> <p>CPC 5 Intangible assets; land; constructions; construction services</p> <p>CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services</p> <p>CPC 7 Financial and related services; real estate services; and rental and leasing services</p> <p>CPC 8 Business and production services</p> <p>CPC 9 Community, social and personal services</p>
<p>B.1 Gross value-added</p>	<p><i>Memorandum items breaking down total output for classifying the market-non-market status of the producer:</i></p> <p>P.11 Market output</p> <p>P.12 Output for own final use</p> <p>P.13 Other non-market output</p>

Industry detail in the Production account

29. With the values of total output by product, and total market and non-market outputs in Table 2 for each establishment, we then classify the establishment by its principal activity or industry *and* market/non-market status. To reflect the information required for this classification, positions for the activity and market/non-market classification codes of the establishment are shown in the first line of Table 2.¹² The activity classification involves principally, if not exclusively, sorting establishments according to the types of product produced (CPC *cccc* or other product code, such as the CPA) for which the total Output is greatest. The major categories of the International Standard Industrial Classification of All Economic Activities, Revision 3 (ISIC) are shown in Box 2 below.

30. We can group the associated production accounts by activity and output transaction status and sum each entry of the accounts across all establishments within each industry *and* output transaction status category. Table 3 shows a model production account for an industry (*aaaa*) that is aggregated from the production accounts of establishments that are classified into that industry and according to whether they are principally market, own final use, or other non-market producers. In most cases, both the establishment and industry production accounts would show higher product detail than we have shown here, preferably at the level of the 4- or 5-digit CPC, or higher with country-specific extensions.

The output aggregate for the Producer Price Index in the Production account

31. The Producer Price Index (*PPI*) is an index of the prices of the outputs of establishments. The position of the *PPI* in the 1993 *SNA* is defined by the relationship of its output value aggregate to those defined in the national accounts. In Box 2, we consider the formation of the *PPI* value aggregate according to its industry coverage, arguing that the *PPI*'s industry coverage should be complete. In Box 3, we further consider market and non-market production within an industry group of establishments that are classified according to market status, arguing that the *PPI*'s coverage should extend both to the market output and output for own final use of all establishments in the economy. Referencing Box 3, the coverage of the *PPI* is shown under the column of Table 3 labeled P.11 Market output and P.12 Output for own final use.

¹² As indicated in Table 3, The 1993 *SNA* recommends use of the International Standard Industrial Classification (ISIC) for activities or industries, the Central Product Classification (CPC) for domestic products, and the closely related Harmonized Commodity Description and Classification System (HS) for exported and imported products. Each country may adapt the international standard to its specific circumstances. If the adaptation amounts to adding further detail, the classification is said to be *derived* from the international standard. The Nomenclature générale des Activités économiques dans les Communautés Européennes (NACE), or the General Industrial Classification of Economic Activities within the European Communities, is an industrial classification *derived* from the ISIC. If the adaptation reorganizes the way in which detailed categories are grouped compared with the international standard, but provides for a cross-classification at some level of detail, it is said to be *related*. The North American Industrial Classification System (NAICS) being implemented by Canada, Mexico, and the United States is an industrial classification *related* to the ISIC. The European Union's PRODCOM classification of industrial products is *derived* from its Classification of Products by Activity (CPA) which, in turn, is *related* to the international standard CPC through a cross-classification defined at a high level of product detail.

TABLE 3. PRODUCTION ACCOUNT WITH PRODUCT AND MARKET/NON-MARKET STATUS DETAIL FOR AN INDUSTRY/ACTIVITY

1993 SNA items in bold refer to flows in goods and services

Activity/industry code (ISIC): aaaa

Uses			Resources			
P.2 Intermediate consumption (purchasers' prices), market, of which	P.2 Intermediate consumption (purchasers' prices), own final use, of which	P.2 Intermediate consumption (purchasers' prices), other non-market, of which	P.11 Output (basic prices), market, of which	P.12 Output (basic prices), own final use, of which	P.13 Output (basic prices), other non-market, of which	
			<i>Producer Price Index output aggregate</i>			
CPC 0 Agriculture, forestry and fishery products						
CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water
CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products
CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment
CPC 4 Metal products, machinery and equipment						
CPC 5 Intangible assets; land; constructions; construction services	CPC 5 Intangible assets; land; constructions; construction services	CPC 5 Intangible assets; land; constructions; construction services	CPC 5 Intangible assets; land; constructions; construction services	CPC 5 Intangible assets; land; constructions; construction services	CPC 5 Intangible assets; land; constructions; construction services	CPC 5 Intangible assets; land; constructions; construction services
CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services
CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services
CPC 8 Business and production services						
CPC 9 Community, social and personal services						
B.1 <i>Gross value-added, market output</i>	B.1 <i>Gross value-added, output for own final consumption</i>	B.1 <i>Gross value-added, other non-market output</i>				

**BOX 2. INDUSTRY/ACTIVITY COVERAGE OF THE PRODUCER PRICE INDEX OUTPUT VALUE
AGGREGATE**

The principal economic activities of the International Standard Industrial Classification of All Economic Activities (ISIC), revision 3, are

- A Agriculture, hunting, and forestry
- B Fishing
- C Mining and quarrying
- D Manufacturing
- E Electricity, gas, and water supply
- F Construction
- G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods
- H Hotels and restaurants
- I Transport, storage, and communications
- J Financial intermediation
- K Real estate, renting, and business activities
- L Public administration and defense; compulsory social security
- M Education
- N Health and social work
- O Other community, social, and personal service activities
- P Private households with employed persons
- Q Extra-territorial organizations and bodies

These are characteristic of the activities identified in most national industrial classifications. In assembling data on the supply and use flows in the economy, a detailed industry production account such as given in Table 3 is effectively constructed for each type of activity in the economy, whose major categories are shown in the ISIC list above. (We will be saying more about the comprehensive presentation of supply and use for the total economy later in this section.) With the product output and expenditure detail in Table 3, we can show more explicitly the typical goods and services coverage of the PPI within the Output aggregate P.1 of the production account for each industry. In most countries, PPIs cover goods producing industries, such as the "mining and manufacturing" activities C-D and sometimes also agriculture A and fishing B, construction F, as well as the two "industrial" service activities electricity, gas, and water supply E and transportation and communications I. In principle, the PPI should cover the market output of all activities, and a number of countries are currently working on rounding out PPI coverage to the remaining service producing activities besides transportation and utilities.

BOX 3. CAN AND SHOULD THE PPI COVER NON-MARKET OUTPUT?

Since the industry Production account in Table 5 is constructed from establishment production accounts aggregated by industrial activity, it is possible for the output of the Market sector of an industrial activity to comprise market and non-market components. Recall that the market sector of an activity or industry comprises the market establishments classified in that activity. The non-market output in the market sector of an activity would be the Output for own final use P.12 of market establishments. There is no Other non-market output P.13 for these units, as the 1993 SNA only recognizes such production from NPISH and General Government institutional units.

Even in the case of Output for own final use, the incidence of high percentages of non-market output for the market sector of an industry is minimized by the method in which the data are compiled and classified. Recall from the definition of an establishment that the objective of identifying and classifying establishments is to distinguish the smallest units for which a production account can be constructed. Any distinct non-market unit (that is, having a production account and producing more than half its output for distribution at non-economically significant prices) in an enterprise will be classified in the non-market sector of the activity in which it is engaged. Hence, while occasions can arise when the accounts of such non-market units cannot be reliably constructed and identified separately from another market establishment in an enterprise, their share of output in the market sector of a given industrial activity can be expected to be quite small in the main.

Nevertheless, the share of non-market output in the market establishment sector may not always be negligible, and the question arises: what are the implications for the output coverage of an output price index? The short answer is that the index should be constructed (should have weights that cover) the entirety of market-valued output, whether or not it is actually sold in a market transaction. Market-valued output comprises Market output P.11 and Output for own final use P.12. By implication the PPI should cover the Market and Output for own final use sectors of an activity. That part of non-market output for which a market equivalent price cannot be credibly constructed, comprising Other non-market output P.13, is effectively out of scope for constructing an output price index and thus the PPI.

Practically speaking, PPI coverages are generally narrower than just described, and may include only the market output of market establishments. Nevertheless, conceptually, the PPI should cover all market-valued output, including the Own final use P.12 category, comprising, as noted in the text

- Output of real estate services from residential dwellings occupied by their owners
- Output of equipment, structures, and customized software produced for the use of units within the same enterprise
- Output of agricultural products for personal consumption by owners and farmworkers.

Consumption.

32. Consumption of goods and services in the *1993 SNA* is shown in the *Use of Income Account*, which appears essentially as in Table 4 for each institutional unit. Recall that the accounts pertaining to goods and services in the *1993 SNA* that can be decomposed into price and volume components, and that would thus draw our interest as price index compilers, are

designated by the codes 'P.n'. Items of final consumption are designated by P.3 with extensions. P.3 comprises Individual consumption expenditure P.31 and Collective consumption expenditure P.32.

Some special classifications regarding the definition of the expenditure aggregate of the Consumer Price Index within Individual consumption expenditure

33. In order to determine the typical expenditure coverage of the *CPI*, two categories of individual consumption expenditure P.31 are shown in Table 4 that are *not* shown in the *1993 SNA*: *Individual consumption expenditure, except consumption from production on own account and imputed consumption expenditure*, and *Other Individual consumption expenditure*. By and large, the first category comprises household "out of pocket" expenditures on goods and services. The second category of expenditure comprises imputed market expenditures undertaken by households, such as the rent foregone by homeowners on their own dwellings, and consumption from households' own production, such as the agricultural produce consumed by farm families from their own farms. We further subdivide *Other individual consumption expenditure* into *Consumption of owner occupied housing services* and *Other individual consumption expenditure except owner occupied housing services*.

Product detail in the Use of income account

34. As with the production accounts of the establishments owned by institutional units, we can consider exploding the product detail of goods and services consumption in the Use of income account according to the type of product consumed. In order to maintain the integration of the system of price and volume statistics on consumption with those we have just covered on production, products would be classified according to the same system as in the production account. We show the major categories of the CPC 1.0 within the components of Final consumption expenditure in Table 5.¹³

¹³ Although the discussion in this chapter maintains a consistent, product classification of expenditure across all goods and services accounts, alternative, functional classifications of expenditure have been developed for each institutional sector for specific purposes. The international standard versions of these classifications included in the *1993 SNA* comprise the Classification of Individual Consumption by Purpose (COICOP), the Classification of the Purposes of Non-profit Institutions Serving Households (COPNI), the Classification of the Functions of Government (COFOG), and the Classification of the Purposes of Producers (COPP). The first column of Tables 5 and 6 is often compiled from household expenditure survey data, which are collected using functional classifications such as COICOP rather than product classifications. To facilitate constructing the cross-economy framework of the *1993 SNA* considered in this chapter, there is a concordance between the CPC and the COICOP.

TABLE 4. USE OF INCOME ACCOUNT FOR INSTITUTIONAL UNITS AND SECTORS
1993 SNA items in bold refer to flows in goods and services

<i>Institutional unit ID: uuuuuuuu</i>		<i>Institutional sector code: S.nnnnn</i>
<i>Uses</i>		<i>Resources</i>
P.3	Final consumption expenditure (purchasers' prices)¹⁴	B.6 <i>Disposable income¹⁵</i>
P.31	Individual consumption expenditure <i>Of which</i> <ul style="list-style-type: none"> • <i>Individual consumption expenditure, except from production on own account, and imputed consumption expenditure, Household sector S.14 only</i> • <i>Other Individual consumption expenditure,¹⁶ of which</i> <ul style="list-style-type: none"> • <i>Consumption of owner-occupied housing services, Household sector S.14 only</i> • <i>Other individual consumption expenditure except consumption of owner occupied housing services</i> 	
P.32	Collective consumption expenditure (General government sector S.13 only)	
D.8	Adjustment for the change in the net equity of households in pension funds¹⁷	
B.8	<i>Saving (balances the account; that is, it is the difference between disposable income B.6 and the sum of expenditures P.3 and adjustment D.8)</i>	

¹⁴ By definition, corporations have no final consumption in the 1993 SNA. Thus, item P.3 and its subdivisions appear with nonzero entries only for household, government, and NPISH units.

¹⁵ The 1993 SNA derives disposable income in a sequence of accounts producing the balancing items *Value added* B.1 (production account), *Operating surplus* B.2 and *Mixed income* B.3 (generation of income account), *Balance of primary incomes* B.5 (allocation of primary income account), and *Disposable income* B.6 (secondary distribution of income account). Collapsing all of these steps, *Disposable income* B.6 is *Value added* B.1 less (net) Taxes on production and imports (payable) D.2 plus (net) Subsidies D.3 (receivable), plus (net) Property income (receivable) D.4, less (net) Taxes on income and wealth (payable) D.5, less (net) Social contributions (payable) D.61, plus (net) Social benefits (receivable) D.62, less (net) Other transfers (payable) D.7.

¹⁶ Other individual consumption expenditure includes all imputed consumption. Such consumption includes, for example, selected non-market goods from own production of households, comprising the housing services consumed by homeowners and the agricultural produce consumed from own production by farm households. It may include an imputation for the consumption of indirectly measured financial services for any of the sectors, and does include the consumption expenditure undertaken on behalf of households by NPISHs and General government, in the use of income accounts for those institutional sectors. The 1993 SNA also contains an alternative presentation, denoted by codes P.4n, wherein all individual consumption is shown in the institutional sector account for Households S.14 only, regardless of the institutional sector actually undertaking the expenditure. The differences between the two classifications disappear at the total economy level.

¹⁷ This adjustment reflects the treatment by the 1993 SNA of privately funded pensions as owned by the household beneficiaries of such plans. It maintains consistency between the income and accumulation accounts in the system. It is not relevant to price and volume measurement, and the reader is referred to the *System of National Accounts 1993*, Chapter IX, Section A.4 for further details.

TABLE 5. USE OF INCOME ACCOUNT WITH PRODUCT DETAIL FOR INSTITUTIONAL UNITS AND SECTORS

Left columns show detail of far right column; 1993 SNA items in bold refer to flows in goods and services, sector titles in italics indicate whether the column appears in the Use of income account for that sector

Institutional unit ID: uuuuuuuu

Institutional sector code: S.nnnnn

Uses

Resources

P.31 Individual consumption expenditure			P.32 Collective consumption expenditure	P.3 Final consumption expenditure (total, purchasers prices)	B.6 Disposable income
<i>P.31 Individual consumption expenditure, except consumption from production on own account and imputed consumption expenditure, Household sector S.14 only</i>	<i>P.31 Consumption of owner-occupied housing services, Household sector S.14 only</i>	<i>P.31 Other individual consumption expenditure, except for owner-occupied housing services</i>	<i>P.32 Collective consumption expenditure, General government sector S.13 only</i>		
CPC 0 Agriculture, forestry and fishery products		CPC 0 Agriculture, forestry and fishery products	CPC 0 Agriculture, forestry and fishery products	CPC 0 Agriculture, forestry and fishery products	
CPC 1 Ores and mineral; electricity, gas, and water		CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	
CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products		CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	
CPC 3 Other transportable goods, except metal products, machinery and equipment		CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	
CPC 4 Metal products, machinery and equipment		CPC 4 Metal products, machinery and equipment	CPC 4 Metal products, machinery and equipment	CPC 4 Metal products, machinery and equipment	
CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services		CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	
CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services ¹⁸	CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services	
CPC 8 Business and production services		CPC 8 Business and production services	CPC 8 Business and production services	CPC 8 Business and production services	
CPC 9 Community, social and personal services		CPC 9 Community, social and personal services	CPC 9 Community, social and personal services	CPC 9 Community, social and personal services	
				D.8 Adjustment for the change in the net equity of households in pension funds	
				B.8 Saving	

¹⁸ In addition to the real estate, rental and leasing services of homeowners the 1993 SNA treats financial services consumption expenditure as the sum of measured and imputed components. Measured expenditures comprise explicit service charges levied by financial institutions for deposit, loan, advisory services and the like, while imputed expenditures reflect the income foregone because the household does not lend (keep deposits with a financial institution) and/or borrow at a reference rate. See Chapter 14. In principle, these imputed expenditures, as well as those for other imputed consumption, are of the same market-equivalent valued type as for owner-occupied housing services and could be covered in the CPI.

The expenditure aggregate of Consumer Price Index in the Use of income account

35. The detailed use of income accounts for institutional sectors can be assembled into a consolidated framework by choosing columns from Table 5 for each sector and displaying them together as in Table 6. In this table, we can see an economy-wide presentation of Final consumption and saving. Table 6 shows that total economy individual consumption comprises the Individual consumption entries P.31 of the Household, NPISH and General government sector Use of income accounts, separately shows the final Collective consumption of government P.32, and consolidates the Disposable income B.6 of all three. The account in Table 6 has been arranged specifically to show the consumption coverage of the typical Consumer Price Index (CPI), which comprises the first and second columns. Some further discussion on the CPI expenditure aggregate is contained in Box 4.

Capital formation.

36. Capital formation comprises accumulation of fixed capital such as equipment and structures, and capitalized intangible assets such as software, change in inventories and work in progress, and acquisitions less disposals of valuables, such as works of art. These items are accounted for in the *1993 SNA Capital account*, which appears, with minor resorting, essentially as in Table 7 for each institutional unit.

37. The item B.9 *Net lending (+)/net borrowing (-)* is the balancing item of the Capital account, making the uses on the left, comprising net acquisitions of stocks of various tangible (good) and intangible (service) items, add up to the resources on the right, comprising the sources of income financing them. From our earlier discussion in the section on institutional units and establishments, it would be easy to conclude that the smallest economic unit to which the capital account can apply is the institutional unit. It was asserted earlier that only institutional units maintain balance sheets and can monitor the stock variables that are the focus of this account. However, the physical capital assets whose changes are tracked in the capital account can and should be compiled, if possible, at the establishment/LKAU level to allow production of data on capital formation by industry. Such data are particularly useful for productivity analysis. As with the other goods and services-related accounts in the *1993 SNA*, the capital account's goods and services items, designated by the codes P.5 with extensions, can be exploded by product type.¹⁹ The account can therefore be rearranged to show this goods and services detail as in Table 8, which, as for Table 7, may pertain to an institutional unit, an institutional sector aggregate, or the total economy.

External trade

38. The external account of goods and services is shown in Table 9. It contains the transactions of nonresident institutional units sector—S.2 Rest of the World—with the five types of resident units taken together. The external goods and services account is generally

¹⁹ In addition to the Central Product Classification, version 1.0 shown here, the *1993 SNA*, Annex V contains a Non-financial assets classification identifying the specific tangible, intangible, produced, and non-produced fixed assets, as well as inventory and valuables items, recognized by the *1993 SNA*

TABLE 6. USE OF INCOME ACCOUNT WITH PRODUCT DETAIL FOR THE TOTAL ECONOMY

Left columns show detail of far right column; 1993 SNA items in bold refer to flows in goods and services

Institutional unit ID: uuuuuuuu

Institutional sector code: S.nnnnn

P.31 Individual consumption expenditure, Total economy S.1 (purchasers' prices), comprising			P.32 Collective consumption expenditure, Total economy S.1 (purchasers' prices), comprising			B.6 Disposable income, Total economy S.1, with uses comprising	
P.31 Individual consumption expenditure, Household sector S.14			P.31 Individual consumption expenditure, General government S.13 and NPISH S.15 sectors			P.3 Final consumption expenditure, Total economy S.1 of which	
Consumer price index expenditure aggregate							
<i>Individual consumption expenditure, except consumption from production on own account and imputed consumption expenditure</i>	<i>Consumption of owner-occupied housing services</i>	<i>Other individual consumption expenditure, except for owner-occupied housing services</i>					
CPC 0 Agriculture, forestry and fishery products		CPC 0 Agriculture, forestry and fishery products					
CPC 1 Ores and mineral; electricity, gas, and water		CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	
CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products		CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverage and tobacco; textiles, apparel and leather products	
CPC 3 Other transportable goods, except metal products, machinery and equipment		CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	
CPC 4 Metal products, machinery and equipment		CPC 4 Metal products, machinery and equipment					
CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services		CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services	
CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services	CPC 7 Financial and related services; real estate services; and rental and leasing services	
CPC 8 Business and production services		CPC 8 Business and production services					
CPC 9 Community, social and personal services		CPC 9 Community, social and personal services					
						D.8 Adjustment for the change in the net equity of households S.14 in pension funds	
						B.8 Saving, Total economy S.1	

BOX 4. HOUSEHOLD INSTITUTIONAL UNITS AND THE COVERAGE OF THE CONSUMER PRICE INDEX

With the expenditure sub-aggregate detail shown in Table 6 for products and institutional sectors, we can show more explicitly the typical goods and services coverage of the CPI within the final consumption aggregate P.3 of the national accounts. Generally, CPIs cover the aggregate in Table 6 labeled *Individual consumption expenditure, except consumption from production on own account and imputed consumption expenditure* by household institutional units, and only that part of *Other individual consumption expenditure* given by *Consumption of owner-occupied housing services*, as shown in Table 6. Consistent with the 1993 SNA and with standard practice, consumption includes the purchase of durable consumption goods with the exception of residential housing units, which are uniquely treated on a "flow of services" basis in the goods and services accounts.²⁰ The transactions involving purchase and sale of housing units are included in the capital formation rather than in the production and consumption entries of the system.²¹

It is worth noting that the treatment of financial services in the 1993 SNA would imply an augmented treatment of financial services consumption to include imputed expenditure as well as the expenditures on explicit financial service charges. This is indicated in the footnote of the CPC 7 item in the column of Table 6 labeled *Other individual consumption expenditure, except for owner-occupied housing services*. See also Financial Services in Chapter 14. These imputed expenditures could be included in the CPI along with the implicit rent payable by homeowners. Since imputed rent and financial service consumption are both eligible for inclusion in the CPI, there seems to be little reason why consumption of households from own production should also be part of CPI coverage, since these goods and services expenditures would be valued at their market equivalent purchasers' prices.

This is not to deny that other Household expenditure aggregates may be of interest for specific purposes. For example, it has been argued that for purposes of tracking only the monetary final consumption transactions of households, the expenditure aggregate given by the first column labeled *Individual consumption expenditure, except consumption from production on own account and imputed consumption expenditure* is most appropriate. Table 6 shows, however, that such an alternative measure is still nested within the overall 1993 SNA structure. On defining price measures for this type of aggregate, see Australian Bureau of Statistics, *An Analytical Framework for Price Indexes in Australia*, Information Paper, Catalogue 6421.0, 1997. We will further consider a family of CPIs for various sub-aggregates of Individual consumption expenditure in Chapter 3.

Finally, regarding the consumption expenditure of individuals P.31 for the Total economy, there seems to be little reason in principle why the CPI should not also cover the components of expenditure in behalf of households by NPISHs and General government, in addition to the expenditures by Households in their own behalf. A family of CPIs covering all of these components of Individual consumption expenditure would fully align the coverage of this major price indicator with the national accounts and avoid the confusion users often experience in distinguishing between the Individual consumption deflator in the national accounts and the CPI.

²⁰ As we will see in a subsequent article of this series, the flow of services from residential dwellings can be alternatively estimated using "rental equivalence" and "user cost" approaches.

²¹ Conceptually, all consumer durables such as automobiles and even certain clothing articles should be treated this way, but reliable data on their rental or equivalent rental values has historically been so difficult to obtain that they are treated in the system as consumed when purchased.

TABLE 7. CAPITAL ACCOUNT
Items in bold refer to flows of goods and services

<i>Uses</i>	<i>Resources</i>
P.5 Gross capital formation, of which	B.10.1 Changes in net worth due to saving and capital transfers, of which
P.51 Gross fixed capital formation	B.8n <i>Saving, net</i>
P.511 Acquisitions less disposals of tangible fixed assets	B.8 <i>Saving (from Use of income account)</i>
P.5111 Acquisitions of new tangible fixed assets	K.1 Consumption of fixed capital (-)
P.5112 Acquisitions of existing tangible fixed assets	D.9 Capital transfers receivable (+)
P.5113 Disposals of existing tangible fixed assets	D.91 Investment grants
P.512 Acquisitions less disposals of intangible fixed assets	D.92 Other capital transfers receivable
P.5121 Acquisitions of new intangible fixed assets	D.9 Capital transfers payable (-)
P.5122 Acquisitions of existing intangible fixed assets	D.91 Capital taxes payable
P.5123 Disposals of existing intangible fixed assets	D.91 Other capital transfers payable
P.513 Additions to the value of non-produced non-financial assets	
P.5131 Major improvements to non-produced non-financial assets	
P.5132 Costs of ownership transfer on non-produced non-financial assets	
P.52 Change in inventories	
P.53 Acquisitions less disposals of valuables	
K.1 Consumption of fixed capital (-)	
K.2 Acquisitions less disposals of non-produced non-financial assets	
K.21 Acquisitions less disposals of land and other tangible non-produced assets	
K.22 Acquisitions less disposals of intangible non-produced assets	
B.9 Net lending (+)/net borrowing (-)	

TABLE 8. CAPITAL ACCOUNT WITH PRODUCT DETAIL
1993 SNA items in bold refer to flows in goods and services

Institutional unit ID: uuuuuuuu

Institutional sector code: S.nnnnn

P. 51 Gross fixed capital formation					P.52 Change in inventories²²	P.53 Acquisitions less disposals of valuables²³	B.10.1 Change in net worth due to saving and capital transfers, with uses comprising
P.511 Acquisitions less disposals of tangible fixed assets, of which²⁴	P.512 Acquisitions less disposals of intangible fixed assets, of which²⁵	P.513 Additions to the value of non-produced non-financial assets, of which²⁶					P.5 Gross capital formation
CPC 0 Agriculture, forestry and fishery products			CPC 0 Agriculture, forestry and fishery products				
			CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water	CPC 1 Ores and mineral; electricity, gas, and water
			CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products	CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products
			CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment	CPC 3 Other transportable goods, except metal products, machinery and equipment
CPC 4 Metal products, machinery and equipment			CPC 4 Metal products, machinery and equipment				
CPC 5 Intangible assets; land; constructions; construction services	CPC 5 Intangible assets; land; constructions; construction services	CPC 5 Intangible assets; land; constructions; construction services	CPC 5 Intangible assets; land; constructions; construction services	CPC 5 Intangible assets; land; constructions; construction services	CPC 5 Intangible assets; land; constructions; construction services	CPC 5 Intangible assets; land; constructions; construction services	CPC 5 Intangible assets; land; constructions; construction services
							K.1 Consumption of fixed capital
							K.2 Acquisitions less disposals of non-produced non-financial assets
							B.9 Net borrowing/net lending

²² 1993 SNA asset code AN.12 Inventories. Excludes intangible assets, land, and constructions.

²³ 1993 SNA asset code AN.13 Valuables. Excludes intangible assets, land, constructions, and construction services.

²⁴ 1993 SNA asset code AN.111 Tangible fixed assets. Excludes intangible assets, land, and construction services.

²⁵ 1993 SNA asset code AN.112 Intangible fixed assets. Excludes land, constructions, and construction services.

²⁶ 1993 SNA asset code AN.2 Non-produced assets. Excludes intangible assets, constructions, and construction services.

TABLE 9. EXTERNAL ACCOUNT OF GOODS AND SERVICES

All Resident institutional units S.1.nnnn with Nonresident institutional units S.2; 1993 SNA goods and services items shown in bold

<i>Uses</i>	<i>Resources</i>
P.6 Exports of goods and services	P.7 Imports of goods and services
P.61 Exports of goods	P.71 Imports of goods
P.62 Exports of services	P.72 Imports of services
B.11 <i>External balance of goods and services</i>	

taken from the Balance of Payments, which uses adjusted merchandise trade information from the customs services for goods P.61 and P.71, and assembles services data on P.62 and P.72 from various sources. For further details, see International Monetary Fund, *Balance of Payments Manual, Fifth Edition* (1993). As with the other accounts, the external goods and services account can be exploded to show product detail, as in Table 10.

Regarding Table 10, the *1993 SNA* states (*1993 SNA* paragraph 15.68) that imported goods should be valued at cost-insurance-freight (cif) at the level of detailed products. On the other hand, the *1993 SNA* requires that total imports of goods be valued fob at the border of the exporting country, thus excluding insurance and transportation in a single adjustment to total imports cif (*1993 SNA* paragraphs 14.36-14.41). That part of freight services on imports provided by nonresidents is included in imports of transport services, and that part of insurance services provided on imports by nonresidents is added to imports of insurance services. Transportation and insurance services provided by residents on imports are included in exports of transportation and insurance services.²⁷

The Supply and Use Table (SUT).

39. Arraying the industries side by side first for market producers, then for own account producers, and then for other non-market producers under *Resources* and *Uses*, we can derive a format for the production portion of an analytical presentation of the data called a Supply and Use Table (SUT). A SUT is shown in Figure 1. It arrays various accounts relevant to monitoring developments in production and consumption within a country according to the *supply* of goods and services (with reference to the *1993 SNA* codes labeling the regions of Figure 1)

- from resident establishments (arranged in industries) in the form of **domestic production (P.1)**,
- from the rest of the world as **imports (P.7)**,
- adjusted for **trade and transport margins²⁸** and **taxes less subsidies on products (D.21 - D.31)**,

²⁷ This rather roundabout approach to imports by product is taken because, as a practical matter, it has been often difficult to obtain insurance and freight charges on imports from customs administrative data systems at the product level of detail. See *1993 SNA*, paragraphs 14.40-14.41. Recent developments in computerized customs documentation have made the itemization of insurance and freight more straightforward, and the *1993 SNA* does also allow for the possibility of determining imports by product at their fob values, consistent with the aggregate valuation of imports. Were this the case, insurance and freight on imports could be shown as trade and transport margins analogously with such margins on domestically produced goods. Figure 1 gives an example of how import detail would be shown at fob values.

²⁸ Trade and transport margins do not appear in the standard sequence of accounts in the *1993 SNA* because these accounts are not shown with product detail. Although these margins are nonzero for individual products, they sum to zero in total, because the amount added to the domestic supply of *goods* comes from the domestic supply of distribution, insurance, and transport *services*. Margins are thus shown in Figure 1, separately for margins on domestic production and imports, because it displays product detail down the columns. In the aggregate, of course, these adjustments for trade and transport margins on domestic production and the cif/fob adjustment for imports, vanish.

TABLE 10. EXTERNAL ACCOUNT OF GOODS AND SERVICES WITH PRODUCT DETAIL
 All resident institutional units S.1 with Nonresident institutional units S.2; 1993 SNA goods and services items shown in bold

<i>Uses</i>	<i>Resources</i>
<p>P.6 Exports of goods and services <i>Export Price Index uses aggregate</i></p> <p>P.61 Exports of goods <i>At fob values</i></p> <p>CPC 0 Agriculture, forestry and fishery products CPC 1 Ores and mineral; electricity, gas, and water CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products CPC 3 Other transportable goods, except metal products, machinery and equipment CPC 4 Metal products, machinery and equipment</p> <p>P.62 Exports of services</p> <p>CPC 5 Intangible assets; land; constructions; construction services³⁰ CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services, of which</p> <ul style="list-style-type: none"> • Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services; <i>except</i> Transport services on imports and exports rendered by residents • Transport services on imports and exports rendered by residents <p>CPC 7 Financial and related services; real estate services; and rental and leasing services, of which</p> <ul style="list-style-type: none"> • Financial and related services; real estate services; and rental and leasing services; <i>except</i> Insurance services on imports rendered by residents • Insurance services on imports rendered by residents <p>CPC 8 Business and production services CPC 9 Community, social and personal services</p>	<p>P.7 Imports of goods and services <i>Import Price Index supply aggregate</i></p> <p>P.71 Imports of goods <i>At fob values, of which</i></p> <p style="text-align: center;">²⁹ <i>At cif values:</i></p> <p>CPC 0 Agriculture, forestry and fishery products CPC 1 Ores and mineral; electricity, gas, and water CPC 2 Food products, beverages and tobacco; textiles, apparel and leather products CPC 3 Other transportable goods, except metal products, machinery and equipment CPC 4 Metal products, machinery and equipment Less: <i>Adjustment to total imports of goods cif for insurance and freight provided by both residents and nonresidents for delivery to the first resident recipient.</i></p> <p>P.72 Imports of services</p> <p>CPC 5 Intangible assets; land; constructions; construction services³¹ CPC 6 Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services, of which</p> <ul style="list-style-type: none"> • Distributive trade services; lodging; food and beverage serving services; transport services; and utilities distribution services; <i>except</i> Transport services on imports rendered by nonresidents • Transport services on imports and exports rendered by nonresidents <p>CPC 7 Financial and related services; real estate services; and rental and leasing services, of which</p> <ul style="list-style-type: none"> • Financial and related services; real estate services; and rental and leasing services; <i>except</i> Insurance services on imports rendered by nonresidents • Insurance services on imports rendered by nonresidents <p>CPC 8 Business and production services CPC 9 Community, social and personal services</p>
B.11 External balance of goods and services	

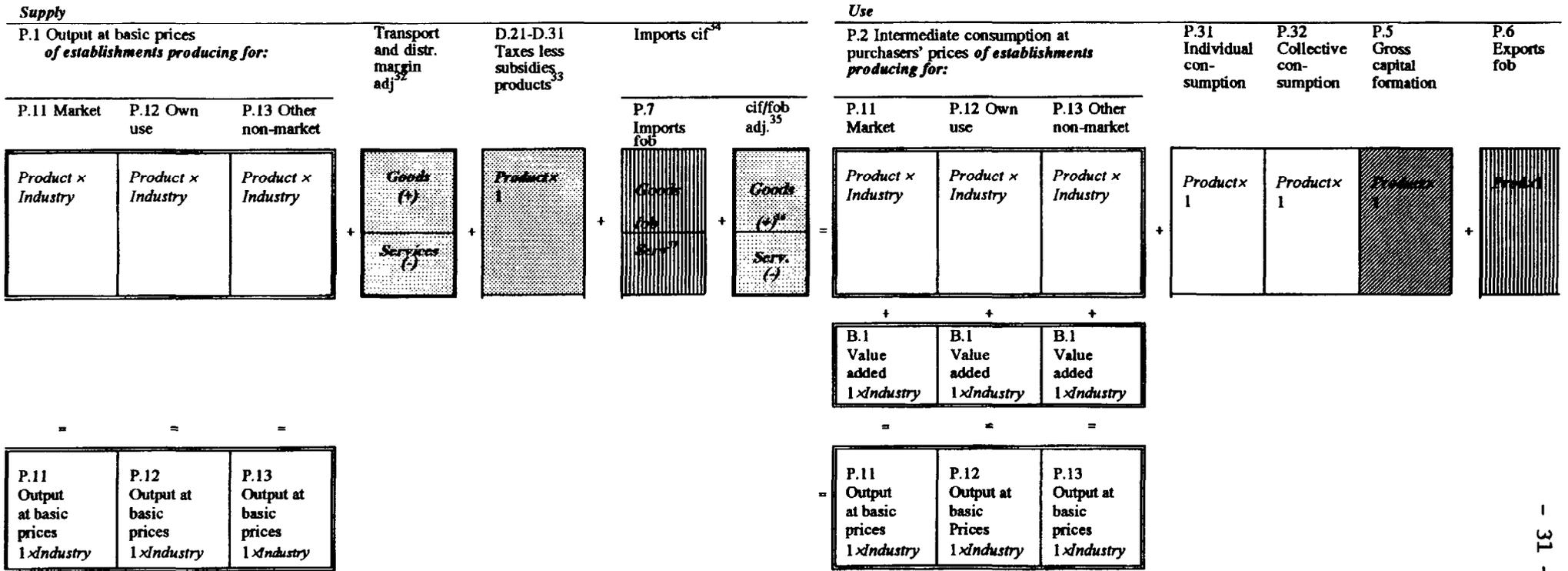
²⁹ The 1993 SNA values imports fob. However, it allows for the fact that while fob valuation by product would be consistent and preferred, compiling such data may be problematic at the product level of detail. Imports of goods cif by product may be all that is available because the insurance and freight data are often not separately compiled by product in customs systems. See 1993 SNA paragraph 15.68. Totals for these data may be obtained instead from resident and nonresident shippers in the process of compiling the Balance of Payments. Insurance and freight services provided by residents on imports are a services export.

³⁰ Construction services only.

³¹ Construction services only.

Figure 1. The Supply and Use Table (SUT)

Production account: double outlines and no fill, Use of income account: single outlines and no fill, Capital account: diagonal fill, External account of goods and services: vertical fill



and the *uses* of goods and services

- for current production by resident producers (arranged in industries) in the form of **intermediate consumption (P.2)**,
- for **final domestic consumption**, including Individual consumption by resident households, resident nonprofit institutions serving households (NPISHs), and the government (P.31), and Collective consumption by the government (P.32),
- **capital formation** by resident enterprises (P.5) (comprising fixed capital formation (P.51), inventory change (P.52), and acquisitions less disposals of valuables (P.53)), and
- for **export (P.6)** and use by the rest of the world.

40. The SUT is designed to highlight the relationship between production and consumption, not between institutional units *per se*. For example, households may undertake production in unincorporated enterprises whose activity appears in the production for own final use part of the SUT, but also consume goods and services, as represented in Individual consumption. The current production transactions of the establishments of all institutional units are grouped together and summarized in one part of the SUT, and the remaining transactions are summarized and organized in another part. The SUT deals principally with flows of transactions in goods and services. Associated with these monetary flows are price and volume components. It is of central interest in monitoring the economy with national accounts statistics to be able to assess movements in the price and volume components of the monetary flows in the SUT. Movements in the price components are of interest as well in assessing changes in the purchasing power of incomes, as well as in influencing the rate of general price change through monetary policy. Finally and not least, price movements in the various national accounts aggregates are used in private sector decision-making and in the escalation of contracts. Movements in the price components of national accounts aggregates are, as discussed at the beginning of this section, measured with price indices.

II. THE MAJOR GOODS AND SERVICES PRICE STATISTICS AND THE NATIONAL ACCOUNTS

The Major Price Series

41. It is instructive at this point to associate with the component aggregates and matrices of the SUT the four major, headline price indices that are compiled by most countries. In so doing, we form a more precise impression of the central purpose of the major price indices in the overall economic statistical system represented by the 1993 SNA. The four main price indices and their associated national accounts aggregates and matrices in the SUT are:

- Output of resident producers (P.1): **Producer Price Index (PPI)**

- Individual consumption expenditure on goods and services (P.31), except consumption from own production, but including the imputed rent of owner-occupied dwellings, of the Household sector S.13 only: **Consumer Price Index (CPI)**
- Exports (P.6): **Export Price Index (XPI)**
- Imports (P.7): **Import Price Index (MPI)**

42. The location and coverage of these major price indicators as they directly apply to goods and services value aggregates in the national accounts is diagrammed in Figure 2. Recall from section I of this chapter that we characterized a price index as a function of price relatives and weights, noting that, other than the formula for the index itself, the requisite features of the relatives and weights would be determined by the value aggregate. These factors were

- What items to include in the index
- How to determine the item prices
- What transactions that involve these items to include in the index
- From what source to draw the weights used in the selected index formula.

Based on our survey of the goods and services accounts of the 1993 SNA culminating in the SUT, these particulars for each of the four major indices can be summarized as in Table 11.

Other Goods and Services Price Indicators in the National Accounts

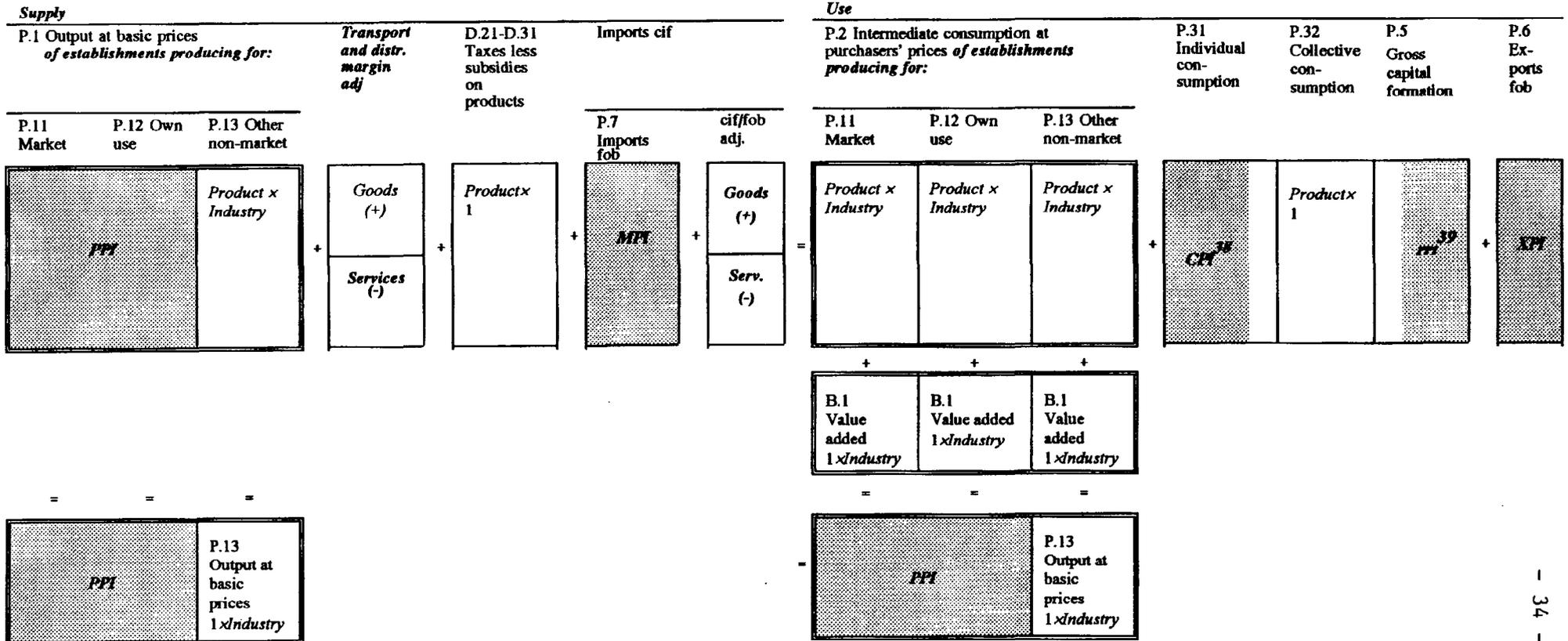
Price indices for Total supply

43. Consistent with our earlier discussion of the coverage of the *PPI*, we define Total Market-Valued Output as the sum of Market output P.11 and Output for own final use P.12. Total output P.1 is the sum of market-valued output and Other non-market output P.13. Total supply at basic prices is the sum of output and imports P.7. Mark-up adjustments at the product level for Trade and transport margins on domestic production, Insurance and freight on imports, and Taxes D.21 less Subsidies D.31 on products would be added to Total supply at basic prices to produce Total supply at purchasers' prices.

44. In decomposing total supply into price and volume components, the total Supply Price Index (*SPI*) at basic prices can be seen to be a weighted mean of the total output price index *YPI* and the import price index *MPI*. The *YPI* comprises in turn the *PPI* and an implicit deflator index (*IDI*) for Other non-market output. To obtain the deflator for Total supply at

Figure 2. The Location and Coverage of the Major Price Indices in the Supply and Use Table

The effective coverage of the major indices is shown by areas with gray fill



³⁸ Covering the Individual consumption expenditure P.31 of the Household sector S.13 only and excluding consumption of goods produced by households for own final use, with the exception of imputed rental of dwellings of owner occupants.

³⁹ Covering the finished goods component of Change in inventories (P.52).

TABLE 11. DEFINITION OF SCOPE, PRICE RELATIVES, COVERAGE, AND WEIGHTS FOR MAJOR PRICE INDICES

Index	Items to include	Price determination for relatives r in equations (2.I.13-15)	Transactions coverage	Sources of weights w in equations (2.I.13-15)
<i>PPI</i>	All types of domestically produced or processed goods and services that are valued at market prices	Basic prices, determined for goods as the date when available for sale (available for change of ownership) or service price when service rendered	Output of resident enterprises, comprising sales plus change in finished goods inventories for goods, and sales for services	The product by industry matrices of Market output P.11 and Output for own final use P.12 in the expanded Industry production account and the SUT
<i>CPI</i>	All types of goods and services purchased by households for individual consumption	Purchasers' prices, determined for goods and services on the date when used, including taxes on products, excluding subsidies on products, and including transportation and distribution margins	Consumption expenditures of the Households sector S.13 of institutional units, excluding consumption from own production except for imputed expenditures for rental of owner occupied dwellings	The product column of the CPI consumption sub aggregate of Individual consumption P.31 of the Household sector S.13 in the expanded Use of Income account and in the SUT
<i>XPI</i>	All types of transportable goods and services purchased by nonresidents from residents. Goods exported without change of ownership for significant processing by nonresidents and subsequent re-import are included.	Purchasers prices at the national frontier of the exporting country (fob), including export taxes and excluding export subsidies, and including transport and distribution margins from the production location to the national frontier.	All transportable goods and services produced or processed by residents and purchased by nonresidents except goods in transit or goods exported and minimally processed by nonresidents for re-import	The product column of Exports P.6 in the expanded External account of goods and services and the SUT
<i>MPI</i>	All types of transportable goods and services purchased by residents from nonresidents. Goods imported without change of ownership for significant processing by residents and subsequent re-export are included.	Basic prices at the national frontier of the exporting country (fob), excluding import taxes and including import subsidies, and excluding transport and distribution margins from the production location to the national frontier.	All transportable goods and services produced or processed by non-residents and purchased by residents except goods in transit or goods imported and minimally processed by residents for re-export	The product column of Imports P.7 in the expanded External account of goods and services and the SUT

purchasers' prices, the *SPI* would be multiplied by an index of the total mark-up for trade, insurance, and transport margins,⁴⁰ and taxes net of subsidies on products.

Total supply price indices at product levels of detail are useful in compiling and reconciling discrepancies in supply and use tables expressed in volume terms. In addition, they are employed in producing industry price indices for intermediate consumption P.2, which are useful for compiling GDP volume measures from the production approach. Although principally used as a compilation aid and in deflation of Value added at basic prices via the double deflation approach (see *Price Indices for Intermediate Consumption* below), supply price indices could also serve as analytical indicators in their own right because of their coverage of all goods and services transactions in the economy relating to production and external trade. As such they may be useful as indicators for economic policy analysis and evaluation requiring broad transaction coverage, in monetary policy formulation, for example.

Price indices for Intermediate consumption

45. In considering total economy and industry Intermediate consumption Price Indices (*IPIs*), the weights correspond to a column-wise reading of the intermediate consumption part of the SUT's use matrix, which is derived from Table 2 and shown in Figures 1 and 2 as the region labeled P.2. Because the various margins on basic prices inherent in prevailing purchasers' prices may vary from using industry to using industry, the ideal sources for purchasers' prices for intermediate consumption price indices would be enterprise surveys. Unfortunately, such surveys are generally burdensome and expensive. Instead, as noted in the discussion above on price indices for total supply, the price index of intermediate consumption by industry can be derived from detailed product components of the *SPI*, which will result in indices of acceptable accuracy if the variation in the total tax, subsidy, transport, and distribution margin is not too great from industry to industry within product class. For the total economy, the price index of intermediate consumption is obtained as a weighted average of industries' intermediate input price indices, where the weights are the share of each industry's intermediate consumption in the total intermediate consumption in the economy.

Price indices for final use

46. The price indices for final use comprise deflators for Individual consumption P.31, Collective Consumption P.32, Gross fixed capital formation P.51, Change in inventories P.52, Acquisitions less disposals of valuables P.53, and Exports P.6. Of the major price indices discussed above, the *CPI* is the principal source of detailed (product level) information for P.31, the *PPI* is a significant source of detailed information for P.51 and the principal source for the finished goods component of P.52. The *SPI* may be the principal source for the input inventories component of P.52 in the absence of a detailed intermediate

⁴⁰ These margins only matter when developing supply price indices at purchasers prices for individual products and product sub-aggregates. For all products they cancel out, leaving only taxes less subsidies on products contributing to the total markup on total supply at basic prices.

inputs purchase price survey, and the *XPI* is the deflator for P.6. The *SPI* can serve, as well, as a source of detailed product information for P.32, P.51, and P.53. We will designate the deflator for Total Final Uses as the Final Uses Price Index or the *FPI*. It would be computed as a weighted mean (formula to be determined) of the component indices just discussed.

GDP deflator

47. As noted above in the discussion of the *SPI* and the *Intermediate Consumption Price Index*, the *GDP* deflator can be compiled in two ways, corresponding to the two goods and services methods of compiling *GDP*: the production approach and the expenditure approach. Recall that the production approach derives from the definition of value added implicit in equation (2.I.16), as the difference between output P.1 (at basic prices) and intermediate consumption P.2 (at purchasers' prices). The 1993 *SNA* recommends the use of double deflation for value added, by which output at basic prices *Y* is deflated by the all items *YPI* to obtain output volume, and intermediate purchases are deflated by an intermediate purchases price index to obtain intermediate input volume. Real value added is then computed as the difference between output volume and intermediate input volume.⁴¹ This operation is equivalent to deflating value added in current prices with a double deflation-type price index having a positive weight on the *YPI* and a negative weight on the *IPI*.⁴² The total value added at current basic prices divided by real value added obtained via double deflation yields the implicit deflator for value added at basic prices. Finally, the *GDP* deflator at purchasers' prices is the Value added deflator at basic prices multiplied by the index of the markup on value added of taxes less subsidies on products.

48. Alternatively, the final expenditure deflator *FPI* may be combined with the *MPI* using a double deflation-type approach. *GDP* volume is calculated from expenditure data by deflating imports P.7 by the *MPI*, and subtracting it from the volume of final uses, calculated by deflating final uses by the *FPI*. The implicit *GDP* deflator would be the ratio of *GDP* at current prices with *GDP* volume so calculated. The aggregate index of *GDP* volume and the aggregate index of real value added should agree with one another, as should, by implication, the implicit *GDP* deflator calculated from the two approaches.

A framework for price statistics

To summarize this section's overview of the main price indicators and the national accounts, Table 12 shows in tabular form the price indices needed for the value aggregates in the

⁴¹ See 1993 *SNA*, Chapter XVI.

⁴² In the usual case just described we have the value added deflator as a Paasche index (2.I.15) of the output price index $YPI^{s,t}$ and the intermediate input price index $IPI^{s,t}$, where the weight on the $IPI^{s,t}$ is

$$w'_i = \frac{-P.2^t}{P.1^t - P.2^t}$$

and the weight on the $YPI^{s,t}$ is $1 - w'_i$. As noted in equation (2.I.7), the corresponding volume index has the Laspeyres or "constant price" form, which is equivalent to the double deflation real value added volume measure described in the text divided by current price value added in period *s*.

TABLE 12. A FRAMEWORK FOR PRICE STATISTICS

1993 SNA aggregate	1993 SNA transaction codes	Valuation and needed detail	1993 SNA source account	Price Index ⁴³	Derivation from other price indices
<i>Supply</i>					
Market-valued output	P.11+P.12	Basic prices, product by industry	Production account with industry and product detail, Total economy S.1	Producer Price Index (PPI)	
Other non-market output ⁴⁴	P.13	Basic prices (Cost of production), product by industry	Production account with industry and product detail, Total economy S.1	<i>Implicit deflator for Other non-market output (IDI)</i>	Derived from volume indicator
Total output	P.1=P.11+P.12+P.13	Basic prices, by product	Production account with industry and product detail, Total economy S.1	<i>Output Price Index (YPI)</i>	$YPI = f(PPI, IDI; w_m), w_m = \frac{P.13}{P.1}$
Imports	P.7	Basic prices (goods fob frontier of exporting country, and under transportation and insurance services, including the freight and insurance on imports provided by nonresidents), by product	External transactions in goods and services account with product detail, Total economy S.1	Import Price Index (MPI)	
Total supply, basic prices	P.1+P.7	Basic prices, by product	Supply and Use Table, Total economy S.1	<i>Supply Price Index (SPI)</i>	$SPI = f(MPI, YPI; w_y), w_y = \frac{P.1}{P.1+P.7}$
Domestic trade, insurance, and transport margin adjustment		Basic prices, for services provided for transportation and distribution within national frontiers, by product	Supply and Use Table, Total economy S.1	<i>Supply Markup Index (SMI)</i>	$SMI = \frac{P.1+P.7+D.21-D.31}{P.1+P.7}$ (in the aggregate) Product level total output markup indices would also include trade and transport margins in the numerator of the above expression.
Freight and insurance on imports adjustment		Basic prices (for services provided from exporter frontier to domestic frontier, regardless of residency of provider), by product	Supply and Use Table, Total economy S.1		
Taxes less subsidies on products	D.21-D.31	Payable, by product	Allocation of primary income account, General government sector S.13		
Total supply, purchasers' prices	P.11+P.12+P.7+D.21-D.31	Purchasers' prices			$SPI \times SMI$

⁴³ The four major price indices are shown in bold.

⁴⁴ This category comprises public services output provided free of charge or at economically insignificant prices by general government and NPISHs. This output is valued at cost because it has no market comparator. A price index cannot be directly constructed for this aggregate because there are no economically significant prices for Other non-market output. The implicit deflator for Other non-market output P.13 is derived by dividing a directly-compiled volume indicator into the value of other non-market output.

TABLE 12. A FRAMEWORK FOR PRICE STATISTICS

CONTINUED

1993 SNA aggregate	1993 SNA transaction codes	Valuation and needed detail	1993 SNA source account	Price Index ⁴⁵	Derivation from other price indices
<i>Uses</i>					
Intermediate consumption	P.2	Purchasers' prices, products by industries	Production account with product and industry detail, Total economy S.1	Intermediate Consumption Price Index (IPI)	Usually incorporates product level information from the Total supply price index at purchasers' prices.
Individual consumption	P.31	Purchasers' prices, by product	Use of income account with product detail, Total economy S.1	Household Consumption Price Index (HPI)	Incorporates the CPI, and may incorporate product level information from the CPI and PPI regarding goods and services produced from own consumption and provided to individuals by NPISHs and General Government.
Household sector S.14	P.31, except imputed consumption and consumption from production for own final use, but including imputed rent of homeowners	Purchasers' prices, by product	Use of income account with product detail, Household sector S.14, with special sub-classification of P.31	Consumer Price Index (CPI) and other subindices as needed	
Collective consumption	P.32	Purchasers' prices, by product	Use of income account with product detail, General government sector S.13	Government Price Index (GPI)	May incorporate product indices from the CPI and PPI.
Gross fixed capital formation	P.51	Purchasers' prices, by product	Capital account with product detail, Total economy S.1	Fixed Capital Formation Price Index (KPI)	May incorporate product indices from the PPI.
Change in inventories	P.52	Purchasers' prices, by product	Capital account with product detail, Total economy S.1	Inventory Price Index (NPI)	Price index of inventory stocks
Acquisitions less disposals of valuables	P.53	Purchasers' prices, by product	Capital account with product detail, Total economy S.1	Valuables Price Index (VPI)	Price index of valuables stocks
Exports	P.6	Purchasers' prices (fob domestic frontier), by product	External transactions in goods and services account with product detail, Total economy S.1	Export Price Index (XPI)	
Total final uses	P.3+P.5+P.6	Purchasers' prices, by product	Supply and Use Table, Total economy S.1	Total Uses Price Index (FPI)	$FPI = f(HPI, GPI, KPI, NPI, VPI, XPI, \bar{w})$ where $\bar{w} = [w_G, w_K, w_N, w_V, w_X]^{46}$ and $w_G = \frac{P.32}{P.3 + P.4 + P.5 + P.6}$ $w_K = \frac{P.51}{P.3 + P.4 + P.5 + P.6}$ $w_N = \frac{P.52}{P.3 + P.4 + P.5 + P.6}$ $w_V = \frac{P.53}{P.3 + P.4 + P.5 + P.6}$ $w_X = \frac{P.6}{P.3 + P.4 + P.5 + P.6}$

⁴⁵ The four major price indices are shown in bold.

TABLE 12. A FRAMEWORK FOR PRICE STATISTICS
CONTINUED

1993 SNA aggregate	1993 SNA transaction codes	Valuation and needed detail	1993 SNA source account	Price Index	Derivation from other price indices
<i>Gross Domestic Product</i>					
<i>Gross Domestic Product</i>	GDP = P.3+P.5+P.6-P.7, or GDP = P.1 -P.2+D.21- D.31	By product when assembled from final consumption net of imports; by industry when assembled from value added at basic prices, plus a total adjustment for taxes net of subsidies on products	Supply and Use Table, Total economy S.1	<i>GDP deflator</i>	$GDP\ deflator = f(FPI, MPI, w_M)$ $= SMI^* \times f(SPI, IPI; w_I)$ <p>where</p> $w_M = \frac{-P.7}{GDP}$ $w_I = \frac{-P.2}{GDP}^{47}$ $SMI^* = \frac{P.1 - P.2 + D.21 - D.31}{P.1 - P.2} \text{ (in the aggregate)}$ <p>Industry level value added markup indices SMI^* would include the total trade and transport margins on output in the numerator.</p>

⁴⁶ Unlike our other aggregations of indices that involve the combination of two component indices, we show the *FPI* as a simultaneous aggregation of six price indices for the components of final uses. Again, f can be any of the indices introduced in this chapter and given by (2.I.13), (2.I.15), or (2.I.10), with the weight of the first item, here of Individual consumption P.31, determined as one minus the rest of the weights, and the price relatives given by the list of index arguments.

⁴⁷ The negative weights of the second index arguments of both of these formulae for GDP is an indication that they represent a "double deflation-type" price index. See 1993 SNA, Chapter XVI, Section E.

national accounts and their relation to the four main price indicators. Indices that are functions of two other indices are shown with the notation

$$f(I_1, I_2; w)$$

where f is an index formula, I_1 and I_2 are price indices, w is the weight of the second index, with the weight of the first argument in f understood to be $1 - w$. For example, if f is the Laspeyres formula (13), then the output price index YPI would be calculated by making the following substitutions: $P_L^{s,t} = YPI^{s,t}$, $r_1^{s,t} = PPI^{s,t}$, $w_1^s = 1 - w_D^s$, $r_2^{s,t} = IDI^{s,t}$, $w_2^s = w_D^s$. f could also be chosen as a Paasche formula (2.I.14) (with the same substitutions except for change in the time superscript on the weights $w_1^t = 1 - w_D^t$ and $w_2^t = w_D^t$), Fisher Ideal formula (10), or other index formula. Further discussion of index formulae will be taken up in a subsequent article.

III. INTERNATIONAL COMPARISONS OF EXPENDITURE ON GOODS AND SERVICES AND LABOR SERVICES PRICE INDICES

Purchasing Power Parities

49. The main price statistics discussed thus far trace price developments of goods and services through time. Purchasing power parities (*PPPs*) compare price levels between geographical areas for a given accounting period. As presently conceived, *PPPs* are designed to eliminate the effect of prices in different currency units when comparing the levels of *GDP* between two countries or areas. The price relatives in bilateral *PPPs* comprise the ratios of the local currency prices, converted to a numeraire currency, of identical goods and services between the two countries or areas. The weights are proportional to the shares of these items in expenditure on *GDP*, expressed in a numeraire currency, between the two countries or areas. The sources of price relatives are the same as those for the final uses *GDP* deflator, and the weights are simply the total final uses, net of imports fob, by product. The *PPP* between area A and area B should be the reciprocal of the *PPP* between B and A. To ensure this symmetry, bilateral *PPPs* are computed using symmetric index numbers such as the Fisher Ideal that was discussed in Section I of this article.⁴⁸

50. A matrix of bilateral *PPPs* provides a means of making not only direct bilateral comparisons, but also bilateral comparisons between any two areas as the product of a sequence of bilateral *PPPs* through any set of intervening areas, beginning with the first area and ending with the second. In order to ensure the consistency of such comparisons, for example, that a chain beginning with a given area and ending with the same area produces a *PPP* of unity, bilateral *PPPs* are adjusted to produce a transitive set of comparisons. The

⁴⁸ Note that in the international comparisons case the superscripts s and t of the price and volume decompositions in section I of this chapter refer to two countries rather than two time periods.

principal methodology for enforcing this transitivity property was developed independently by Elteto, Köves, and Szulc, and is referred to as the EKS method.

51. A time series of *PPP* statistics traces a series of *GDP* price levels converted to the numeraire currency. The resulting numeraire currency *GDP* deflators should be consistent with the *GDP* deflator in local currency multiplied by an exchange rate index between the numeraire and local currencies.

Wage and Compensation Indices

The 1993 *SNA* provides for the income components comprising value added in the Generation of Income Account, shown in Table 13. The largest of the income components itemized in this account is Compensation of employees D.1, comprising Wages and salaries D.11 and Employers' social contributions D.12. Account D.1 represents a value aggregate for a flow of labor services and is thus susceptible to decomposition into price and volume components. Table 14 shows the same account exploded by type of labor service (occupation) for an establishment or industry. The price index of labor services or Employment Cost Index (*ECI*) measures developments in total compensation by occupation within industry. The price of labor services in total compensation terms is of particular interest when compared with the *GDP* deflator, which indicates the relative purchasing power of labor compensation in terms of production for final consumption. This comparison is useful in assessing cost-push pressures on output prices and as an input into compiling measures of the productivity of labor. A second useful comparison is between the wages and salaries subindex of the *ECI*⁴⁹ with the *CPI*. The ratio of the *ECI* with the *CPI* indicates the purchasing power of wages in terms of consumption goods and services, and tracks the material welfare particularly of the Employees subsector S.143 of the Household institutional subsector S.14, (see Box 1).

⁴⁹ In the *ECI*, the price of labor services comprises all of the components of Compensation of employees, including Employers' social contributions (benefits) as well as Wages and salaries. The Wages and salaries subindex of the *ECI* would be another example of a price index adjusted by a markup index. Analogously with the price index for Total supply at purchasers' prices in Table 12, the *ECI* would be adjusted in this case by a "markdown index" taking off Employers' social contributions.

TABLE 13. GENERATION OF INCOME ACCOUNT FOR ESTABLISHMENT, INSTITUTIONAL UNIT,
OR INSTITUTIONAL SECTOR
1993 SNA goods and services items shown in bold

<i>Uses</i>	<i>Resources</i>
D.1 Compensation of employees	B.1 <i>Value added</i> ⁵⁰
D.11 Wages and salaries	
D.12 Employers' social contributions	
D.121 Employers' actual social contributions	
D.122 Employers' imputed social contributions	
D.2 Taxes on production and imports	
D.29 Other taxes on production ⁵¹	
D.3 Subsidies	
D.39 Other subsidies on production (-) ⁵²	
B.2 <i>Operating surplus</i> ⁵³	

⁵⁰ From the Production account.

⁵¹ Taxes on production unrelated to products.

⁵² Subsidies on production unrelated to products.

⁵³ Balancing item of the Generation of income account.

TABLE 14. GENERATION OF INCOME ACCOUNT FOR ESTABLISHMENT AND INDUSTRY WITH LABOR SERVICES (OCCUPATIONAL⁵⁴) DETAIL
 1993 SNA goods and services items shown in bold

<i>Establishment ID: eeeeeee</i>		<i>Activity/Industry code (ISIC): aaaa</i> <i>Market status: P.1n</i>		<i>Institutional unit ID: uuuuuuu</i> <i>Institutional sector code: S.nnnnn</i>	
<i>Uses</i>				<i>Resources</i>	
D.11	Wages and salaries	D.12	Employers' social contributions	D.1	Compensation of employees
1: Legislators, senior officials and managers		1: Legislators, senior officials and managers		1: Legislators, senior officials and managers	
2: Professionals		2: Professionals		2: Professionals	
3: Technicians and associate professionals		3: Technicians and associate professionals		3: Technicians and associate professionals	
4: Clerks		4: Clerks		4: Clerks	
5: Service workers and shop and market sales workers		5: Service workers and shop and market sales workers		5: Service workers and shop and market sales workers	
6: Skilled agricultural and fishery workers		6: Skilled agricultural and fishery workers		6: Skilled agricultural and fishery workers	
7: Craft and related trades workers		7: Craft and related trades workers		7: Craft and related trades workers	
8: Plant and machine operators and assemblers		8: Plant and machine operators and assemblers		8: Plant and machine operators and assemblers	
9: Elementary occupations		9: Elementary occupations		9: Elementary occupations	
0: Armed forces		0: Armed forces		0: Armed forces	
				D.2	Taxes on production and imports
				D.29	Other taxes on production
				D.3	Subsidies (-)
				D.39	Other subsidies on production
				B.2	Operating surplus⁵⁶
					B.1 Value added⁵⁵

⁵⁴ Shown are Major groups of the International Standard Classification of Occupations 1988 (ISCO-88), ILO.

⁵⁵ From the Production account.

⁵⁶ Balancing item of the Generation of income account.

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