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THE GATHERING AND COMPILATION OF STATISTICS OF PRICES

(Report by the Secretary-General)

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

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I. INTRODUCTION

1. This paper furnishes the basis for the preliminary consideration by the Statistical Commission of revisions and extensions in the guiding principles concerning the collection and compilation of statistics of producer (wholesale) prices that were adopted at the seventh session in 1953. At the eleventh session, the Commission decided to undertake this task after discussing the paper, Problems and Methods in the Gathering of Representative and Comparable Wholesale Price Series (E/CN.3/264). The Commission came to this conclusion in view of the changes that had taken place in the purposes, character and content of national systems of wholesale price statistics since recommendations on this subject were adopted.

2. Countries were devoting increasing attention to the requirements for statistics of prices which were correlative with statistics of output and fitted into systems of national accounts. Similar price data were also needed in order to evaluate the terms of trade (i.e., cost-price relations) and the related circumstances of producers, to identify sources of inflationary and deflationary pressures, and to measure the economic well-being of consumers. In the light of the shifts in the emphasis given to the various uses of price statistics, a growing number of countries were replacing or supplementing the more traditional commodity price indexes by sector or similar price indexes.

3. Countries were enlarging the field of transactions covered in their price statistics in order to satisfy the requirements for these data. Transactions in finished goods were being included in the field of coverage to an increasing extent; and efforts were being made to add price series on highly fabricated capital and similar goods. Prices on the output of industries other than those producing intermediate goods were being given a more important part in national systems of price statistics. Special series of price quotations on exports and imports were also the subject of increasing attention; and some efforts were being made to add prices of the inputs of materials into the various industries to the system.

4. The extensions in the field of transactions dealt with in price statistics, as well as the greater attention that was being given to integrating the data with other economic statistics, aggravated certain difficulties encountered in

gathering and compiling these statistics; and required improvements and innovations in the methods and techniques employed in this work. The greater number of, and more diverse, transactions to be covered in the price series demanded more rigorous ways of selecting the representative transactions to be priced. The collection of comparable series of prices involved more precise and detailed specification of the quotations in the case of finished goods than in the case of raw materials or semi-finished goods. The frequency with which changes in the character and quality of the goods in the market had to be dealt with, as well as the difficulties of resolving these problems, were also greater in the case of the more highly fabricated commodities. The pricing of unique goods raised additional and more complex problems; and led to the development of new techniques of gathering and compiling representative and comparable series of prices.

5. In order to furnish the background for discussing the topics mentioned above, the requirements for statistics of prices are first outlined. Dealt with in the next three sections of the paper are the scope of statistics of prices; the character, classifications of weighting of these statistics; and the formulae, and base periods for index numbers and other aggregate of prices. Considered in the last four sections are the techniques of selecting representative transactions for pricing; ways of specifying price quotations and detecting changes taking place in the characteristics of these transactions; methods of adjusting price series to a comparable basis where changes have occurred in the transactions representative of the market; the pricing of the capital and other unique goods; and the treatment of discontinuities in priced transactions.

6. In each instance, the topic is discussed in the light of recent developments in national practice and experience and national experimentation and plans for further work. The discussion of each of the topics includes suggestions, where appropriate, on the direction in which the Commission might wish to consider revising and extending the relevant portions of the recommendations on statistics of producer prices that were made at the seventh session.

II. REQUIREMENTS FOR STATISTICS OF PRICES

7. The requirements for statistics of prices stem from a number of diverse, though related, uses of the data. These uses might be grouped into four categories.

(i) Assessing, analysing and controlling economic conditions, for example, evaluating the relative trends in prices, output, employment and other aspects of economic activity; detecting, accounting for and counteracting inflationary or deflationary pressures in the economy; ascertaining the correlations between changes in the prices of goods and services and the conditions of demand and supply; and assessing the flexibility or rigidity of prices in responding to changing economic conditions.

(ii) Evaluating the price aspects of the circumstances and experience of producers, for example, measuring the terms of trade or gross margins (i.e., the prices of outputs relative to the prices of inputs); determining cost-push pressures on prices; and assessing the competitive position of the various sources of supply of commodities.

(iii) Formulating price policies relating to selected kinds of producers, consumers, or external trade; and establishing prices in the case of various types of transactions.

(iv) Factoring changes in the value of national accounting flows into components of price and quantity and analysing trends in these two elements of value, one in relation to the other.

For purposes of these various uses, statistics of prices are required that differ in the kinds of transactions covered, in detail in which the data on prices are classified, and in some instances, in the definition of these prices.

A. For General Economic Analysis

8. The most common and traditional use of price statistics has been in analysing changes in prices, output and other indicators of general economic conditions in relation to one another. Analyses of this type have been undertaken in order to assess the health of the economy and to formulate broad economic policies. For

these purposes, price data are needed on domestic production, the domestic supply of goods and services (i.e., the sum of domestic production and imports) and the uses of the domestic supply. The transactions that are of particular interest in the case of uses are domestic consumption, capital expenditure and exports. General index numbers of wholesale prices which often refer conceptually to the sales of all producers and importers have often been utilized to measure general price trends. However, the duplication in coverage and the undue weight of commodities passing through many stages of production in these indexes, as well as the lack of correlation with other general economic indicators, limits the usefulness of general wholesale price indexes for economic analysis.

9. In any case, prices on large aggregates are usually far from sufficient for measuring trends in prices as changes in the prices of goods and services are diverse, reflecting differing conditions of supply and demand and varying marketing and pricing arrangements. On the side of supply, it is valuable to have price indexes on the sales of the various kinds of producers, importers and other distributors. These data would be of assistance not only in identifying areas of inflationary or deflationary tendencies, but also in ascertaining the circumstances of suppliers of goods and services which contribute to these pressures. For example, such data on prices might be correlated with indexes on the volume of output or sales of the various kinds of suppliers and on the prices, consumption, and unit-costs of their inputs of goods and services. In order to identify the factors of demand leading to changes in price, it is desirable to have correlated index numbers on the price and volume of the various intermediate and final uses (e.g., consumption, capital formation, exports) of the characteristic products of the various industries.

B. For Evaluating Conditions in the Market

10. For purposes of pin-pointing inflationary or deflationary tendencies, price data are wanted on individual commodities or relatively detailed classes of commodities. These statistics are also essential in depicting conditions in the market and in evaluating the flexibility and structural pattern of prices. Supply and demand are, of course, balanced and reflected in price in terms of individual commodities; and the sensitivity of prices to changes in market conditions varies

substantially among commodities. In view of these requirements for data, a number of countries issue series of averages or index numbers of the price of individual commodities. These statistics often relate to selected commodities, weekly or somewhat less frequently and a much more complete list of commodities, monthly or quarterly. The selected list of commodities is not infrequently restricted to those for which prices are very sensitive to changes in economic conditions; and some countries compile special indexes of the prices of such commodities, e.g., the main agricultural products, metals and other raw materials. These index numbers are of particular interest in detecting incipient inflationary or deflationary trends since such pressures may start with selected industrial raw materials and spread through the economy.

11. In order to identify changes in prices at an early stage, series relating to contracts for the future delivery of goods are more useful than series relating to spot sales or to goods currently being delivered. This is the case, in particular, for goods that take a relatively long period to produce. However, where the period of production is relatively brief, the prices of goods for future delivery are likely to be misleading concerning current market conditions. In these circumstances, the anticipations of buyers and sellers will usually enter into the setting of prices; and it would be more useful to utilize series relating to spot sales or contract for rapid delivery of goods.

C. For Use by and With Respect to Producers

12. Data on the prices of individual commodities are of course of particular interest to sellers and buyers of these commodities. In their case the values of these statistics are greatly enhanced by data on the principal varieties of, and markets for, the commodities. Producers and distributors are also interested in assessing the competitive position that they command in their industry and the circumstances of the industry relative to other parts of the economy. For these purposes, price data on the sales and on the inputs relative to the outputs of the various industries are of considerable value. Useful statistics of this kind are measures of changes in the terms of trade (e.g., price indexes of sales relative to price indexes of purchases of non-factor inputs), price indexes of value added, or indexes or other composites of sales prices relative to the unit-

cost of the inputs. For purposes of measuring terms of trade and like uses, some countries exclude from the indexes of sales and purchases the transactions between producers engaged in the same industry so as to measure the situation of the industry considered as a whole.

13. The kinds of price statistics outlined above are of interest to a wider audience than the producers and distributors engaged in the activities to which the data relate. As was noted earlier, these data are essential in tracing inflationary or deflationary pressures that may have originated in changes in the circumstances of the various industries and in analysing their economic health and circumstances. Such figures are also wanted in evaluating the margins added to prices at each step in the chain of processing and distributing goods and in studying the pricing policies followed by producers and distributors.

D. For Setting Price Policies and Prices

14. The type of price statistics outlined above are also needed in formulating price policies in the case of particular industries - for example, the payment of subsidies, for the promotion of exports, or the fixing of import duties. In the countries with centrally planned economies, these data enter into setting the prices of various kinds of commodities. Price statistics are also in demand in establishing changes in wages and salaries or in the prices of goods to be delivered in the future. For example, adjustments in wages and salaries in the light of changes in consumer price indexes are common; and escalation clauses are not infrequently included in contracts for the purchase of capital goods that take a long time to produce. The escalation clauses may be based on the changes in a price composite on the materials and labour to be employed in the production.

E. For National Accounting and Related Purposes

15. Statistics of prices often find use in expressing national accounting and related data in constant prices. Series of prices are utilized extensively for this purpose in the case of the centrally planned economies.

16. In estimating the expenditure flows in the accounts (e.g., consumption expenditure, capital formation, exports or imports) in constant prices, use is often made of price series on the individual commodities included. As a result,

the weighting patterns and base period utilized in the constant price can be chosen in the light of the requirements of national accounting. Where use is made of index numbers of prices relating to broader classes of transactions, the weighting patterns of these indexes are implicitly built into the national accounting data in constant prices; and price indexes utilized in this fashion should be weighted and classified so as to fit the national accounting data that is being deflated.

17. Index numbers of prices are more commonly utilized in deflating the value added by some, or even all, industries than the items of expenditure on the gross product. This is however not the case in countries with centrally planned economies. In these countries extensive use is made of price series on individual commodities to express the net and gross output of industries in constant prices. For purposes of deflating value added, price indexes are desired on the gross outputs and the gross inputs of non-factor services of the industries covered. Not infrequently, index numbers of both price and quanta are utilized in this work, one series supplementing the other. A similar use of price indexes is to compile quanta indexes for kinds of economic activity, such as the distributive trades, or some of the output of an industry, where suitable indicators of quanta are not available directly.

18. In addition to national accounting data on expenditures and production, index numbers of prices have been employed to express wages and salaries and other types of income in constant prices, generally, in terms of changes in purchasing power. The indexes required for this purpose should relate to the set of goods and services purchased with these incomes.

19. For use in converting data from current prices to constant prices, as well as in analysing the circumstances of producers, the statistics of prices should relate to the sales (purchases) made at the same time as the goods and services are being produced (consumed). As was noted above, these prices may differ from the prices at which contracts are being currently negotiated for future completion. Ideally, the price series utilized to deflate flows relating to an entire year should be averages weighted in terms of the actual pattern of production (consumption) during the year. This is usually difficult to achieve; and unweighted averages of the price statistics are commonly used except in the case of flows which exhibit marked seasonal fluctuations in price.

III. THE TRANSACTIONS AND PRICES TO BE COVERED

A. The Field of Transactions

20. In view of the requirements for data on prices, in principle, systems of price statistics should relate to all commercial transactions in goods and non-factor services. Price series are desired on transactions at each stage in the chain of production and distribution of all types of commodities. This suggestion represents an expansion in the field of transactions to be covered in price statistics that was recommended by the Statistical Commission at its seventh session. Price series on sales by retail trade units to households and the service-producing industries have been added in order to include in the system price series on the consumption expenditures of households and the activities of retail trade. Similar requirements have led to the inclusion of the sales of the service-producing industries.

21. Many countries gather prices of the sales of retailers and selected services to households as part of their work on consumer price index numbers. In most instances the consumer price indexes relate to the purchases of particular segments of the population; and for purposes of the general retail price statistics that are required as part of the full system, the field of coverage would be extended, in principle, to all sales at retail to all households, urban and rural. It would be more difficult to effect this extension in the case of services than in the case of goods because of the difficulties of defining and measuring the price component of the sales of a number of services. These difficulties also exist, and may even be greater, in the case of sales of services to business units. A few countries only therefore attempt to cover sales by the service-producing industries to other businesses in their system of producer price statistics.

22. In the case of most national systems of price statistics, it has not been found feasible to encompass, even in principle, a number of types of transactions in addition to those mentioned above. The field of transactions covered has usually been restricted in the light of the urgency of the needs for price data and the relative difficulties of gathering these statistics.

23. Most countries have concentrated on price series relating to the transactions of producers of goods, imports and exports, and the expenditure of households. Not infrequently, construction and the production of other heavy capital goods are omitted because of the difficulties of compiling suitable price series. The urgent requirements for these data have none the less led to concerted efforts in a number of countries to include these activities in producer price statistics. Price series on the purchases of intermediate or capital goods by most kinds of producers are usually excluded from the system, though the collection of prices on the purchases of farmers or construction materials is not uncommon. The latter type of prices are utilized in compiling price series on construction activity. More serious difficulties are encountered in gathering prices on the purchases of producers than on their sales in view of the greater intermittency and incomparability in purchases than in sales. A few countries are considering, or experimenting with, the direct collection of prices on the purchases of selected materials and capital goods by industrial units; and a greater number of countries may compile prices on purchases from available data on the sales of producers, imports, transportation and other delivery charges.

24. Very few countries have systematically covered the sales or purchases of wholesalers as such, except for importers and exporters. The purchases of selected kinds of wholesalers, for example, farm assemblers, have however been priced as a convenient source of price information on the sales of farmers. The omission of wholesalers has been due to considerations such as the following: It is difficult to unravel the place of each wholesaler in the chain of distribution; and data for purposes of appropriate weights with which to combine price series are often lacking. Further, price statistics are in much greater demand on the initial flow of goods and services into the economy (i.e., the domestic sales of producers and imports), the flow of goods to end-uses (e.g., the sales of capital goods, the sales of retailers and the service industries to households, and exports), or the use of intermediate materials by producers. National statistical authorities have felt that with these sets of prices, it would be possible to follow trends in the price spread involved in the distribution of goods at wholesale and retail.

25. In view of the differences in the urgency of the various requirements for price statistics and in the problems and difficulties of gathering these data, the Commission may wish to consider suggesting the following broad order of priorities in developing a full system of price statistics.

(i) Prices of the sales of all goods by producers, whether for intermediate or final consumption, fixed capital formation or exports, giving priority to data for the major kinds of producers in the economy; prices of imports; prices of the sales of goods by retailers and of services to households.

(ii) Prices of important services such as transportation; prices of the purchase of goods for intermediate consumption by producers of goods; and prices of the purchases of fixed assets by producers.

(iii) Prices of the sales of wholesalers to other sectors of the economy and for export and of the purchases of wholesalers from other sectors of the economy and in imports; prices of the purchase of goods by retail trade; prices of the sales and purchases of the service-producing industries; and prices of the purchases of fixed assets by wholesale and retail distributors.

B. The Character of the Prices

26. It would be useful if the recommendations on price statistics adopted at the seventh session of the Commission were extended to include suggestions on the character of the prices to be covered in the system. Suggestions on this subject may be of assistance in national efforts to improve these statistics and in furthering the international comparability of the data. For example, price series may deal with list or transaction prices, include or exclude various types of charges, or relate to sales (purchases) or contracts negotiated.

27. It is common practice for countries to seek data on the prices at which transactions are in fact carried out; and it is these prices that are of interest and value. Discounts, special allowances, rebates and other concessions from list prices are generally taken into account. List prices are utilized as a last resort where, for example, transactions have not occurred in the recent past or the prices involved in transactions can not yet be determined. Where prices

are fixed by Governments, such prices are usually gathered. In the case of countries with centrally planned economies, the prices fixed by central or local authorities are generally covered in the statistics of prices.

28. The charges included in series of prices should reflect the type of transaction being priced. In the case of prices on sales, transport, insurance and other delivery charges, service and interest charges for hire-purchase arrangements or delays in payment beyond the customary period, installation and similar charges, should usually be excluded. In other words, the series of prices gathered should, in most cases, cover charges incurred up to the point that the commodities leave the establishment of the seller. This would yield price data that is, in general, coincident in coverage with data gathered on the value of sales or shipments of most producers or distributors; and is the practice followed in the price statistics of most countries.

29. However, in the case of sales of some kinds of goods, it becomes necessary to include some of the charges mentioned above. The sales value of heavy machinery, for example, often includes the costs of transportation and installation; and installation of the machinery is part of the normal activities of the seller. The price should therefore cover the installation charges but not the transport or delivery charges, unless the seller also furnishes these services. None the less, where the common trade practice is to include transport and similar charges in the sales price, it may not be feasible to separate these charges from the other elements of the sales price. In any case, in price series on exports, all charges up to the point of export should be included since the charges will represent payments for the services of domestic producers.

30. In the case of prices on purchases, all charges incurred up to the point of delivery to the purchaser should be included so as to have the price component of his cost. Such charges would include transport, insurance and other delivery charges, installation expenditures, purchase, excise and other commodity taxes paid, and subsidies received, but not service and interest charges for delayed payment arrangements. Where countries have attempted to gather or compile prices of purchases, all charges up to the point of delivery have been covered.

31. National practice varies significantly with respect to the treatment of turnover, purchase, excise, other commodity taxes or subsidies in price series on

sales. The approach adopted appears to hinge on the way these taxes and subsidies are dealt with in statistics of the value of sales, output and related data. It would be advantageous, if feasible, to seek figures of sales prices which include commodity taxes and exclude subsidies and vice versa. Price series would then be available for use in conjunction with value series in which commodity taxes and subsidies are dealt with in either fashion; and the impact of commodity taxes and subsidies on market prices could be measured. For example, it is common practice in countries with centrally planned economies to gather data on prices including and excluding turnover taxes.

32. As was noted above, some uses of price statistics call for prices on sales (purchases), while other uses would be better served by prices on contracts negotiated. In national practice, prices on sales (purchases) or on current orders which call for the earliest fulfilment appear to be most commonly sought. In the case of heavy capital goods, the value of the sale (purchase) will often have been negotiated long before the sale (purchase) is consummated. In these cases therefore substantial differences could occur in series of prices between sales (purchases) and new contracts made. In these circumstances, most uses of price statistics other than the deflation of value of sales, shipments or value added, are best served by prices relating to contracts negotiated in the immediate past for the earliest fulfilment. It may therefore be desirable to suggest that the prices to be sought should relate, with some exceptions, to current orders received (placed) for earliest fulfilment from stock or in the minimum time required for fabrication and delivery. In the case of prices of imports and exports, however, the prices of commodities currently flowing over the borders of the country would be preferred. This is so because the major uses of price data on imports and exports relate to these physical flows.

IV. THE CHARACTERISTICS OF VARIOUS SYSTEMS OF PRICE STATISTICS

33. Major developments have taken place in the character of the index numbers of producer and related prices compiled by countries since the Commission considered this question at its ninth and seventh sessions. In view of the demands for data on prices which are correlated with a number of other economic statistics, the traditional systems of indexes of wholesale prices of countries with market

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economies are being replaced, supplemented or modified by use of the sector approach to compiling index numbers of prices. For example, systems of sector indexes have been substituted for the more traditional system in the case of the Federal Republic of Germany, Israel, the Netherlands, Ireland, New Zealand, the Republic of South Africa and the United Kingdom. Other countries have supplemented or are supplementing their traditional system of indexes with sector indices, for example, Canada, Finland and the United States. Still other countries have modified their traditional index numbers to include certain aspects of the system of sector indexes, for example, Denmark, France, Italy or Sweden.

A. Classifications in Systems of Producer Price Indexes

34. A basic difference between the traditional and sector approaches to indexes of producer and related prices is the scheme of classification utilized. Classifications in the traditional systems of index numbers are based primarily on the composition and other physical characteristics and the stage of processings of the commodities involved in the transactions covered. To some extent distinctions are also made as to the broad division of industrial activity (e.g., agriculture, manufacturing) in which the commodities are produced. In the systems of sector indexes of producer prices, the schemes of classification are based primarily on the kind of industrial activity of the producers involved in the transactions covered and the economic origin and destination of the commodities dealt in. Classifications according to economic origin generally distinguish between domestic production and imports; and classifications according to economic destination are derived from the economic use to which the commodities will be put, for example intermediate consumption subdivided to some extent according to the industry of use, final consumption, fixed capital formation and exports.

35. Where countries have modified their traditional systems of indexes, classifications according to economic origin and destination have been added to the schemes of commodity classifications. The classifications according to economic origin have generally distinguished between domestic production and imports and, less frequently, subdivided domestic production into divisions of industrial activity. Classifications according to economic use to be made of commodities have been more commonly added than classifications according to origin.

These classifications are essentially the same as classifications according to economic destination in the case of the sector approach to producer price indexes. Japan and the United States have been compiling supplementary sets of index numbers classified entirely according to the use to be made of commodities. In these schemes, goods in domestic supply are classified into goods for intermediate consumption, final consumption and fixed capital formation and each of these broad categories are, in turn, subdivided further. The subdivision of goods for intermediate consumption is based on stage of processing, type of goods and industry of use. The classification of goods for final consumption emphasizes durability and the rudimentary subdivision of fixed assets is in terms of the industry of purchase.

36. On the other hand, in some of the systems of sector indexes, use is made of classifications according to commodities that are subsidiary to classifications according to the kind of industry in which these commodities are principally produced. For example, in the system of producer price indexes of the Federal Republic of Germany, a subsidiary commodity classification scheme is utilized in the price indexes of exports and of intermediate (basic) materials. In the Irish system of sector price indexes, a similar approach to classifying commodities is employed in subdividing the price indexes for broad classes of domestic manufacturing. In the United States, work is proceeding on indexes of wholesale prices for detailed categories of products that are subdivisions of the classes of manufacturing in which these products are primarily made. This series of indexes will serve as building blocks in compiling price indexes of sales according to industrial origin.

37. The developments in the classification of price indexes outlined above suggest the desirability of integrating the sector and commodity approaches to the classification of index numbers of producer prices. This would yield a system of consistent price indexes which are comparable with other economic statistics classified according to either commodity (e.g., external trade statistics), kind of industrial activity (e.g., output and input data), or type of final use (e.g., expenditures on consumption or fixed assets). This type of classification scheme would also facilitate the compilation of index numbers of prices since, in the last analysis, price statistics refer to individual commodities, varieties of these commodities, etc.

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38. An integrated scheme of classification according to commodity and sector is proposed in the model system of producer price indexes set out below. It is based on linking commodities with the kind of industrial activity where these commodities are principally produced. As was noted above, classification schemes of this type are already employed in price statistics. Such classifications are also being utilized to an increasing extent in industrial and input-output statistics. Under another item of the agenda of the thirteenth session, the Statistical Commission will be considering a bridge between the Standard International Trade Classification (SITC) and the International Standard Industrial Classification (ISIC), Classification of Commodities by Industrial Origin, which furnishes a basis for devising an integrated international classification scheme for commodities and industries.[1/]

B. The Weights and Related Aspects of Index Numbers of Producer Prices

39. The differences in the schemes of classification of the various systems of index numbers are of course reflected in the weighting diagrams of these systems. The divergencies in these diagrams are also the result of differences in the transactions covered in the indexes of each of the systems. In order to discuss these differences, it is essential to classify the sector indexes into the gross and net approaches to compilation.

40. In the case of gross sector approach, the weighting of the price indexes reflects all the transactions of the class of producers to which each index relates. For example, the weight of the price index of the sales of food manufacturers is proportional to the value of all sales of this type of establishment, whether or not the sales are to other food manufacturers. In the case of the net sector approach, however, transactions between producers of the same class are omitted in weighting the indexes for the class. In the example just cited, the weight for the price index for food manufacturers would reflect sales to other kinds of producers only, as well as for final use without further processing.

1/ E/CN.3/307.

41. The divergencies between the gross and net sector approaches are therefore due to differences in the treatment of transactions in goods for intermediate consumption. And, the differences in weighting patterns between the two approaches that in fact occur depend on the breadth of the classes of domestic producers that are distinguished in the indexes. Where detailed classifications of producers are employed (e.g., at the three- or four-digit level of an industrial classification), gross and net sector weighting patterns are not likely to exhibit significant differences. This is the case because few transactions will take place between producers of the same class, especially where shipments between establishments of the same enterprise are excluded. However, where the span of each class distinguished is wide (e.g., where all manufacturing makes up one category), considerable difference will occur between the weighting patterns of the two sets of indexes. Thus, the weighting pattern of net sector indexes, but not gross sector indexes, varies with the breadth with which classes of producers are distinguished. And, the aggregates corresponding to the indexes for each class are additive in the case of gross sector indexes, but not net sector indexes.

42. In view of the need to subdivide transactions of producers as to whether or not these transactions are with other producers of the same class, more information is required on the destination of sales (or production) or origin of purchases (or inputs) of domestic producers for purposes of weighting in the case of net indexes than in the case of gross sector indexes. Essentially the same information is required as would be available in an input-output table where the industrial classification is identical with that employed in the net sector indexes. In the case of the gross sector approach, information would be required on the destination of the sales (or production) of domestic producers in terms of intermediate consumption and various final uses without further processing only. On the other hand, the weighting of indexes would be free of duplication in the case of the net sector approach but not in the case of the gross sector approach.

43. Since the transactions between producers of the same class are omitted from net sector indexes, these price index numbers are more suitable than gross sector indexes in measuring the terms of trade between the producers considered as a whole and the rest of the economy. For a number of other purposes - for example, for deflating value added, imports, exports, or expenditures on consumption or

fixed capital formation or measuring the price relationships between outputs and inputs - both kinds of price indexes are equally useful. For detecting inflationary pressures, for measuring the price correlatives of gross outputs or inputs, sales or other gross flows, or for summarizing the price situation faced by an industry, gross sector price indexes are generally more applicable than net sector indexes.

44. Most countries which have compiled, or are planning to compile, sector indexes favour the gross sector approach. Ireland and the United Kingdom only are utilizing the net sector approach. Countries may be favouring the gross sector approach because of considerations such as were outlined above, as well as the fact that it incorporates desired features of the more traditional system of index numbers of producer prices.

45. In the traditional approach to compiling index numbers of producer and related prices, weighting is proportional to the value of all transactions in commodities covered in each index number. This may result in greater duplication in weighting than in the case of gross sector indexes because imports of these commodities are usually included and, not infrequently, the transactions of wholesale traders are also added. Some classes in the traditional system of indexes may also include more stages in the processing of the same general type of commodities than is the case in the classes of systems of gross sector indexes. Often, because distinctions between the various economic flows are not as clearly drawn in the traditional systems of price indexes as in the sector systems of price indexes, the field of transactions covered by each of the traditional type indexes cannot be precisely determined.

46. In principle, sales (purchases) of goods are covered in the various systems of price index numbers; and the weights utilized should refer to these transactions during the base period. In practice, it is not infrequently difficult to ascertain the value of sales (purchase); and weights are made proportional to the outputs (inputs) of commodities during the base year that correspond to these sales (purchases). It should be noted that for deflating some national accounting and related flows, price index numbers weighted in terms of outputs (inputs) are more appropriate.

C. Systems of Retail Price Indexes

47. National systems of consumer price index numbers are, on the whole, more similar to one another in the character of the classifications and weights employed than national systems of producer and related prices.

48. The schemes of classification utilized in consumer price indexes are usually based on the character and object of the expenditures on consumption by households and the socio-economic status of the households dealt with in the indexes. The classifications according to object include such categories as food, clothing, furniture and house furnishings, house rent, recreation. The classes distinguished are often similar to the categories of classifications of private consumption expenditures in national accounting. The classifications according to socio-economic characteristics consist of distinctions between households such as urban and rural and size of income. Categories of this type are also utilized to define the households, the expenditures of which are covered in the consumer price indexes.

49. The weighting diagrams for consumer price indexes generally relate to the pattern of consumption expenditures during the base period of the households covered in the index numbers. The weighting diagrams are usually derived from household surveys of patterns of consumption expenditure. In a few countries, use is also made of national accounting data on these expenditures. For purposes of general schemes of retail prices, the consumption expenditures of all households should of course furnish the basis of the weighting diagrams.

D. Model of A System of Price Index Numbers

50. Set out below are model tables that should facilitate the Commission's discussion of suggestions concerning systems of price index numbers. The model tables delineate the framework of a fully developed, integrated system of statistics of producer and distributor prices. The system has been devised in the light of national and international requirements for index numbers of prices and the convergence in national patterns and practices of compiling these statistics. The scheme fits in with systems of national accounting and the measurement of economic flows in constant prices.[2/]

2/ See, for example, A System of National Accounts (Proposals for the Revision of SNA, 1952). E/CN.3/320, 9 February 1965, Statistical Commission, Thirteenth Session.

Table 1. Index Numbers of Producer Prices of the Domestic Supply of Goods

Goods according to principal products of kind of industrial activity		Price indexes of sales of goods produced domestically and imported						
		Total goods	Goods produced domestically	Goods imported	Utilized in the domestic economy for:			Exported
					Further processing (intermediate consumption)	Final consumption	Fixed capital formation	
Condensed list 1	More detailed list - ISIC major groups or group 1/	2	3	4	5	6	7	8
Total goods								
Agriculture, forestry, fishing and hunting								
Agriculture	01							
Forestry	02							
Fishing and hunting	03-04							
Mining and quarrying	1							
Coal mining	11							
Metal mining	12							
Petroleum and natural gas	13							
Other non-metallic mining and quarrying	14 and 19							
Manufacturing	2-3							
Food, beverages and tobacco	20 and 214; 211-213; 22							
Textiles, wearing apparel and leather products	23; 241; 243-244; 29							
Wood products and furniture	25; 26							
Paper and paper products printing and publishing	27; 28							
Chemicals and chemical, petroleum, coal, rubber and plastic products	31; 32; 30 and 399							
Non-metallic mineral products	331; 334 and 339; 332-333							
Basic metal industries	341; 342							
Metal products	35; 36; 37; 38; 391-395							
Construction	40							
Electricity, gas and steam	511; 512-513							

1/ For descriptions, see International Standard Industrial Classification of all Economic Activities, Statistical Papers, Series M, No. 4, Rev.1, Statistical Office of the United Nations, New York, 1958.

A MODEL SYSTEM OF INDEX NUMBERS OF PRICES (continued)

Table 2. Index Numbers of Prices of Sales and Intermediate Purchases of Producers and Distributors

Producers and distributors according to kind of industrial activity		Sales of goods and services	Purchases for intermediate consumption or for sale without further processing	Purchases of fixed assets
Condensed list 1	More detailed list - ISIC major group or group 1/	2	3	4
Agriculture, forestry, fishing and hunting				
Agriculture	01			
Forestry	02			
Fishing and hunting	03-04			
Mining and quarrying	1			
Coal mining	11			
Metal mining	12			
Petroleum and natural gas	13			
Other non-metallic mining and quarrying	14 and 19			
Manufacturing	2-3			
Food, beverages and tobacco	20 and 214; 211-213; 22			
Textiles, wearing apparel and leather products	23; 241-242; 243-244; 29			
Wood products and furniture	25; 26			
Paper and paper products printing and publishing	27; 28			
Chemicals and chemical, petroleum, coal, rubber and plastic products	31; 32; 30 and 399			
Non-metallic mineral products	331; 334 and 339; 332-333			
Basic metal industries	341; 342			
Metal products	35; 36; 37; 38; 391-395			
Construction	40			
Electricity, gas and steam	511; 512-513			
Wholesale trade 2/	611			
Retail trade	612			
Transport and storage	71-72			
Other services	73; 822; 83; 84; 852-853; 854-856; other			

1/ See Table 1 for foot-note.

2/ Sales to and purchases from other wholesalers are excluded.

Table 3. Index Numbers of Prices of Retail Sales of Goods and Services to Households

Goods and services by object of consumption expenditure
All goods and services
Non-durable goods
Durable goods
Services
Food, beverages and tobacco
Food and non-alcoholic beverages
Alcoholic beverages
Tobacco
Clothing, footwear and accessories
Clothing
Footwear and repair
Accessories and similar personal effects
Gross rent, fuel and light
Gross rent and water charges
Fuel and light
Furniture, furnishings, and household equipment and operations
Furniture
Household textiles and other furnishings
Household equipment
Non-durable household goods
Domestic and other household services
Medical care and health expenditure
Medical and pharmaceutic products
Medical and health services
Transportation and communication
Personal transport equipment
Operation of personal transport equipment
Purchased transport
Communication
Recreation, entertainment and education
Equipment and accessories, including repair
Entertainment and recreational services
Books, newspaper and magazines
Other
Other goods and services
Personal care
Personal effects
Restaurants and cafés
Other services, n.e.c.

51. Suggestions are included in the model system with respect to price indexes on (i) the supply of goods and services to the economy by producers and through imports, classified according to their usual origin in industry; (ii) the absorption of these goods in intermediate and final uses, valued at producer prices, perhaps adding commodity taxes; (iii) the purchases of intermediate and capital goods and of services by the various kinds of producers and distributors; and (iv) retail sales of goods and services to households, classified according to the object of the household expenditure. In general, the weighting diagrams proposed for the series of price indexes are based on the total value of the relevant sales (shipments or gross outputs) or purchases (deliveries or gross inputs) during the base period. As was noted in Section B above, adopting the gross sector approach to weighting contributes to the flexibility of the resulting price composites and index numbers and eases the task of estimating the required weights. None the less, in the case of wholesale trade, the considerable and unsystematic duplication in transactions between wholesalers seriously limits the meaning and usefulness of covering all of their sales and purchases in the price index numbers. It is therefore proposed that the weighting patterns and pricing for these indexes relate to the sales to and purchases from other sectors of the economy only.

52. Price indexes of the sales of goods by domestic producers are classified in two fashions in the suggested system: In the case of Table 1, according to the principal products of each kind of industry; but in the case of Table 2, according to the kind of industry itself. To the extent that the sales of the establishments in each kind of industry consist of goods other than its principal products (i.e., the degree to which the ratio of gross value of shipments (output) of its characteristic products to the gross value of all its shipments (output), here called the specialization ratio, is less than 100 per cent), the commodities making up corresponding categories in the two schemes of classification will differ. The transactions covered in the category for the principal products of each industry will exclude its sales of subsidiary products, but include the sales of its principal products by other kinds of industry. If specialization ratios are high, say 90 per cent or more, the effect of the differences between the two modes of classification on the trends in the price indexes of the sales

of domestic producers will probably not be significant in practice. Specialization ratios are likely to be high where the detail in industrial classification, is limited, as, for example, in the condensed classifications suggested in Tables 1 and 2; and the differences between the two tables in the price indexes of sales (gross outputs) of goods may be expected to be negligible.

53. Differing modes of classification are suggested in Tables 1 and 2 in view of the differences between the tables in the setting, and uses made, of price data on the sales (gross outputs) of producers of goods.

54. For purposes of the price indexes of Table 1, price composites of like commodities produced domestically and imported would be combined into data on the domestic supply of these commodities; and the figures of these total domestic supplies would be distributed among the various intermediate and final uses. The classification of commodities imported that is closest to a national industrial classification and feasible is classification according to the principal products of each domestic industry. Employing such a scheme of classification, where each commodity is assigned to a single class only, has additional advantages in the case of Table 1: the relative price trends of competing domestic and imported products may be compared; and the weight of the domestic supply of commodities making up each class, as well as the associated price series, can be uniquely allocated among the various intermediate and end uses. Table 1 is similar in character to a telescoped and truncated input-output table where the commodity is the unit of observation. In view of the emphasis on the commodity, the essential differences between the approach suggested in Table 1 and the traditional approach to producer price indexes originate in differences between the classifications.

55. In the case of Table 2, however, price indexes and composites are called for on the sales (gross output) of all commodities made by each type of producer, whether or not these are principal or secondary products. These data are needed, for example, for use in conjunction with price composites and indexes on the purchases (inputs) of intermediate goods and non-factor services, and in assessing the economic health of various producers. And data on the consumption of intermediate materials and non-factor services cannot be easily allocated among the primary and subsidiary products. The price index numbers of the sales and purchases of producers suggested in Table 2 represent the gross sector approach to these statistics.

56. Despite the differences in emphasis between Tables 1 and 2, the two modes of classifying the sales (gross output) of producers should be linked to one another as closely as is feasible. This is accomplished by classifying goods according to the kind of industry from which the commodities principally come. These links between the two modes of classification facilitate the joint compilation and use of the price composites and indexes of sales of the two tables. For example, price statistics of the sales of producers of goods for Table 2 may be compiled from the data of Table 1 through changes in the way in which the basic data are combined and weighted. As was noted earlier, the extent of these changes will depend on the specialization ratios of the various industries. The close links between the two series of data also furnish a basis for assessing the effects of domestic demands for goods, exports and imports on the experience and economic health of the various domestic industries.

57. Price data on the sales of services are not included in Table 1 because of the minor importance of these sales, except at retail, and the difficulties of gathering these statistics on services. It is suggested that in developing an integrated system of price statistics, Table 1 be given priority over Table 2. On the whole, a number of the series suggested in Table 1 are more easily compiled and more urgently required than the price series on the sales (gross output) of the various kinds of producers included in Table 2. In particular, this is the case for the price indexes and composites of the sales of domestic producers and imports, as well as the combined domestic supply of goods, and of exports. And as was noted earlier, the first series of price statistics may furnish an adequate approximation to the price indexes of the sales of goods by various industries. A somewhat lower order of priority might be assigned to the price series on the domestic uses without further processing of the supply of various types of goods. Among the domestic uses, greater priority might be given to price series on goods for final consumption and fixed capital formation, as well as the combination of these two series, than to price statistics on goods for intermediate consumption.

58. The classification in Table 1 of goods according to the principal products of the various industries furnishes another approach to setting priorities in developing the series of price index numbers suggested in the table. For example, higher priorities might be assigned to price statistics on the principal products

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of industries that account for important kinds of domestic production, imports and exports. Or, lower priorities might be assigned to price index numbers on construction or the highly fabricated principal products of certain metal product industries.

59. The more detailed list of classes of principal products suggested in Table 1 adapted to the character of an economy furnishes, on the whole, more suitable guidance than the condensed list with respect to the detail in which the suggested price indexes might be published, even at a relatively early stage of work on producer price statistics. For example, countries will wish to issue data on domestic production, imports or exports classified in greater detail than in the suggested condensed list in the case of important classes of principal products. Where classes of principal products are not too important, however, it may be preferable, or necessary, to employ the categories of the condensed list. The condensed list, modified in the light of the structure of the economy is probably more useful in the case of price series on the various domestic uses. Even where the condensed list is utilized, for example, most of the cells of Table 1 on fixed assets would be empty. In the case of this series of price indexes, what is needed is of course data on metal products in some detail and on total fixed assets only. As the classes of significance in the case of final consumption, intermediate consumption and fixed assets differ from one another, the series are best published in separate tables, differing substantially in detail of classification.

60. As was indicated in section E above, many countries are already gathering and compiling the price statistics suggested in Table 3 on sales of goods and services at retail to part of the population. These inquiries into price statistics might be gradually extended to include more rural and urban areas of the country and additional socio-economic classes of the population in order to approximate the data suggested in Table 3. These data would relate to all retail sales of goods and services to all households of a country. The price indexes, and coupled composites, proposed in Table 3 would furnish appropriate data for use in estimating national accounting data in constant prices on most categories of private consumption expenditure. The scheme of classification proposed in Table 3 is very similar to the classifications of private consumption expenditures and of national series of consumer price indexes. As in the classifications of the latter series,

services are entirely distinguished from goods in the proposed classification. This is not usually the case in classifications of private consumption expenditures, but consistency between these classifications and the proposed scheme is attained at the summary level, if not the detailed level, of the proposal. The statistics proposed in Table 3 also furnish (i) data for deflating the value of retail sales and (ii) when compared with the series on final consumption of Table 1, measures of the margins added in the flow from producers to households.

61. The price statistics gathered on sales to household for purposes of Table 3 should also furnish basic data for compiling the price data on the sales of units classified under Retail trade and Other services in Table 2. Thus, the statistics called for in Tables 1 and 3 provide the basis for compiling the price series suggested in Table 2 on the sales of all types of producers and distributors except transportation and wholesale trade. It was suggested at the end of part III above that transportation be given moderate priority but wholesale trade be assigned low priority in developing a system of price statistics. Moderate orders of priority were also suggested for series of price indexes set out in Table 2 on the purchases of goods for intermediate consumption and the purchases of fixed assets. This order of priority was suggested on the assumption that the index numbers would be compiled from price data on the domestic supply of goods and on transport and distribution charges.

62. Classification of index numbers and associated aggregates according to the condensed list of industries proposed in Table 2 may yield suitable information for most of the requirements for these price statistics. The categories of the more detailed classification suggested in Table 2 might be utilized in the case of important industries in the economy. The condensed and more detailed lists of industries proposed in Tables 2 and 1 are identical with the industrial classifications under consideration for national accounting work.[3/]

E. Price Statistics of Individual Commodities

63. Index numbers, relatives and averages of prices for individual commodities, varieties of these commodities and the like furnish the building blocks for the various systems of index numbers, as well as the data on marketing conditions that

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3/ See Table 13, pp. 117-121, A System of National Accounts, op. cit.

are in wide demand. The recommendations of the Commission therefore emphasized that these price data should be compiled and published for important commodities.

64. A number of national statistical authorities compile and issue series of prices on the sales of individual commodities or varieties of these commodities by producers or the closest practical equivalent in the chain of distribution. These series usually represent the important products of the country. In some instances, figures are also furnished for transactions in products of major importance in various key markets. The series of prices are usually published monthly and annually, and sometimes weekly in the case of commodities which exhibit significant short-term fluctuations in price and are traded on organized markets. Frequently the price series issued do not cover the more highly fabricated domestic products though the scope of these statistics is being extended in the case of a number of developed countries. Series of prices on individual commodities which are major imports, though not important domestic products, are less commonly published; and the Statistical Commission may wish to call attention to the value of issuing these data. Separate series of prices on exports of, and domestic transactions in, major domestic products are also not generally available.

65. As the Commission recommended, the detail in which the individual commodities are defined in these series of prices is at least equivalent to the item (five-digit) level of the SITC; and often corresponds to sub-divisions of these items. In identifying the individual commodities, as well as the markets, for which data will be compiled and issued, a balance must be struck between the requirements for detailed price data and the increased work and difficulties involved in compiling more detailed figures. The item level of the SITC sets the upper limit, in most cases, to the span of the appropriate definition of an individual commodity.

66. Price series of the retail sales to households of individual goods and services are also published as part of a number of national systems of consumer price statistics. These series generally refer to sales to particular kinds of households in selected urban areas; and are usually published monthly or quarterly and annually. In general, the detail in which individual commodities are identified in these price series is at least as great as that at the item level of the SITC.

67. In most instance, the statistics published for individual commodities consist of index numbers of relatives, or of only relatives, of the prices gathered on the various varieties of the commodities. The relatives of the varieties are usually derived from the relatives or prices of the transactions of respondents at various terms of sale and in various markets. In principle, as the Commission recommended, the index numbers of the price relatives of varieties, as well as these price relatives themselves, should be weighted averages of the basic price data. In practice, the data required for these weights (e.g., value of sales (purchases) or gross outputs (inputs) during the base period, depending on the major uses to which the data will be put) are often unavailable; and recourse is taken to unweighted averages or very rough weights. The use of unweighted or roughly weighted averages of price relatives, or absolute prices, of varieties to compile indexes for individual commodities will not significantly affect the reliability of these indexes as long as the dimensions of change in the price relatives, or absolute prices, are much the same. This is likely to be the case where use is made of price relatives, but not absolute prices, of varieties of narrowly defined commodities. It might therefore be suggested that price relatives be employed at each stage of the computations.

68. Price statistics on individual commodities in the form of absolute average prices are preferable to index numbers for use as information on market conditions, on the structure of prices or for the regulation of prices. However, more basic data are required to compile reliable average prices; and the problems of comparability, discontinuities and the like are likely to be more serious. For these reasons, series of average prices are usually restricted, if issued at all, to a few commodities (e.g., selected farm products or raw materials) where organized markets exist.

V. FORMULAE AND BASE PERIODS

69. Practically all countries utilize the Laspeyres formula (i.e., a fixed base year in the past and weighted arithmetic means) in compiling index numbers of producer and consumer prices. The use of this formula in the case of producer price indexes was recommended by the Commission. The Laspeyres formula is employed primarily because of practical considerations. For example, the data required in

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compiling weighting patterns are most readily available for a period in the past; and direct comparisons may be made between the index numbers for all the periods covered in a series.

70. On the other hand, price index numbers compiled on the basis of the Laspeyres formula tend to overstate price rises or understate price declines. These limitations of Laspeyres type indexes become significant when marked changes take place in the relative prices of the commodities covered or the underlying structure of supply and demand. Changes in the structure of relative prices, the character and costs of the supply of commodities, or the pattern of relative preferences for these commodities put the weighting pattern of the base period seriously out of date. For example, as compared with the past base year, sales (purchases) during the current year will tend to rise less rapidly in the case of commodities exhibiting increases in relative prices or costs of supply, than in the case of commodities showing declines in relative prices or costs of supply.

71. The use of the current year as the base period for the index numbers (i.e., employing the Paasche formula) tends to understate price rises and overstate price declines. This use of the Paasche formula would mean adopting a moving base period; and unless the price index numbers for successive years were chained back, direct comparisons could not be made between years other than to the current year. Further, basic data for purposes of compiling the weighting pattern of the current year may not be available.

72. In the light of these problems, the Statistical Commission recommended that the weight base be shifted to a more recent period when significant divergencies occur between price index numbers based on the Laspeyres and Paasche formulae. Investigation of the need to change the base period was suggested at least at ten-year intervals of time. In view of the pace of the post-war changes in economies, it may be desirable to narrow this interval of time to once every five years.

73. In shifting the weight base of series of price statistics countries have generally linked the series compiled on the old base to the series computed on the new base at the new base period or a proximate year. Though it would appear to be desirable to link the two series together at a year midway between the two periods, reweighting part of the old series of price statistics may be too

burdensome. Because of the considerable divergence that may be expected between Laspeyres and Paasche type comparisons of the new and old base periods, advantage might be taken of index numbers based on the Fisher ideal or Marshall-Edgeworth formulae in effecting the link between the old and new series.

74. If it were feasible, there are a number of advantages to employing a moving weight base of the recent past in compiling index numbers and composites of prices. This approach would, for example, keep the weight base of the price statistics relatively up-to-date and add materially to the values of these data when employed in conjunction with index numbers of volume compiled in terms of a similar weight base. It would also facilitate the addition to the series of changed or new commodities. The use in this approach of the Fisher ideal or Marshall-Edgeworth formulae would contribute to its advantages. In order to issue useful series of index numbers extending over a number of years, the indexes for successive years could be chained back to a common period. It should be noted that the approach outlined in this paragraph is utilized in some of the countries with centrally planned economies. In these systems of price indexes, the Paasche or Laspeyres formulae are employed.

75. The Statistical Commission may wish to consider the question of the length of the weight and comparison base periods to be employed in price statistics. Most countries utilize a year for these purposes. Some countries have employed a longer period (e.g., three years) in order to avoid the distortions that may occur in the pattern of weights or prices because of circumstances peculiar to a particular year. However, adopting a weight base period that is longer than a year is probably impractical in the case of a number of countries, primarily because of the lack of the data required to compile weighting patterns. The use of a number of years as the weight base of course also adds to this work. The Commission may therefore wish to suggest the use of at least a year as the weight base period. Though the use of a period longer than a year as the comparison base does not give rise to the problems mentioned above, there are advantages to employing the same period as the weight and comparison basis.

VI. GATHERING REPRESENTATIVE AND COMPARABLE PRICE SERIES

76. The number of transactions to be covered in price statistics is great even where the system is limited in scope. It is essential to cover transactions not only in a considerable number of different commodities, but also in the much greater number of varieties, circumstances of sale and markets for these commodities. Further, the series of price quotations are needed monthly, if not more frequently; and the marketed varieties, conditions of sale, etc. of the commodities are subject to change. In order to restrict the quotations gathered to a manageable number of series, it is therefore necessary to define and select from among the great number of transactions to be covered, a set of representative transactions with respect to which comparable series of prices may be gathered. It is also essential to ensure the representativeness and comparability of the transactions prices, as conditions in markets change. This part of the paper is devoted to a discussion of the principles and methods of dealing with these problems and the ways in which the pertinent recommendations of the Statistical Commission might be extended or modified.

A. Criteria and Methods of Selecting Representative Series of Price Quotations

77. The selection of representative transactions to be priced consists of a series of steps. In the case of producer prices, for example, the Commission suggested the following order of selection: firstly, the commodities to be priced; secondly, varieties for each of these commodities; and thirdly, respondents for each of these varieties. In some cases, circumstances of sale and markets are also elements in the selection process; and in systems of retail price statistics, the choice of representative markets is always an important phase of the process of selection. In principle, the order of selection should be such that the units of observation which exhibit the greatest variations in prices should be selected first. In practice, the information that is readily available for carrying out the selection is an important determinant of the order of selection. For example, in a number of countries, the selection of respondents for gathering producer prices precedes the choice of varieties because the information required to select varieties needs to be gathered from respondents whereas data on respondents are available from censuses

of manufacturers and similar sources. In the case of producer goods which are not customarily transported, the selection of respondents (markets) should, in principle, precede the selection of varieties. For retail price statistics, the selection of markets should, and generally does, precede the selection of commodities for pricing.

78. The selection at each stage has always been purposive, based on criteria designed to yield representative transactions for pricing. Considerable weight has of necessity also been given to the extent of co-operation that might be expected from respondents and the ease of pricing (e.g., ease of specification, regularity and frequency of transactions, complexity of circumstances of sale). Partly because of the extent to which these factors can be stumbling blocks to administrating price statistics programmes, probability samples of the transactions to be priced have not been utilized.

79. The major criteria that have been employed in selecting representative transactions are (i) the relative importance of the various kinds of transactions, as measured, for example, by value of sales, (ii) the extent of correlation in price trends (e.g., price leadership) within each class of transactions, and (iii) the magnitude of variation over time in prices for each of these classes. The last two criteria are of importance in efficient selection because the greater is the intra-class correlation in price trends or the smaller the variation over time in prices, the smaller is the number of transactions that need to be priced in order to attain a given level of reliability. The first criterion has been more commonly used systematically than the other two because of the greater availability of the required information for applying the criterion, much of it from the same sources as the basic data for weighting. None the less, the Commission may wish to call attention to the usefulness of the last two criteria for purposes of selecting representative transactions for pricing. It may be recalled that the Commission included the criterion of the importance of transactions in its recommendations on this question.

80. Data on sales, shipments or gross output for purposes of determining the relative importance of commodities, markets (areas of the country) or respondents, are often readily available from censuses of mining, manufacturing and distribution or similar sources. However, the same type of data are not usually available for

the varieties or circumstances of sale of commodities; and such information is in general gathered from respondents, trade associations or other market sources, often in the form of general statements of conditions. The criteria of intra-class correlations in price trends or variation over time in prices, based on the judgements of respondents, trade associations, etc., are more commonly applied in the case of selecting varieties than in the case of selecting commodities or respondents.

81. The criterion of relative importance has been employed in different fashions. A number of countries have selected all commodities or respondents of each class in the field of transactions to be covered which account for sales in excess of a given value. Some of these countries have also sampled the remainder of each class in order to gather price series that are more representative of the class as a whole. A few of these countries have fixed the cut-off value of sales without regard to the classes of commodities or markets to be distinguished in the price statistics; and therefore may have not included adequate representation in the price series gathered for some of these classes. Other countries have chosen commodities or sellers in each class of the field to be covered which account for a given proportion of the sales of the class. This would be statistically more efficient than the use of absolute cut-off values for each of the classes.

B. Frequency of Gathering Price Quotations

82. The frequency with which price quotations are gathered on the transactions selected also has bearing on the representativeness of the price data compiled. As the Statistical Commission suggested, the frequency of collection should be related to the relative importance of the transactions represented by the various price quotations and the relative variation over time in these prices. If prices fluctuate substantially, it is necessary to gather a number of price quotations during a month or a quarter in order to measure the prices during the whole of these periods. And, if transactions have a considerable weight in the price statistics, it is essential to attain relatively greater reliability in the relevant price quotations. The decisions on the frequency with which price quotations are to be gathered should also take account of the costs and burden of gathering price quotations. In practice, collection of quotations more frequently than once a

month is feasible in most countries only where organized exchanges or trade associations are the sources of price information. Otherwise, the monthly gathering of quotations, referring to transactions during a selected day of the month, appears to be the practical maximum frequency of collection.

C. Specification

83. All of the uses of price data hinge on gathering series of quotations on transactions that are comparable with respect to price, i.e., on a series of transactions which if executed at the same time and in the same market would fetch the same price. In order to accomplish this, it is essential to specify the aspects of each type of priced transaction which are pertinent to the setting of prices on the market. The Commission may wish to call attention to the need for, and nature of, specifications in the revised recommendations on price statistics.

84. Specifications should relate to the characteristics of transactions which enter into determining the price at which sellers and buyers are willing to engage in these transactions. In principle, therefore, the specifications of price quotations should indicate the physical and operating characteristics of items and the conditions under which transactions in these items are executed. Examples of physical characteristics are generic terms for items, the stage and type of processing, character of constituent materials or parts and the way in which these components are combined, or the size, shape, packaging or style of items. Illustrations of operating (i.e., performance) characteristics are the uses to which an item may be put and the capacity, power, speed of operation or durability of the item. Descriptions of the portion of the market for which the item is intended (e.g., utility or low priced) have also been utilized. Indicative of the circumstances of sale described in specifications are the market and lots in which the item is sold, the type of buyers, the terms of delivery and payment, the services to be rendered (e.g., delivery, installation, repair), the guarantees involved, and whether or not excise, turnover or other indirect taxes are to be included.

85. It has been common national practice to specify the physical characteristics of commodities. Description of the circumstance of sale has been included somewhat less frequently. Operating characteristics have been specified rather infrequently

in view of the difficulties of defining operating characteristics. Also, while operating characteristics are frequently correlated with physical characteristics, the opposite is less often the case; and physical characteristics may be more important determinants of production costs than operating characteristics.

86. However, where countries have added capital goods or finished cognate items to their price series, they have found it essential to include descriptions of performance, as well as of physical characteristics and circumstances of sale, in specifying these price quotations. The inclusion in specifications of operating characteristics is desirable not only for machinery or equipment for producers, but also for consumer items such as vacuum cleaners or washing machines. In general, the difficulty of devising specifications that will ensure the collection of comparable series of price quotations increases as the degree of fabrication of the priced commodities rises. To be useful, specifications must become more detailed as the degree of fabrication increases; and the task may be complicated by the relative lack of standardization in some highly elaborated goods.

D. Maintaining the Representativeness and Comparability of Price Quotations

87. In order to maintain the comparability and representativeness of the price quotations gathered, it is essential to detect the many changes that occur in the characteristics of the transactions covered in statistics of prices and to adjust these price quotations to the changes. Changes are common in the marketed varieties of commodities and in the circumstances of sale of these varieties. Or, some commodities will decline in importance and finally disappear from the market, while other commodities will command an increasing share of the market. Further, entirely new products will be offered and become important. Methods that have been utilized to detect these changes are outlined below. The Commission may wish to call attention to the advantages of incorporating such techniques in the procedures for gathering price statistics.

88. One approach to detecting changes in the transactions in the market is to review with respondents, perhaps annually, the relative importance of the different commodities, as well as the varieties and circumstances of sale for selected commodities, in which they deal. For example, respondents may be asked (i) to classify the types of transactions being priced into those of constant, declining

or increasing importance and (ii) to indicate types of transactions that are not being priced which are becoming important.

89. An approach to detecting changes in the characteristics of transactions for which prices are gathered is to incorporate queries on this subject in the questionnaire utilized to gather price quotations. The specifications of the transactions for which price quotations are being sought could be detailed in the questionnaire; and respondents might be requested to indicate whether the price quotations provided still refer to these specifications and whether the transactions described still account for an important part of their sales. If either is not the case, respondents could be asked to describe, in some detail, the transactions for which price quotations are being furnished or which have become important in sales. In place of such explicit queries, respondents are more frequently requested to notify the national statistical authority of any changes of either type, taking account of specifications set out in questionnaires.

90. Still another approach to detecting changes in the characteristics of transactions for which price quotations are being gathered is based on questioning respondents on significant month-to-month increases or decreases in reported prices, for example, of 10 per cent or more. Unless such fluctuations are explicable (e.g., in the light of similar variations in price series for cognate items), respondents are questioned on the differences, if any, between the transactions for which price quotations have been provided and the transactions specified by the statistical authority. This approach is more commonly employed than the devices outlined in the preceding paragraphs.

VII. ADJUSTING PRICE SERIES TO A COMPARABLE BASIS

A. The Problem and Character of the Adjustments

91. As was indicated above, in keeping series of price quotations aligned with the transactions taking place on the market, quotations must be replaced, new quotations need to be added, and old quotations discarded. Such changes are more commonly required in the case of highly elaborated manufactures than in the case of simple fabricated goods or raw materials. In the case of countries with centrally planned economies, this problem has an additional aspect. There, prices must be assigned to new items which are aligned with the prevailing prices of related old items.

92. In substituting one series of quotations for another, national statistical authorities are faced with comparing the relative prices and economic worth (quality) of the new and replaced transactions. The relative economic worth (quality) of two items is equivalent to their relative market prices, provided each item is traded in the same market during the same time. The results of making these comparisons may be classified as follows: The difference in price between the new transaction and the replaced transaction is due entirely to a difference in quality; does not reflect a difference in economic worth; or is accounted for in part by a difference in quality. In other words, no change has taken place in "pure" price; the change in "pure" price is equivalent to the two prices; or the change in "pure" price lies between these two extremes. In the first case, the new series of price quotations would be spliced (linked) to the old series of price quotations; in the second case, the new price quotations would be substituted for the old series; and in the third case, the new series of prices would be reduced by an adjustment factor, termed "g" in this paper, before being substituted for the old series of prices. The factor "g" is a measure of the economic worth of the new transaction relative to that of the replaced transaction.4/

4/ What has been said may be expressed symbolically as: $r_{12} = \frac{\frac{Pb_2}{g}}{Pa_1}$

where r_{12} is the relative for the change in "pure" price from period 1 to period 2; Pb_2 is the price quotation for the new transaction and Pa_1 is the price quotation for the replaced (old) transaction; and "g" is the measure of the economic worth of the new transaction relative to the replaced transaction. If "g" is equal to $\frac{Pb_2}{Pa_1}$, then $r_{12} = 1$ and Pb_2 is linked to Pa_1 when introduced into the price series. If "g" is equal to 1, then $r_{12} = \frac{Pb_2}{Pa_1}$ and Pb_2 is substituted for Pa_1 when introduced into the price series. If $Pb_2 \leq$ "g" ≤ 1, then $\frac{Pb_2}{g}$ is substituted for Pa_1 when injected into the price series.

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93. In adding new price quotations without replacing old quotations, statistical authorities are not confronted with the problem of assessing the economic worth of transactions that are newly priced relative to closely related (i.e. cognate) transactions that are already priced. Prices would be available for both sets of transactions at the same time and on the same market; and the relative prices of the two sets of transactions may therefore be taken to be a measure of their relative economic worth. In these circumstances, the new series of quotations may be spliced to the cognate series of price quotations.

94. Where, however, price quotations for the transactions, the economic worth of which are being compared, are not available simultaneously, other methods must be priced for evaluating "g". In principle, the measure of "g" should be equivalent to the relative prices that the two types of transactions would fetch if these transactions were to take place simultaneously; and should be derived by simulating the market processes through which the transactions, or the significant differences between them, are valued. This implies balancing, in each case, sellers' supply price (cost plus profits) and buyers' offering price (relative utility), one against the other. In fact, the best that might be done is to evaluate, from the point of view of both sellers and buyers, the economic worth of the differences between the two sets of transactions in the characteristics that are thought to be correlated with differences in price. In practice, it is often not possible to evaluate the economic worth of these differences in terms of both groups. The evaluation is most commonly carried out in terms of supply or cost price in the case of producer prices. More, even exclusive, attention is devoted to consumers' valuation in the case of retail prices.

95. In the case of the centrally planned economies, producers' cost and supply prices have been the main considerations in establishing prices though account is also taken of additional factors, especially in setting retail prices. The relative utility of the item being priced is one of these factors.

96. The techniques employed to evaluate the relative economic worth of two types of transactions necessarily depend on a number of considerations. The avenues of information and the resources that are available for this endeavour, set practical limits to what might be done. The conditions under which the shift in transactions occurs and the characteristics of these transactions relative to one another point

to the relevant data. The following paragraphs deal with the character and merits of the techniques that have been utilized for adjusting price series to a comparable basis. The Commission may wish to include in its suggestions on price statistics a statement of the principles that should underlie these adjustments and of the broad alternatives for making them.

B. The Use of Overlapping Prices

97. As was noted above, prices are sometimes available simultaneously for the pair of transactions to be compared; and provide the basis for splicing (linking) the pertinent quotations. This situation occurs most frequently when shifts take place in the relative importance of the various transactions in a commodity or class of commodities. The pair of transactions may differ in circumstances of sale, may represent two varieties of the same commodity, or even be unlike but related commodities. National experience suggests that simultaneous price data is most likely to be available for differing conditions of sale (e.g., type of customer, terms of delivery or payment, size of lots); and more likely to be had for varieties of a commodity than for two related commodities.

98. In dealing with the gradual displacement of transactions in markets, decisions are required on the point in the overlapping period when one set of quotations are to be replaced by the other set of quotations. It is advisable to make the substitution when the replaced and new variants of the transactions command a significant portion of the market, for example, when the variants have about equivalent shares of the market. At that stage, the new variant will have been on the market long enough to be known and be produced efficiently, while the replaced variants will not have yet become obsolete.

99. In view of the advantages of having simultaneous prices in replacing one set of quotations by another, statistical authorities have sought these figures if they did not already have the data. These efforts have frequently consisted of gathering market prices for the differences in circumstances of sale or in components (e.g., with or without certain accessories). In the absence of market information, statistical offices have asked respondents to estimate the market price that the old variant of the transactions would fetch at present or that the new variant of the transactions would have commanded in the past. Some offices have found it

valuable to carry the use of market valuations further by measuring the change in the "pure" price of cognate items during the time elapsing between the disappearance of the old variant and the introduction of the new variant.5/ Either of the last two techniques for adjusting series of price quotations to a comparable basis are most applicable where the elapsed time between the substitution of one series for the other is short and the change in prices during the interval of time is small.

C. Substitution or Splicing

100. Techniques based on the use of overlapping prices are not applicable in a number of situations, for example, rapid and drastic shifts from one variety to another of a commodity. Abrupt alterations often occur for the characteristics or style of wearing apparel, automobiles or machinery or in the packaging of processed foods. Rapid changes may also take place in the composition of paints and other products, or the weight of a loaf of bread or a bar of chocolate. The task of evaluating the relative economic worth of the new and the old varieties is often complicated by the practice of producers of changing quality and "pure" price at the same time.

101. In the circumstances described above, splicing or substitution is frequently employed by statistical authorities, reflecting decisions that differences in price are essentially the results of differences in quality or changes in "pure" price, respectively. These decisions are frequently reached by commodity specialists, based on comparisons of the characteristics (physical and sometimes operating as well) of the paired transactions and on the circumstances surrounding the shift from the old to the new varieties.

102. Substitution is often utilized where a change in an item is trivial or involves an appeal to fashion. Substitution also appears to be appropriate in the case of minor improvements in the composition or performance of an item which is linked with an increase in price of the same magnitude as the rise in "pure" price for related articles. On the other hand, splicing is generally employed where

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5/ Dividing the ratio of the price of the substituted transactions at the end of the period to the price of the replaced transactions at the beginning of the period by the change in "pure" price of the cognate items during the period furnishes a measure of the relative economic worth of the paired transaction.

significant changes occur in the make-up or character of items, particularly as a result of technological development or efforts to expand markets substantially. As was indicated earlier, linking is also appropriately utilized when introducing entirely new commodities into the price indexes. These price quotations should be introduced only after sufficient time has been elapsed for the efficient production and marketing of the new commodities.

103. Where the relative economic worth of paired transactions differs significantly from the ratio of their prices or from one, efforts should be made to emplcy quantitative techniques of evaluating "g". As was indicated in Section A above, these methods depend on the correlation between the relative characteristics of the paired item and their relative prices.

D. The Quantitative Use of Physical or Other Characteristics

104. This approach to evaluating "g" has been employed most frequently where a simple linear relationship may be expected between the economic worth and a single, measurable characteristic of the paired items, for example, the weight of bread or soap, the metal content per unit of ore, or the purity and specific gravity of sulphuric or nitric acid. This technique has also been applied to operating characteristics in the Soviet Union when introducing new items into price series, for example, determining price or cost per unit of energy content in the case of wood or per unit of potential power in the case of turbines, electric generators or steam boilers. It has been reported from Hungary that the use of quantitative relationships between physical and operating characteristics, on the one hand, and economic worth on the other, has been extended to much more complicated situations.6/ More than one measurable attribute is dealt with; and the relationship between "g" and the quantified characteristics need not be linear. This has been accomplished by assigning point values to each of the attributes and totalling the weighted point values over all of the attributes. In Sweden, a similar approach, based on engineering, road and other tests, has been employed in assessing the relative economic worth of automobile models.

6/ See Annex 1 to the paper, E/CN.3/264.

105. The methods outlined above all rest on assumptions about functional relationship between economic worth and the measured characteristics; and the use of these techniques in more complex situations involves engineering, laboratory and other technical facilities. Use has also been made of an approach where the degree of relationship and the parameters of the function are determined through statistical analysis of market prices. This approach has been called the "hedonic index" or "principal factor indexes of quality". The function chosen may be applied to data on the market prices and the selected attributes of the varieties of a commodity on sale during the period when either the new or the old types of transactions took place in the market. The results obtained for the two periods are likely to differ in view of changes between the two periods in relative consumer preferences and conditions of supply.

106. In employing the hedonic approach, as well as the techniques described earlier, a basic assumption is that these factors of price determination have not changed significantly in the interval of time between the disappearance of the old item and the introduction of the new item. The shorter this interval of time, the more likely is this assumption to be well founded. An elaboration of the hedonic approach where the assumption is not made, is the use of time as one of the variables in the fitted function. In this case, the data on prices and the selected attributes that are utilized in fitting the function of course relate to various periods of time; and the parameters associated with the variable, time, would reflect not only changes in relative consumer preferences and conditions of supply, but also changes in the over-all level of prices.

107. The hedonic approach has been experimented with in cases such as the prices of automobiles, kinds of power equipment, and single-family dwellings or other construction projects. A few of these experiments have been carried out by national statistical authorities. These experiments have resulted in differing assessments of the usefulness of the hedonic approach. For example, the conclusion reached as a result of an experiment in the United Kingdom on the price of motor cars was that this technique had little, if any, advantage over less objective methods of assessing the relative economic worth of items.[7/] The

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7/ See Annex II, E/CN.3/204, for a description of the experiment.

statistical analysis was not found to be useful for objective selection of the attributes strategic in the variation of prices, perhaps because of the high degree of intra-correlation between the various attributes. And, the basic changes in consumers' preferences and conditions of supply apparently vitiated the reliability of the estimates from the regression of the relative economic worth of two motor car models that were on the market at different periods of time. On the other hand, an experiment in the United States with the multiple regression analysis of the price of a single-family dwelling that is mentioned below points to a more favourable assessment of the hedonic approach.

E. Use of Cost and Supply Price Data from Suppliers

108. Because of the limited extent to which it is possible to employ the techniques described in Section D, increasing use is being made of data on supply or cost price in adjusting price series to a comparable basis where substitution or splicing is not appropriate or overlapping price data are not available. Data are usually gathered from respondents on (i) the cost, supply or estimated market price of the components or materials that account for the difference between the new and old varieties of an item, (ii) the cost or supply price for the new variety when the former variety was on the market or vice versa, or (iii) the parts of the difference in price between the new and old varieties that are due to changes in "pure" price and alterations in specified characteristics. Market prices will of course be more closely approximated by supply (asking) prices than by cost prices. In particular, supply prices may be expected to approximate market prices in the case of industrial machinery and equipment and of highly fabricated consumer goods, if averaged for major suppliers of commodities.

109. In gathering these data from respondents, it is desirable to be as specific as is feasible with respect to (i) the difference in attributes between the two varieties that are to be valued, (ii) the type of valuation sought, and (iii) the period of reference for valuation. Focussing the attention of the respondents on the difference in characteristics to be valued should assist in gathering more pertinent and objective estimates. Supply prices are preferable to costs in order to cover the profits that are included in market prices. Also, estimates of profits by major suppliers will not infrequently take account of the prices that

buyers are willing to pay. As supply or cost prices may differ from one time to another, it is essential to indicate whether the data are wanted for the period that the old or the new variety was on the market. Seeking information for the more recent period may yield more reliable data.

VIII. UNIQUE GOODS

A. The Pricing Problem and the Alternatives

110. The pricing of heavy capital goods (e.g., railroad rolling-stocks, large turbines, buildings, bridges and other construction projects) raises special price problems because of the substantial incomparability between successive transactions. Each capital item is usually made to order, according to markedly different specifications; and contracts generally extend over a considerable period of time and contain varying guarantees, terms of payment, escalator clauses and other provisions. Further, a long period of time may elapse between successive contracts for a particular type of the capital good. None the less, in view of the urgent requirements which were outlined earlier in this paper, countries are compiling price statistics of capital goods to an increasing extent.

111. As it is not possible to gather comparable price series on transactions in capital and other heavy goods directly, statistical authorities have employed other ways of covering the prices of these goods in series of index numbers. In a few instances, it has been assumed implicitly that prices of heavy machinery are the same as the trend in the price indexes of most other important commodities. In some other instances, price relative or indexes of cognate items or classes of items have been employed as indicators of the price trends in heavy machinery or construction projects, for example, small, mass-produced electric motors for large, order-made electric motors; mass-produced metal products for heavy machinery in general; or raw materials utilized for construction.

112. In view of the lack of suitable cognate items or class of items, as well as the questionable assumption underlying this method of including heavy capital goods in price statistics, a number of statistical offices are utilizing, or exploring, other techniques of compiling comparable price data on these commodities. These alternatives are based on compiling comparable price series for specified models of

important types of machinery or construction projects. One of these techniques involves computing price indexes of direct inputs for the model. Another technique is based on gathering or compiling data on producer's supply or cost prices for the model. A third technique consists of estimating the market price of specified capital goods from regressions of market price on strategic characteristics based on actual transactions in varieties of these capital goods. This is essentially an application of the hedonic approach to assessing economic worth that was discussed in the preceding part of the paper.

B. Specification of the Models

113. In most cases, an essential phase of the techniques listed above is defining the characteristics of the capital goods to be priced that are thought to be the key determinants of market price. It is preferable that these factors be considered from the point of view of both producers and buyers and that the model approximate the most common or typical combination of characteristics for which it is possible to assemble price data. Statistical authorities have therefore sought the assistance of trade representatives or important respondents in specifying models. In a few instances where price series are gathered from trade association or individual producers on the total cost or supply price of a model, statistical authorities have not furnished detailed specifications for fear of over-straining the co-operation of respondents.

114. Various approaches are employed in defining models for purposes of compiling price statistics on capital goods. The approaches utilized depend on factors such as (i) the methods and basic data utilized in compiling the price statistics, (ii) the characteristics and circumstances thought to be the important determinants of price, and (iii) the avenues of gathering information and the resources that are available for the work. In defining a number of the models in use, emphasis is placed on characteristics that are considered strategic to producers' supply or cost price. In some of the models, the specifications combine factors that are relevant both to producers' supply and buyers' demand price.

115. The most frequently used approach is to describe the model in terms of the physical and related operating characteristics with which the direct costs of producers are most closely correlated, for example, materials used, component

parts, dimensions and capacity, process of construction, and design. Such specifications are essential to weighting where price statistics are compiled from price series on inputs of materials and labour on the component parts of the model, or on the steps in producing it. Specification in these terms also furnishes producers who may be supplying data on cost or supply (bid) price of a model, a precise basis for making estimates.

116. This approach to defining models is especially common in the case of construction projects. In order to keep such models representative, changes will be required in the specifications as changes take place in the materials, components and processes actually utilized. Further, to attain representativeness at any one time, it may be necessary to specify a number of different models for each type of capital good.

117. Ways of describing models that take account of the points of view of both producers and buyers are utilized, or being explored, in some countries. In the centrally planned economies, for example, prices for heavy machinery are set in the light of cost or supply price per unit of potential output. In the United Kingdom, models of industrial plant or heavy custom-built machinery are defined in terms of output capacity per unit of time; and these specifications have been extended by adding criteria of the input of raw materials, and labour required to produce a given output. Producers are requested to provide figures of the total cost or supply price for various types of industrial plant or heavy machinery thus described.

118. In addition to including factors which are important to the price that buyers of the plant or heavy machinery would be willing to pay, this mode of specification would not require as frequent changes in specifications to maintain representativeness as those in terms of the physical characteristics of models. This is so because of the flexibility allowed in the materials and components to be employed. However, models defined entirely in terms of performance furnish less control on the methods respondents utilize to provide the price data and may not take account of important determinants of producers' supply price such as materials utilized in construction.

119. Still another approach to specifying models of capital goods is being explored in the United States. In this experiment, characteristics significant in explaining

the variance in the sales price of probability samples of single-family houses built with mortgages insured by a Government agency were identified through multiple regression analyses. About ten attributes reflecting considerations entering into producers' supply price and buyers' demand price (e.g., area, number of rooms, type of foundation and structure, income of buyer, climatic zone), were scaled and investigated. From the function relating sales price and the scaled attributes, various models of new single-family houses could be priced, for example, the average, most typical or other type of house during the past year, the current year, etc. The experimentation is considered to be a successful application of the hedonic approach.

C. The Price Statistics Gathered and Compiled

120. Index numbers of the prices of the principal raw materials consumed and the labour directly employed have often been utilized to measure price trends for construction projects and, to a lesser extent, for other types of heavy goods. These indexes are usually weighted in terms of the estimated quantity of each type of raw material consumed and labour employed in producing standardized construction projects or machinery during a base year. The index numbers therefore do not reflect changes in costs since the base year due to changes in the productivity of labour, in the efficiency with which raw materials are utilized, or in the types of raw materials consumed. The models for which the price indexes are computed may also become outdated and unrepresentative. These deficiencies in the price index numbers can be remedied by changing the base year of the index numbers, but it is often impracticable to make frequent changes of this type. Further, these index numbers do not take account of changes in supply price due to variation in overhead charges or profit margins.

121. To avoid the deficiencies of price index number of direct inputs, some countries are compiling index numbers of market or supply (bid) price of the physical components or key stages of model construction projects. For example, Canada and the Federal Republic of Germany are utilizing this approach; and the United States is exploring it. In the Federal Republic of Germany, quarterly series of data are gathered on bid (offer) prices for 160 standardized physical components or stages of construction projects. These series of quotations are

assembled into price index numbers for various models of residential and non-residential buildings, bridges, road work, etc. In Canada, contract prices if feasible, and bid prices, if not, are gathered on standardized steps in constructing roads and bridges. In the United States, an experiment is being conducted in the contract price of component parts or stages in the construction of apartment buildings. In all of these cases account is taken of the effects of changes in technological productivity, overhead costs, profit margins and so on. Attempts in the United Kingdom to gather and include data directly on changes in unit overhead costs and profit margins have not been too successful.

122. In the case of heavy machinery or transport equipment, some countries have sought information on the movement in prices by periodically (e.g., every quarter or month) gathering data on the total supply or cost price for representative models. For example, this approach is utilized in the case of ships in the Netherlands and the United Kingdom and in the case of industrial plants and heavy, custom-made machinery in the latter country. In utilizing this approach, efforts are made to adjust the specification of models to the characteristics of the capital goods being currently produced. Estimates of contract or bid prices for the models would of course be preferable to estimates of cost price.

123. In the United States, experiment with the hedonic approach mentioned above, the total sales price during various periods of time of a given type of new single-family house could be estimated from the fitted functions. The functions included a constant term representing the sales price of a single-family house of average characteristics other than those explicitly covered in the independent variables; and the coefficients of each class of the latter characteristics which were scaled indicated additions or subtractions from the constant term when the class occurred in the case of a defined model. Each class of the scaled attributes was noted as either present or absent.

IX. IRREGULAR AND GENERAL DISCONTINUITIES

A. The Nature of the Problem

124. Priced transaction may be discontinued temporarily because of seasonal patterns in the demand or supply of items or because of unforeseen events.

Seasonal discontinuities often occur in the case of food products or wearing apparel. Suspended imports of priced articles because of special quotas or duties are examples of irregular discontinuities. Discontinuities in priced transaction may result in distortions in price indexes when the price quotations are first excluded and then included, particularly where these quotations have a significant weight in the indexes. Ways of avoiding these discontinuities, either in the short-run changes or in the long-run trends, must therefore be devised.

B. Irregular Discontinuities

125. The appropriate method for dealing with irregular discontinuities in quotations depends to a great extent on whether or not the discontinued transactions carry considerable weight in price indexes or exhibited significant fluctuations in price. If the temporarily discontinued quotations have negligible weight, or have shown little flucturation in the past, it is appropriate to omit the quotations temporarily from the indexes; or, better, to carry forward the last available prices. The second alternative is easier to do and is less likely to result in illusory changes in the indexes.

126. Where the aforementioned conditions do not hold it is common practice to estimate the missing prices, based on price series for cognate items or groups of items. Use should be made of the most similar cognate variety or commodity, the price trends of which exhibited the greatest correlation with the price variations in the discontinued items. Where cognate items are not available, some countries carry forward the last available quotations for discontinued items, while other countries impute the price trends in the class of commodities closest to these items.

127. When the discontinued items again appear in the market introducing the actual price quotations into price indexes may result in sharp illusory changes in these index numbers. The sharp unreal changes might be eliminated by proporting the change in the level of the price quotations over each month or other interval of the period during which the items were not on sale. However, this can be a laborious procedure and probably should not be carried out except where reintroducing the price quotations gives rise to very marked distortions in published price data.

C. Seasonal Discontinuities

128. A common national practice in dealing with seasonal discontinuities in priced items is to carry forward the last acceptable price quotation between the time of its usual disappearance and reappearance on the market in sufficient quantity. The last acceptable price quotation might refer to some time before the disappearance of the items from the market because of the atypical price situation at the time of disappearance. Similarly, it may be desirable to wait some time after the reappearance of the item to replace the "dummy" price quotation.

129. In some cases, use is made of price data for cognate series to bridge the gap between the disappearance and reappearance of seasonal items. This approach might be taken where price trends, during the periods when the seasonal and cognate items are on the market, are similar. In a few instances, prices for seasonal items have not been included in compiling price data relating to the months or quarters during which these items are not on the market. If this practice is followed, the annual price statistics should include the prices of the seasonal items for only that part of the year when these items are on the market.

X. CONCLUSION

130. In view of the developments during the last decade, a number of suggestions have been made in this paper for extending and revising the recommendations on price statistics which the Commission adopted at the seventh session in 1953. These suggestions are based on the requirements for statistics of prices and national practices, problems and experiments in gathering and compiling these data. Also, included in this paper is a more detailed discussion of the methods and techniques that are embodied in the suggested guiding principles on the collection and compilation of price statistics.

131. The Statistical Commission may wish to invite the Secretary-General to engage in the following tasks in the light of the Commission discussions of this paper:

(i) Prepare a draft set of guiding principles and a supplementary technical report on statistics of prices for consideration by the Statistical Commission.

(ii) Study the problems, methods and techniques of pricing the sales of services.

(iii) Consult with national statistical offices and international statistical bodies, as necessary, in the course of this work.
