

DEPARTMENT OF INTERNATIONAL ECONOMIC AND SOCIAL AFFAIRS
STATISTICAL OFFICE

STATISTICAL PAPERS

Series **M** No. **76**

**PRICE AND QUANTITY
MEASUREMENT IN
EXTERNAL TRADE:**

Two studies of national practice



UNITED NATIONS
New York, 1983

NOTE

Symbols of United Nations documents are composed of capital letters combined with figures. Mention of such a symbol indicates a reference to a United Nations document.

ST/ESA/STAT/SER.M/76

UNITED NATIONS PUBLICATION

Sales No. E.83.XVII.7

01250

Inquiries should be directed to:

**PUBLISHING DIVISION
UNITED NATIONS
NEW YORK, N.Y. 10017**

Preface

This publication has been designed as a supplement to Strategies for Price and Quantity Measurement in External Trade, ^{1/} a technical report prepared by the Statistical Office of the United Nations Secretariat and published in 1981. Through the presentation of two case studies of national practice and experience, the present report aims to provide detailed practical guidance on the development and implementation of the two main approaches to price and quantity measurement in external trade. The relative merits of the two approaches and also of an approach combining the best features of each have been extensively discussed in the earlier report. Both publications should be of direct assistance to countries initiating work in this important area, as well as to those planning to improve existing work.

The two case studies in this publication have been prepared independently by national specialists in the respective methodologies. The first study, on the practice and experience of the Federal Republic of Germany in applying the survey pricing approach, was prepared by Siegfried Guckes, Chief of the Prices Division of the Federal Statistical Office. The second study, on the practice and experience of Norway in applying the unit value approach, was prepared by Svein Brenna, Chief Scientific Officer of the Central Bureau of Statistics. The authors have prepared these studies in their capacity as consultants to the Statistical Office of the United Nations Secretariat. The generous contribution of the Statistical Office of the Federal Republic of Germany in making the services of Mr. Guckes available for the project without charge is gratefully acknowledged.

The studies are presented substantially as drafted by the authors. Only minor editorial changes have been made by the United Nations Secretariat. No attempt has been made to incorporate systematically into the discussion the differing practices and experience of other countries. Where references of this kind do appear, they represent the authors' understanding of such practices and experience and have not been independently confirmed with the countries concerned.

The Statistical Office of the United Nations Secretariat wishes to express its appreciation to the Statistical Office of the Federal Republic of Germany and to the Central Bureau of Statistics of Norway for their co-operation in making the project possible. Responsibility for the views presented rests with the authors in their capacity as consultants to the Statistical Office of the United Nations Secretariat.

^{1/} United Nations publication, Sales No. E.82.XVII.3.

CONTENTS

| | <u>Paragraphs</u> | <u>Page</u> |
|---|-------------------|-------------|
| PREFACE | | iii |
| PART ONE. THE SURVEY PRICING APPROACH AS APPLIED IN THE FEDERAL REPUBLIC OF GERMANY | | |
| INTRODUCTION | 1 - 10 | 2 |
| I. NATURE OF THE INDEXES AND BASIS OF CALCULATION | 1.1 - 1.17 | 5 |
| II. DRAWING UP WEIGHTING PATTERNS AND ESTABLISHING GROUPS OF REPORTING AGENTS | 2.1 - 2.12 | 10 |
| III. SELECTION OF ITEMS FOR PRICING | 3.1 - 3.9 | 14 |
| IV. SECURING "PURE" PRICE COMPARISONS | 4.1 - 4.19 | 17 |
| V. INDEX CHECKS | 5.1 - 5.7 | 22 |
| VI. TECHNIQUES FOR PROCESSING PRICE MATERIAL | 6.1 - 6.4 | 24 |
| VII. PRESENTATION OF RESULTS | 7.1 - 7.8 | 25 |
| VIII. UTILIZATION OF RESULTS | 8.1 - 8.9 | 27 |
| <u>Annexes</u> | | |
| I. GUIDELINES FOR COMPLETING THE QUESTIONNAIRE ON SELLING-PRICE STATISTICS FOR EXPORT GOODS (EXPORT PRICES) AND PURCHASE-PRICE STATISTICS FOR FOREIGN GOODS (IMPORT PRICES) | | 29 |
| II. SHUTTLE LIST FOR IMPORT PRICE STATISTICS | | 35 |
| III. SHUTTLE LIST FOR EXPORT PRICE STATISTICS | | 37 |
| BIBLIOGRAPHY | | 39 |
| PART TWO. THE UNIT VALUE APPROACH AS APPLIED IN NORWAY | | |
| INTRODUCTION | 1 - 3 | 42 |
| I. BACKGROUND INFORMATION | 1.1 - 1.6 | 43 |
| II. SCOPE AND OBJECTIVES | 2.1 - 2.9 | 45 |
| III. NATURE OF THE BASIC DATA | 3.1 - 3.21 | 47 |
| IV. CONCEPTS AND DEFINITIONS | 4.1 - 4.24 | 51 |

CONTENTS (continued)

| | <u>Paragraphs</u> | <u>Page</u> |
|---|-------------------|-------------|
| V. RELATION TO NATIONAL ACCOUNTING WORK | 5.1 - 5.15 | 56 |
| VI. INDEX NUMBER FORMS AND REQUIREMENTS | 6.1 - 6.23 | 59 |
| VII. PROBLEMS OF PRICE MEASUREMENT | 7.1 - 7.49 | 67 |
| VIII. NATURE OF THE SOLUTIONS | 8.1 - 8.43 | 77 |
| IX. INDEX NUMBER CALCULATIONS | 9.1 - 9.44 | 87 |
| X. ORGANIZATION OF WORK | 10.1 - 10.14 | 95 |
| XI. ROLE OF FOREIGN TRADE INDEXES IN AN INTEGRATED SYSTEM ... | 11.1 - 11.7 | 98 |
| XII. PRIORITIES FOR INITIATING OR IMPROVING WORK | 12.1 - 12.15 | 100 |
| XIII. CONCLUSION | 13.1 - 13.5 | 103 |

Annex

| | | |
|---|--|-----|
| Table. QUARTERLY INDEX NUMBERS OF EXTERNAL TRADE OF NORWAY: VALUE OF SPECIMEN COMMODITIES AND COVERAGE | | 104 |
|---|--|-----|

Part one

**THE SURVEY PRICING APPROACH AS APPLIED IN THE
FEDERAL REPUBLIC OF GERMANY**

INTRODUCTION

1. Rather than discussing questions of a theoretical nature, such as the pros and cons of true indexes of foreign trade prices as compared with unit value indexes of foreign trade, the purpose of this study is to describe the procedures followed by the Statistical Office of the Federal Republic of Germany in calculating its indexes of foreign trade prices. These indexes are calculated and published continuously, in addition to unit value indexes of foreign trade. Theoretical problems are examined here only to the extent that they clarify the procedures discussed.

2. A few remarks are in order concerning the concept that provides the basis for the system of official national price statistics as a whole. This system has been developed to provide - parallel to the overall statistical picture of the economic flows of goods and services as they are recorded and presented in their movement from one economic stage to another or from one sector of the economy to another - an integrated picture of the development of the price component of these flows. With a national economy comprising a high proportion of exports and imports in the sales/purchases of the domestic sectors, as is the case in the Federal Republic of Germany, the overall price statistics picture would show too wide a gap if the representation of the price component in foreign trade were eliminated. Unit value indexes of foreign trade would not close this gap. It may be admissible in a list of statistical measuring instruments to approximate the unit value indexes to the price indexes, and it may even be tenable to consider unit value indexes as a kind of substitute for price indexes; but nobody can seriously maintain that unit value indexes are suitable for showing pure price changes in isolation from other changes in the development of the value of a group of commodities.

3. This brings up another characteristic feature of the system of price statistics used in the Federal Republic of Germany - the particular strictness of the price concept applied in the decomposition of the value changes of a group of goods and services into price and quantity components. The principles governing this decomposition proceed from the consideration that differing characteristics that may entail price differences at a given point in time will have to be imputed to the quantity component. The type and physical condition of a commodity is only one of these characteristics. (Reference will be made only to commodities, though the same applies, mutatis mutandis, to services.) Two commodities of identical quality and with the same quantity unit may have differing prices at a certain point in time because the related services provided with their sale differ. This applies, for instance, to transport services, stock-keeping, credit facilities and warranties. Differences of this kind are sometimes reflected directly in contracts of sale - for example, credit may be extended up to one month or up to three months. Sometimes such differences appear only in covert form in the terms of the contract - in the quantity supplied or the contract quantity, for instance. All characteristics that determine price must remain constant over time or must be imputed as constant if the pure price changes of an aggregate are to be covered and measured in isolation. Accordingly, all value changes in such an aggregate that are due to changes in price-determining characteristics must be assigned to the quantity component.

4. In this respect, hardly any major differences of opinion are expressed in international discussion. In price statistics, most statistical offices treat two commodities as different not only if they differ in type, quality and quantity (in

the narrow sense), but also when these characteristics are the same but the other price-determining characteristics vary. What may perhaps distinguish the Statistical Office of the Federal Republic of Germany from other statistical offices are the conclusions it draws from this practice with respect to questions of principle, such as the question whether unit value indexes can be transformed into suitable substitutes for true price indexes. This question is answered in the negative if the transformation is to consist only of breaking down the relevant aggregate of commodities, such as exports or imports, to the degree that the elementary unit value indexes relate in the individual case to homogeneous groups of commodities only and if the homogeneity resides only in the physical similarity of the individual products. For example, crude oil is a relatively homogeneous commodity. If, however, in two consecutive months, large shipments supplied on the basis of long-term import contracts are followed by smaller quantities bought on the spot markets, or if, after receiving imports from Venezuela, crude oil is received from Saudi Arabia, the unit value index of imports for crude oil may, even with complete price stability in the individual components of the flow, show major monthly changes with the changing sources.

5. To examine this point from another angle, the Statistical Office of the Federal Republic of Germany considers price observation not so much as relating to a selection of commodities as referring to a selection of purchase contracts. Only the purchase contracts relate - expressly or implicitly - to all those price-determining characteristics that have to be accounted for, if prices are to be observed and their changes measured.

6. The reference to purchase contracts brings up a further feature of the price statistics concept employed in the Federal Republic of Germany. To use a German technical term, this is the zeitlicher Preisschnitt (time-references of prices) - the point in time at which a price is to be shown in price statistics as existing or valid. In the majority of purchase operations, four points in time are relevant to the parties involved: (i) the time from which the offer price of the seller applies; (ii) the time at which the price is agreed upon; (iii) the time when the commodity is delivered to the buyer; and (iv) the time when payment is effected. Of these four point in time, the first and fourth may be set aside as less important, the first because there may not be any transaction corresponding to the offer price or because the price eventually applying may differ from the offer price. (It should, however, be noted that there are price statistics for which most statistical offices normally make use of the time at which the offer price applies - as in the case of retail prices - or the time when payment is made - as in observing the development of rents.) As a general rule, for all price statistics the Federal Statistical Office refers to the time at which the contract is concluded. Broadly speaking, this is because the actual object of price statistics is seen as residing in the realized purchases rather than in the physical world of goods.

7. In respect of actual market transactions, it should further be noted that price formation - the fixing of a price - takes place at the conclusion of the purchase contract, not before and not after. The selection of a relatively early point in time, which always precedes, sometimes even by several months, the physical delivery of the commodities, or even the further processing of the commodities, is mostly considered an advantage. Price indexes that relate in point of time to the setting of prices are, so to speak, directed into the future. They are particularly well-suited to those purposes of economic policy and analysis where the early definition of economic processes is of special importance.

8. However, for indexes of foreign trade prices, this time-reference of prices also has a disadvantage - namely, the difference that arises with the statistics of export and import values. These, in principle, refer to the time when commodities cross the border. The unit value indexes of foreign trade, on the other hand, are synchronous with the measures of export and import values because they have been derived from these values and the relevant quantities. Where synchronization is the prime concern, the unit value indexes of foreign trade are of advantage. On the other hand, they cannot fill the gap in a system of statistics of contract prices when true price indexes are not calculated for foreign trade.

9. In calculating its foreign trade price indexes ("International Price Indexes"), the International Prices Division of the Bureau of Labor Statistics of the United States of America, uses a time reference that differs from that of the Statistical Office of the Federal Republic of Germany. For the reference period (the first two weeks of the third month in each quarter), the Division collects export/import prices of commodities exported/imported during this period. In Finland and Sweden, the indexes of foreign trade prices also refer to the time of delivery of the commodity.

10. In order to assess the extent of the time-disparity between the indexes of foreign trade prices and foreign trade statistics in the Federal Republic of Germany, the Federal Statistical Office some years ago asked the firms reporting foreign trade prices about the time difference between the conclusion of a contract and the point at which the relevant commodities crossed the border. With relatively large differences between various types of commodities, there was, on a weighted average, a time difference of about eight weeks for exports and about nine weeks for imports. This information, which on a higher level of aggregation is also available for group indexes, enables the indexes of foreign trade prices to be used to reflect the price situation at the time when the commodities are crossing the border.

I. NATURE OF THE INDEXES AND BASIS OF CALCULATION

1.1 Before explaining in greater detail how the Statistical Office of the Federal Republic of Germany calculates the indexes of export and import prices, we shall briefly indicate the nature of these indexes and the basic principles guiding their construction.

1.2 The indexes of foreign trade prices of the Federal Statistical Office are weighted averages of price relatives calculated on a monthly basis for a representative selection of export/import commodities. They thus measure and present the pure price development in merchandise trade with foreign countries. Prices of services are not considered and all transactions with the German Democratic Republic are excluded. The prices for which the changes are measured are those agreed to in the month of the survey and presentation in the index and relate to prices free at border. For imports, the indexes exclude importers charges, such as customs duties, price-adjustment levies, currency-conversion compensation payments and turnover tax. For exports, the indexes exclude value-added tax and taxes on consumables, such as the mineral-oil tax, tobacco tax and spirits tax. It should be noted that the indexes of export and import prices for the United States, mentioned above, are calculated on a quarterly rather than a monthly basis.

1.3 The reference value of these price indexes - the total value of the transactions covered and presented separately - is the export/import value in the base year of the index (at present, it is 1976) as shown by the foreign trade statistics of the Federal Republic of Germany. However, the entire export/import value is not used as the index reference value. Not considered are some commodities for which the information required for price measurement cannot be obtained (military goods, for example) or for which, owing to the nature of the items, pure price changes cannot be determined with sufficient reliability, either directly or indirectly, by having them represented by other items that are better suited to price observation (antiquities and art objects, for example). On the whole, the reference value is 4.5 per cent less for exports and 5 per cent less for imports than the total value of exports/imports for the base year as shown in the foreign trade statistics.

1.4 The indexes of foreign trade prices for Finland and Sweden, on the other hand, relate to 100 per cent of the export and import values in the base year. The indexes of the United States of America are still in preparation. It is their objective to cover all merchandise trade with foreign countries, except trade involving military goods. At the present time, just under two thirds of the total value of exports and about 50 per cent of the total value of imports is accounted for by price indexes. Indexes of foreign trade prices for raw materials and semi-finished products are still lacking in the United States, though price measurement normally causes fewer difficulties for these commodities than for industrial finished products.

1.5 While the reference values of all other price indexes calculated by the Statistical Office of the Federal Republic of Germany for analytical purposes can be allocated to an institutionally definable sector of the national economy (the price index of trade and industry to trade and industry, the consumer price index to private households), this does not apply to the indexes of foreign trade prices nor to their partial indexes. The indexes of foreign trade prices are indexes

relating to economic stages and not economic sectors. They are characterized only by the fact that the goods whose price development they are intended to measure are the object of transactions with foreign countries. It is unimportant that the German exporter/importer belongs to a specific sector of the economy. In order to measure the export prices for products of mechanical engineering, for example, a representative selection of enterprises exporting such products is questioned, no matter whether the enterprises are part of this or another industrial group or of the wholesale trade sector.

1.6 This approach is not self-evident and is not applied in the same way by all countries in calculating true indexes of foreign trade prices. The concept closest to the one employed by the Federal Republic of Germany seems to be that of the United States. The reference value of the United States indexes of foreign trade prices is referred to as the "product universe purchased from abroad by United States residents" or "sold by United States residents to foreign buyers". In Sweden and Finland, however, export prices for the partial indexes for manufacturing are reported by producers but not by exporters in wholesale trade. The reason is that the two countries calculate from the index of export prices, and from the corresponding index of producers prices for sales on the domestic market, a price index for the total sales of manufactured products, and they wish to have uniform price material relating only to the sales side of the producers of manufactured products.

1.7 The Statistical Office of the Federal Republic of Germany also calculates a total index of selling prices for industrial products from the index of producers prices of industrial products for domestic sales and the partial index of export prices for industrial products. In so doing, it accepts the fact that the index of export prices for industrial products is compiled on the basis of price series derived in part from price returns from wholesalers. It puts up with this deficiency since it is not possible to find a really "clean" solution for the combination of price series of domestic sales and the series of export prices, the former being essentially established from "ex works" selling prices and the latter referring to selling prices free at border.

1.8 Like all the price indexes of the Federal Statistical Office that are calculated for analytical purposes, the indexes of foreign trade prices are (in contrast to the deflator price indexes) determined according to the following version of the Laspeyres formula:

$$I_i = 100 \cdot \frac{\sum_i w_i \left(\frac{P_i^t}{P_i^0} \right)}{\sum_i w_i}$$

where t = time of observation

w_i = value share of commodity variant i in the base year

P_i = price of commodity variant i

0 = base year

1.9 The Laspeyres character of the indexes of foreign trade prices used in the Federal Republic of Germany is limited to retaining unchanged the index weights of the base year. It does not relate to the selection of the goods, for instance, in the sense that the specifications of goods actually imported or exported in the base year are to be retained as long as these specifications exist. For reasons that will be explained later, the Federal Statistical Office replaces the specifications of goods originally selected if those specifications substantially lose their importance in exports/imports. This principle also applies to all price indexes of the Federal Statistical Office.

1.10 Goods that are novel in respect of major physical features or economic characteristics and that appear on the market after the base year are included in the index programme after the change-over to a newer base year, provided that they have achieved sufficient importance in exports/imports. Hence, there is a distinction between similar successor goods on the one hand and novel goods on the other. Only the former are included in the index calculations before a change-over is made to a more up-to-date index base when the original specification loses substantially in market importance. Although this is the general rule, the special circumstances of an individual case may occasionally lead to a departure from this principle and to the inclusion of a really new kind of item in the survey and calculation programme. The introduction of colour television sets may serve as a case in point. Though these television sets must be considered a new kind of product as compared with black and white sets, they were already included in the index tabulations before general index revision. If this had not been done, there would have been available for the price representation of television sets on the export market only price series relating to a rapidly shrinking partial market, with price development in this market in direct contradiction to price development in the overall market.

1.11 The Federal Statistical Office is thus opposed to the view taken by some statistical offices that such deficiencies inevitably arise from the application of the Laspeyres formula and that they have to be accepted once the decision in favour of this formula has been taken. It takes the position that when applying the Laspeyres formula, it is permissible to form price relatives reflecting the actual price situation. Thus, it takes into account the following considerations:

(a) Price relatives corresponding to a strict Laspeyres concept - that is, relating to the specifications of goods purchased or sold in the base year - can in a period of several years be calculated only for a few types of basic foodstuffs, raw materials and semi-finished products; finished industrial products generally are subject to such fast changes that the variants of goods originally included have disappeared from the market after a short period and been replaced by successor variants;

(b) For cost reasons, it is not possible to effect special price collections for the Paasche price indexes required for deflation. Rather, deflator indexes and the Laspeyres price indexes required for analytical purposes must be calculated on the basis of one and the same price collection programme. This programme has to be established in such a way that it permits the compilation of current realistic price-related instead of Laspeyres-oriented or Paasche-oriented measures.

1.12 As already explained in the preliminary remarks, the indexes of foreign trade prices of the Federal Statistical Office must be considered as part of a general system of price indexes. For this reason the base year for the foreign trade

values from which the index weights are derived is chosen not in isolated consideration of these indexes alone but with a view to the overall system of price indexes and to the total set of economic indexes compiled by the Federal Statistical Office. Moreover, the recommendations of international organizations, especially of the European Economic Community (EEC), are also considered. In these circumstances, it is of limited value to look into the question of which base year (and what periodicity for future changes in base year) would seem to be most appropriate with regard to the measurement of foreign trade prices.

1.13 At the present time, 1980 is the general base year used in the Federal Republic of Germany. In future, allowance will presumably be made for the five-year rotation suggested at the international level, unless one of the years to be considered under this scheme (1985, 1990 and so on) should prove unsuitable because of extreme general economic conditions in the Federal Republic of Germany (as was the case with the internationally recommended year 1975). Though the selection of a general index base year cannot be determined by the pros and cons in respect of foreign trade prices, the question nevertheless arises of how to assess the selection made in the Federal Republic of Germany and the rotation planned for the future.

1.14 All price indexes calculated in the Federal Republic of Germany for analytical purposes are continued and published in terms of the last base year until the computation of a new index on a new basis has been completed. As the greatest part of the work on the calculation of a new index cannot begin until the statistical results for the new reference value are available, as a rule a period of several years will elapse after the end of the new base year before the first results of the new calculations are available. Thus, the new indexes of foreign trade prices on base 1976 were published for the first time at the end of 1979. However, this makes it possible to compare the figures of the old and new indexes over several years. It seems noteworthy that when considering all index changes made so far by the Federal Statistical Office (1950-1958, 1958-1962, 1962-1970 and 1970-1976), this type of comparison revealed a greater difference between the old and new indexes of foreign trade prices than was the case for other price indexes. This justifies the conclusion that, at least as far as the situation in the Federal Republic of Germany is concerned, it seems even more important for the indexes of foreign trade prices than for the other price indexes to switch to a newer index shopping basket after not too long a time. The structural changes of import and export values obviously are more pronounced than the structural changes of the reference values of the other price indexes. This should not come as a surprise if one considers the implications for international trade of the volatility of exchange rates, which has existed now for many years, and of the shifts in international purchasing power resulting from the price increases for oil.

1.15 The indexes of foreign trade prices calculated in the United States of America and in Sweden at the present time are based on shopping baskets selected some years ago. In the case of the United States, shopping baskets date back to 1973 (with rebasing to the reference year 1967 = 100); while in Sweden, the shopping baskets date back to 1968, which is also the reference year. In Sweden, there have been plans to revise the index weights at least every six years, but this has not been put into practice so far because of the time and effort involved in making the revision. With regard to the United States indexes, allowance has to be made for the fact that these are being used mainly as partial indexes for individual commodity groups. This means that the distance from the original base year is of less importance. The indexes in Finland relate to the year 1975 and

will shortly be rebased to 1980, like the indexes in the Federal Republic of Germany. In the future, the intention is to make new calculations every five years.

1.16 After reviewing the experience of the Federal Republic and the plans concerning the change in the index base year, the remarks in paragraphs 1.1 and 1.2 above can be supplemented by stating that the indexes of foreign trade prices primarily serve for short-term and medium-term price comparisons. For long-term comparisons, only chain indexes are available. Strictly speaking, such chain indexes exist only for exports and imports as a whole and for some of the larger groups of goods; they are provided to the user upon request. For all other groups of goods where indexes are published currently, the Federal Statistical Office publishes linking factors enabling interested parties to link the up-to-date series with the series in question in terms of the last general index base year. Obvious reservations apply to a long-term index series formed in this way: nobody knows to what extent an index change occurring during a period that includes one or even several changes of the base year is due to pure price movements or to differences between the index shopping baskets.

1.17 Parenthetically, it should be noted that the price indexes of the Federal Statistical Office calculated in terms of a particular base year do not always start in January of that year. In order to minimize the break within the series (in terms of the preceding base year) caused by linking, the indexes are normally calculated back to a point in time preceding the new base year and using the new shopping basket. For example, the price indexes on base 1970 begin in January 1968 so that the linking of the 1970 series with the series on base 1962 can be effected from January 1968.

II. DRAWING UP WEIGHTING PATTERNS AND ESTABLISHING GROUPS OF REPORTING AGENTS

2.1 This chapter deals with the individual steps taken in compiling indexes of foreign trade prices. They involve a question of methodological principle on which the Federal Statistical Office takes a differing view and decides in a different way from some other statistical offices. This is the question whether the selection of goods and reporting agents should be made by a random sample or in a direct (judgemented) manner.

2.2 The Federal Statistical Office does not use probability samples for its indexes of foreign trade prices or for any other official price statistics. This is a practice contrary to that of the International Prices Division of the United States Bureau of Labor Statistics, for instance, which has unreservedly decided in favour of the random sample for the selection of goods and reporting outlets and has systematically substituted random samples for the "judgement samples" it had originally been using. The Central Statistical Office of Finland also selects goods and reporting agents on the basis of random samples; however, in contrast to the position of the United States, the trend in this case may be away from the principle of random sampling.

2.3 The Statistical Office of the Federal Republic of Germany bases its practice of selecting goods and reporting agents only in a purposive way, rather than by random selection, on the following considerations. According to the very general principles discussed in the introduction, only goods with definite specifications (as to quantity unit and quality, as well as to payment arrangements and other conditions of the purchase contract) can in the last analysis be selected. (It is for this reason that the selection of goods according to these principles is, strictly speaking, a selection of purchase contracts.) There are, however, no records at all on the totality of the transactions involving goods with different specifications. Therefore, a delineation of the universe required for any random sample is lacking. A complete record of export/import values at the lowest level of the commodity classification is certainly available. In the foreign trade of the Federal Republic of Germany, there are about 9,000 individual items from the Commodity Classification for Foreign Trade Statistics. (As each of these items has a commodity number of its own, it has become the general practice in foreign trade and customs affairs to call the items themselves "commodity numbers". In the present report, we shall continue to refer to them as "individual items".) Although in terms of this classification these are commodities in the sense of price statistics, they frequently constitute combinations of numerous transactions involving differing specifications whose complete representation would require formation of an equally great number of individual price relatives. One could, to be sure, provide for a multistage sampling procedure by first drawing a random sample from the 9,000 items and then effecting a random sample of the individual specifications for each of the items included in the selection. But, as explained, there is no record containing all the specifications existing in each case.

2.4 Thus, the procedure of random sampling would be applicable only at the first stage, in respect of the 9,000 items of the commodity classification. But at this stage the question of a sample or a purposive selection does not arise in practice, because in fact a "cut-off limit" is drawn in such a way that all items under a certain value limit are excluded entirely. As to the positions above the cut-off limit, the statistics of foreign trade prices constitute a total enumeration.

2.5 In any case, for the selection of individual specifications under a given item, the Federal Statistical Office would not draw a random sample even if a complete list of these specifications were available. If the price collections were to be based on a random selection of specifications, it would very soon turn out to be impossible to collect continuously comparable prices for some of these specifications. Of the specifications that actually would be suitable for continuous price comparisons, some would have such a low representation effect that a cost-benefit analysis would show that the time and effort involved in the relevant survey and calculation work would not prove rewarding and that it would be necessary to refrain from including them. Such losses, which would differ in importance from position to position, would have the effect of impairing the random character of the original selection and, in very grave instances, even of completely destroying it. Of course, the nature of a random sample is not that all cases have the same chance of being pre-selected, but rather that all cases have the same chance of becoming part of the universe actually observed.

2.6 Relevant considerations in the selection of reporting agents have induced the Federal Statistical Office to make a purposive selection instead of drawing a random sample. As far as the technical preconditions are concerned, a random sample of reporting agents would, in contrast to a random sample of specifications, be quite possible. A list of all exporters and importers could be obtained. It would also be possible to make a stratification by size class, so that firms with higher export/import values could be given a correspondingly greater chance of being included in the selection. But there too such a great number of losses would occur after the initial price collection work that the random character of the selection would be largely lost. For one thing, selected reporting outlets that are not prepared to provide the price data (and complementary information needed for the pure price comparison) would have to be eliminated because the Federal Statistical Office is of the view that information obtained by legally requiring firms to comply with reporting laws is likely to be unreliable. Also, there would be other reporting outlets that, though prepared to co-operate, had not effected any sales/purchases suitable for showing genuine price changes. This case is of greater importance for the price statistics of foreign trade than for price statistics of domestic sales, because price statistics of foreign trade involve, in addition to the generally applicable requirements, that of keeping constant the country of destination consignment.

2.7 For the reasons given above, the Federal Statistical Office does not use random samples for calculating price indexes. While recognizing these reasons, critics have repeatedly described the renunciation of random samples by the Federal Statistical Office as questionable on the grounds that it becomes impossible to measure the defectiveness of the price indexes. These critics overlook the fact that according to all experience, the magnitude of the sampling error, which alone can be measured, is far smaller than those errors that (a) are due to deficiencies in the information provided by firms that report reluctantly or are unsuitable for other reasons or (b) are attributable to deficiencies resulting from the inclusion of inappropriate goods in the comparisons. Above all, they overlook the fact that purposive selection is designed particularly to avoid these grave errors.

2.8 How does the Federal Statistical Office proceed with its purposive selection? To prepare the selection of goods, a preliminary draft of the weighting pattern is first made. This is a presentation of the reference value for the new index of export/import prices, classified in terms of the 9,000 individual items of the Commodity Classification for Foreign Trade Statistics; these are the positions

with a seven-digit number. The groups of goods mentioned earlier that cannot be shown either directly or indirectly in price statistics are excluded. The next operation is to distribute among the other individual positions the value amounts of those individual positions whose export/import values are below the "cut-off limit". The eliminated individual positions accordingly are represented in the index by other individual positions. The distribution of the eliminated positions among the remaining individual positions could, within the combinations of commodity groups, be made at the next higher stage of aggregation of the foreign trade classification. This would be justifiable if this classification were constructed in such a way that goods with a similar price development were always aggregated. However, this is not the case. Nor can such an objective be expected for the other commodity classifications of official statistics. Therefore, the commodity classification whose structure comes closest to this objective has to be determined. It was found that this is most likely the case for classifications whose commodities are grouped according to their interrelations in production. This principle of classification is used for industrial products in the Commodity Classification for Industry Statistics and for other products in the Classification of Products in Agriculture, Forestry and Fisheries. Before redistributing the eliminated positions to the other individual positions, all individual positions were arranged according to these two classifications.

2.9 The redistribution yields a list of individual positions from which those goods that are to be used as a basis for price collection must be selected. Together with the export/import values (which in part have been increased owing to the redistribution), this list already represents a rough version of the weighting pattern of the index. The detailed version of the weighting pattern directly used for continuous index calculation is obtained by simply distributing the export/import values for the individual positions among the various goods selected for this purpose. Parenthetically, it might be mentioned in its detailed version, this weighting pattern has several additional codes that are used in the process of computerized index calculation and permit the results to be shown according to different commodity classifications and broken down into groups of countries.

2.10 The construction of the detailed weighting pattern thus presupposes the selection of individual goods for comparison. This selection, however, is not made following the selection of the smallest commodity groups for which foreign trade values are shown - that is, after the selection of the so-called individual positions - but at a later stage of work, once the reporting agents have been selected, the great majority of which are export/import enterprises. This sequence is explained by the fact that the Federal Statistical Office selects the goods for comparison only in co-operation with the reporting agents. Strictly speaking, it is the reporting agents who select the goods for comparison. The co-operation of the Federal Statistical Office is generally limited to determining for the reporting agents the individual positions - the smallest commodity groups from which the goods for comparison have to be selected. In its "Guidelines for completing the questionnaire on selling-price statistics for export goods (export prices) and purchase-price statistics for foreign goods (import prices)" (see annex I below), the Office further prescribes the principles that firms must consider in selecting goods for comparison.

2.11 As already mentioned, the selection of the reporting agents is not made according to a random sample but by purposive choice. The information derived from foreign trade statistics on the exporters/importers with the highest export/import values for a specific individual position is used for this purpose. In a further

phase of processing those pre-selected firms that are not continuously, or at least for the major part of the year, effecting greater exports/imports are excluded. The relevant information from foreign trade statistics is combined with further data from other sources and in part from the reporting agents themselves - that is, with data designed for making a final selection - which with a given inquiry effort, permits maximum price representation of the foreign trade values.

2.12 The method of selecting the reporting agents is thus also determined by an economic principle. This principle plays a part in other countries, too. An additional aspect of the system applied in the Federal Republic of Germany is, however, that the official surveys of price statistics are performed pursuant to a specific law and that this law prescribes a limit to the number of respondents (which has not been raised since 1958). At the present time, export and import prices are reported by a total of about 4,400 reporting agents. In Sweden, the number of reporting agents for statistics of foreign trade prices is about 900; in Finland, about 600. Given the structure and volume of foreign trade in Finland and Sweden, the number of reporting agents is comparable with the number in the Federal Republic. The number of agents reporting the statistics of foreign trade prices in the United States of America, however, (already some 14,000 enterprises at the present stage, where only half of the total value of imports and just under two thirds of the total value of exports are being covered) provides a much better foundation for index computations than does the number in the Federal Republic.

III. SELECTION OF ITEMS FOR PRICING 1/

3.1 After the reporting firms have been chosen, they are asked to select items for pricing for one (or several) individual position(s) - that is, individual "commodity numbers" of the commodity classification - to be used in future continuous price reports. According to the directions distributed for this purpose, these should be items with the following properties:

(a) The item should account for the greatest possible value share within the export/import programme of the firm;

(b) The item should preferably be suitably representative of other commodities in the export/import programme of the firm with regard to price development;

(c) The item should be particularly well-suited to measuring true price changes - that is, it should have the least possible variability in price-determining characteristics.

3.2 With a given amount of time and effort invested in collection work, maximum representativity of the indexes of foreign trade prices should be achieved. One purpose of the property described in paragraph 3.1 (a) above is to ensure that there are as few gaps in the series of individual prices as possible, so that makeshift solutions (which may always be defective) need be applied only in a few cases to close the gaps.

3.3 In the case of paragraph 3.1 (c), the objective is also to avoid errors: items whose price-determining characteristics are subject to frequent changes should, wherever possible, be avoided because the makeshift solutions for eliminating non-genuine price changes from the price series are too uncertain and hence defective. This aspect is not without problems since the elimination from price observation of all items with frequently changing characteristics would, strictly speaking, be justifiable only if it could be assumed that those items would also be represented in their price development by other items included in the price observation. This is, however, highly uncertain. There are definite indications, for instance, that items whose quality has remained unchanged over a long time are subject to cost conditions different from those of items whose physical condition is changing continuously. Thus, highly rationalized and capital-intensive production would be much more feasible in the case of products whose technical make-up remained the same for a long time than for commodities whose outward shape, for instance, must constantly be adapted to changes in fashion. But it would be unwarranted to conclude from this fact that, for instance, standard leather shoes for men have a different price development from fashionable leather shoes for women, or that the prices for leather portfolios are

1/ As this chapter does not deal with the selection of goods on the basis of the Commodity Classification for Foreign Trade Statistics but with the selection of individual specifications as observation objects for continuous price reports, the terms "priced items" and "specifications" will be used.

taking a course different from ladies leather handbags, particularly since the impact of cost conditions on pricing depends on the type of cost calculation actually practised. Perhaps the buyers of standard leather shoes for men must, owing to a corresponding cost allocation, contribute to the permanent "development expenditure" occasioned by the continuous adaptation of form, colour and kind of leather tanning to the changes of fashion in the case of ladies leather shoes. In the last analysis, the question of the differing price development of two types of goods, one of which eludes the possibilities of price measurement, is academic.

3.4 Of practical importance, however, is the problem of neglecting items whose price can be measured only with great difficulty, where large categories of goods and entire sectors of the economy may be involved. In such cases, gaps would occur which would be detrimental to the overall index. This danger actually exists in respect of the building of large ships, the construction of large machinery and plant construction. For this reason and to prevent firms from refusing to file price reports, the Federal Statistical Office provides the reporting firms of these branches of industry with additional indications and recommendations. Makeshift solutions suggested in such cases are discussed in chapter IV below.

3.5 The Federal Statistical Office considers the selection of the best-suited items for pricing to be one of the most important problems of price index computation. It regrets that for reasons of economy it has to content itself only with giving the firms selected for the price reports directives by mail. The International Prices Division of the United States Bureau of Labor Statistics, however, is able to follow a much more effective practice. After being informed of the kind of reports they are expected to supply, each of the selected reporting firms is visited by a staff member of the Division. This staff member is first given information about the particular situation of the firm; he then selects, together with the enterprise, the item to be used as a basis for the price reports and arranges all the details of reporting.

3.6 Another important feature of the directives issued by the Statistical Office of the Federal Republic of Germany relates to the price-determining characteristics the reporting firm must define for each of the selected items and must set out as completely as possible in the survey questionnaire. The firm is expected to select the individual price-determining characteristics in such a way that they describe generally the most frequent type of sales contract in use currently and presumably also to be used in the future. This provision also aims, on the one hand, to ensure maximum representativity of the price series to be established and, on the other hand, to prevent the development of too many gaps in this series.

3.7 The price-determining factors listed in the directives can be summarized as follows:

(a) Item description, with all the details relevant to the price level (a brief description, for example, of a model or type number is sufficient if all these details are thus defined);

(b) Quantity unit;

(c) Quantity purchased, as specified in the contract;

(d) Quantity supplied (if the quantity purchased is supplied in several parts);

(e) Country of destination (for export prices) and country of consignment (for import prices);

(f) Means of transport;

(g) Freight situation (for example, ex works, free at border); if possible, export prices should relate to "free at German border" or f.o.b.; if necessary, import prices must be converted to "free at German border" or "c.i.f. German seaport";

(h) Type of packing;

(i) Terms of payment.

3.8 Additional indications are intended to ensure that further characteristics are recorded as "price-determining characteristics" if a price also depends on other agreements. (There are, for instance, sales contracts where the buyer is granted an additional price advantage if he purchases within a year a specified minimum quantity or agrees to take deliveries within certain periods.) Conversely, it is not necessary to include a prescribed characteristic if it is of no importance in determining the price charged (for instance, if the price is sometimes determined only by the quantity supplied and not by the quantity agreed upon in the contract). Nor is it necessary to indicate individual countries of destination if the export price is, for instance, the same for all countries in Europe or in South America. It should also be mentioned here that all reporting firms are requested to state, wherever possible, several prices for a priced item - namely, the prices charged for exports to or imports from a country in each of the following groups of countries:

(a) States members of the European Communities (EC);

(b) Other industrialized countries of the West;

(c) Developing countries (excluding States members of the Organization of Petroleum Exporting Countries (OPEC));

(d) OPEC countries;

(e) State trading countries.

3.9 Very often the reporting firms are unable to supply the prices indicated above. This explains why the Federal Statistical Office could not fully realize its plans to break down its indexes of foreign trade prices according to the above-mentioned groups of countries. The differentiation by country of destination or of origin in the price reports permitted only breakdowns of (a) the overall indexes of exports and import prices by EC and outside countries; (b) the overall index of import prices by other industrialized countries of the West, by developing countries (excluding OPEC countries) and by OPEC countries; and (c) the overall index of export prices in terms of other industrialized countries of the West.

IV. SECURING "PURE" PRICE COMPARISONS

4.1 The provision and fixing of price-determining factors alone does not ensure the recording of only genuine price changes. This also presupposes a regulation, applied to both the reporting firms and the Federal Statistical Office itself, by which the genuine price changes are determined if one of the prescribed price-determining characteristics changes. The relevant instructions for the reporting firms are quite simple: the firms are to report, in addition to the price return for the changed sales contract of the reference month, a comparative price for the previous month, the so-called "comparable price of the previous month". Thus, the effective difference between the price of the reference month for the new sales contract and the previous month's price for the former sales contract is split into two parts, the genuine and the non-genuine price differences. The calculation procedure, for which the previous month's price, reported subsequently for the new sales contract, is used, is also simple: the basis price is corrected in conformity with the ratio between the comparable price of the previous month (Pt) and the price that had actually been reported in the preceding month (Po) for the former sales contract, so that in the quotients $\frac{P_t}{P_o}$ the denominator again relates to the same contract as the numerator. The formula approach for this operation is explained in greater detail by the Central Statistical Office of Finland in Studies No. 56: Producer Price Indices - Methods and Practices. The basic formula is the same as the one used by the Statistical Office of the Federal Republic of Germany. Moreover, the Central Statistical Office of Finland makes special provision for a distinction according to the direction of the genuine and the non-genuine price change.

4.2 The real problem, however, is not the kind of formula to be applied in the calculations but the valuation of that part of the total price difference between the new and the former sales contract which has to be assigned to the non-genuine price change. It should first be emphasized that this valuation generally is much more difficult to make for changes in the quality of the items to be observed than in the case of changes in other price-determining characteristics. If there is, for instance, a change in the means of transport employed to bring an export commodity to the border or the seaport, the reporting firms normally have no difficulty in stating what the comparable f.o.b. price for the previous month would have been. The situation is similar as far as changes in packing, terms of payment and the like are concerned.

4.3 It should also be mentioned that there is no really satisfactory solution to the much more difficult question of valuing quality changes. With this in mind, and noting that other countries have experienced a similar difficulty, the Federal Statistical Office has concluded that it is important to ensure that the number of cases for which it is necessary to distinguish between genuine price changes and quality changes is not too great.

4.4 The Federal Statistical Office is considering, as an appropriate means to this end, advising the reporting firms not to retain the selected priced items for too long but to switch to another item (usually the "successor product") or to other specifications when the item observed so far (or one of its price-determining characteristics) is losing too much market-share. If possible, the change-over should be made when the former sales contract is still available and the new sales contract is already sufficiently representative. In such cases, it can, as a rule be presumed that the price difference between the former and the new sales

contracts does not contain a genuine price difference since both are in price competition with each other, but that it corresponds fully to the difference in price-determining characteristics. If this assumption is justified, the entire price difference can be eliminated by a simple linkage of the former price series with the newly established series. The difficult problem of breaking this difference down, which frequently cannot be solved satisfactorily in practice, consequently does not arise.

4.5 The number of cases where this problem cannot be avoided and has to be solved is rather large. The problem arises especially in cases where the new price-determining characteristics appear only after the price-determining characteristics considered thus far have disappeared. If price-determining characteristics other than the quality of the goods are involved, it will as a rule be possible to find a satisfactory solution even if the new and the old characteristics do not co-exist. There will often be considerable difficulties, however, in the case of a quality change that occurs without overlapping of the new and old qualities.

4.6 Clearly, the main reason for the difficulties involved is that the quality of an item, in terms of its importance for the purchaser, as a rule is not determined by a single characteristic but by an entire set of characteristics. Therefore, the utilization of multiple regression equations suggests itself as a means of establishing the relationship between the individual characteristics of an item and its price. The Federal Statistical Office has experimented with this procedure but for various reasons has not obtained any useful results. On the one hand, it was found that the calculation results contained large unexplained "price remainders", owing to the fact that characteristics that could not be quantified (for example, "status value") had to be excluded, as did certain quantifiable characteristics for which no relevant records were available (for example, serviceability, susceptibility to repairs, useful economic life). Difficulties also arose in connection with the attempt to select characteristics that were independent of each other with regard to their relation to price. And for some characteristics, the relation to price did not follow a rectilinear course. Existing regression approaches are useless if the quality change has resulted from entirely new characteristics. There are also practical reasons advising against the use of multiple regression equations. First, as a precondition for reliable results, voluminous price material must be available with data for as many variants as possible. In addition, the establishment of multiple regression equations, especially if several experimental calculations are necessary, requires more time than is available in the course of the monthly index processing (14 days as a maximum).

4.7 Under these circumstances, the Federal Statistical Office has to content itself with having the reporting firms determine the required "comparable price of the previous month", in the case of quality changes, only by means of rough estimates. If the firms do not find their own solutions to this problem and ask the Federal Statistical Office for advice, the Office normally recommends an evaluation of the quality difference on the basis of the increase (or decrease) of the relevant costs. From a methodological point of view, this is not entirely satisfactory because the market-related valuation of quality characteristics - which actually is what matters - often has another relation to the price than would be expected from the cost calculation. (Thus, it was established that the substitution of sporting plastic strips for chromium-plate mouldings on a motor

car, which had been received positively by the market, even involved cost savings for the producer.) On the whole, the cost shares are, however, a suitable makeshift measure for eliminating the effect of quality changes.

4.8 In other countries cost measurement is also normally given precedence over other makeshift solutions, though survey directives and reporting forms do not always show this. The practice followed in the United States of America is, however, perfectly clear. There, the forms have columns for entering the "cost of quality change" - that is, the amount of the increase or decrease - and the explanations show that any valuations of changes in respect of other price-determining characteristics should also be entered. "Quality change" in this case means any kind of non-genuine price change.

4.9 Quality changes that influence the utility value of a given time to a minor extent only, or that are generally considered a kind of "superficial distinction" and do not have any importance for the consumer or the investor, are not taken into account. In this case, there is a direct switch made from the price of the old specification to the new one. This practice is admittedly not unobjectionable; it is justifiable only where the assessment concerning the insignificance or negligibility of the quality change is actually correct. To neglect an insignificant quality change, however, is not justifiable where this occurs repeatedly in the case of a specific item, because after a certain time through cumulation it may (as compared with the original quality of the item) acquire the dimension of a quality change that is significant and must not be disregarded. Specifically, this applies in the case of the so-called "creeping improvement or fall-off in quality" which can be apprehended and handled appropriately only if, on the basis of special instructions for the processing of the reported price data, provision has been made for the repeated neglect of a minor or superficial quality change to be registered.

4.10 The Federal Statistical Office also ignores pure fashion changes in the construction of series for the indexes of foreign trade prices, (as well as for other price indexes). Such changes occur not only in the case of clothing, jewellery and other personal effects but also with many other consumer goods, and frequently even with investment goods. In price statistics, such changes should actually be treated as quality improvements since the market normally rates the newer fashionable article higher than the one that has gone out of fashion, even if it is otherwise identical. This should also be unobjectionable from a methodological point of view if, afterwards, the gradual process of growing out of fashion were to be considered and treated as a gradual down-grading of quality. Generally speaking, these two effects should approximately offset each other, so that in the end, the same or almost the same level of price change would apply, as if fashion changes had not been taken into account. There is nevertheless a difference that must be considered: the estimate of the non-genuine price change, "modification of fashion", may be subject to error so that the expected balance is not achieved after all. Accordingly, it is better to neglect changes in fashion and - if there are no other non-genuine price changes - to compare the prices actually reported directly with each other. The same applies in the case of certain items of fresh food that undergo quality changes at harvest time. Here, too, the quality improvement involved is neglected, as is the gradual down-grading of quality later on.

4.11 A special case of quality change involves consecutive variants of items produced in single piecework on the basis of special orders from the buyer which

differ from purchase to purchase. These are "unique goods" for which it is impossible to determine genuine price changes without making special arrangements. Where the selection of such "unique goods" as items for pricing cannot be avoided (because large gaps would arise in the price measurement of foreign trade), the Federal Statistical Office applies the so-called "component" or "decomposition" method - that is, it does not include the entire item in price observation, but only those parts that are individually unchanged technical components of the item. As an obvious precondition, the relevant items must consist in large part of such invariable components and the reporting firm must be in a position to divide the total price up according to these components. This procedure of price measurement is not provided for in the directives but is agreed upon in individual cases with the reporting enterprise, taking due account of the particular situation of the particular firm. If it is necessary and also possible to apply the component method, the individual components are the subject of price measurement and all survey prescriptions apply.

4.12 The Central Statistical Office of Finland employs a similar solution in the case of "made-to-order products" (also referred to as "tailor-made products"). It also effects a decomposition - not a decomposition of the price for the "made-to-order product" but a decomposition of the costs of the product, including labour and other factor costs.

4.13 Special considerations and provisions are necessary to handle the seasonal absence of an item, as may be the case for certain agricultural products. As there cannot be a satisfactory solution to this problem, the Federal Statistical Office tries to avoid it by selecting from among the kinds of goods affected by this problem only those items where the seasonal gaps can be closed by current adjustment by means of other price series for the same kind of good. For instance, the price series for imported fruit from countries of the southern hemisphere are continued after the end of the harvest season, thereby drawing upon the development of price series concerning the imports of the same kinds of fruit from North Africa, the Middle East or other regions.

4.14 Where, at short notice, price returns are not submitted (because, for example, a reporting firm did not happen to have any exports or imports in the reference month), an adjustment is made by means of the price development of other priced items. For this purpose, as a basic principle other items are selected that constitute the same kind of goods (or if necessary, belong to the same group of goods) and that, according to prior observation, come closest in their price development to the trends in the price series where the gaps have occurred.

4.15 Caution must be exercised when the price returns for the items originally observed start to come in again. First, it is necessary to make sure that the reports relate to exactly the same priced item (with exactly the same price-determining characteristics) to which they had referred before the interruption. If they do, it is necessary to switch directly from the last makeshift price used to bridge the gap to the new price of the item originally observed, even if a break occurs in the continuous series. This break has to be accepted; it constitutes a correction of the makeshift series which - as can be seen - was not fully suited to closing the gap. If, however, the price returns coming in again relate to an item that is not the same as the former one, the price difference should be eliminated by linking.

4.16 Where a price series is discontinued and this cannot be considered a case of quality change or of change in another price-determining characteristic, a new item, possibly of a new reporting firm, must be selected and the effect of the transition to the new price series eliminated by linking. If a replacement is not to be sought or cannot be found, the index will have to be continued without this series. In this case, too, the effect of the correction will have to be eliminated from the index series. As a rule, a special arrangement will be made to amend the weighting scheme (for example, by distributing the weight of the discontinued item on a pro-rata basis among the other weights of the relevant lowest commodity group). Without an arrangement of this kind, all other priced items would in effect be given a higher value.

4.17 With regard to the price that the reporting firms are supposed to indicate, this is - as has already been shown and explained in greater detail - the price arrived at by the conclusion of a contract in the reference month. While for all other price statistics of the Federal Statistical Office, the contract price applying at a fixed date has to be reported, the statistics of foreign trade prices record monthly average prices. There are two reasons for this, one of a historical nature, the other of a material nature. In order to understand the first reason, it has to be borne in mind that these price statistics started in the early 1950s by recording import prices and that, in this connection, the recording of the development of prices for raw materials was a primary consideration. Because of the great variability of these prices, it was considered inadequate to limit the observation to the price situation on a single day of the month. This gave rise to the directive that instead of a key-date price the (simple) average of all prices agreed on in the reference month for the relevant item had to be reported. This directive was adhered to later after the recording of foreign trade prices had been extended to the entire body of imports and also to exports. In view of the narrowly defined commodity descriptions and the additional limitation due to the fixing of further price-determining characteristics, many reporting firms could in fact report only a few contract prices per month, so that it was necessary to accept reports on any calendar day if these firms were to report prices for every month. Given this situation, it seemed advisable to recognize all prices ruling during each month and to use their average for the index calculations.

4.18 It is obvious that for covering actual price developments, the list prices are not sufficient. Therefore, we have to insist again and again that the reporting firms must report actual prices instead of list prices. It is, of course, admissible to report the relevant prices by indicating in the survey questionnaires the list price and the rebate allowed on it.

4.19 Where the price is fixed in a foreign currency in the export or import contract on which the price report is based, the price must be reported in that currency. The conversion to deutsche mark is made by the Federal Statistical Office. Thus, it is guaranteed that the same kind of exchange rate is always applied and that price changes due only to differing kinds of exchange rates (buying rates, selling rates, middle rates; officially quoted rates or special rates for higher turnover; differing foreign exchange markets; differing treatment of incidental charges) are thereby avoided.

V. INDEX CHECKS

5.1 The selection of reporting firms and of priced items, the formulation of questions in the questionnaire, the directives for its completion and the rules for the construction of price series as the component parts of the index calculation are all designed to provide a realistic picture of pure price development in foreign trade. Supplementing these procedures the Federal Statistical Office regularly performs special checks to determine whether this aim has actually been achieved in an optimum way.

5.2 The first of these checks is intended to eliminate any errors due to the failure to distinguish between genuine and non-genuine price changes. It proceeds from the information the reporting firms are supposed to provide in the survey form under "remarks" concerning the reasons for major price changes. Actually, the Federal Statistical Office is not seeking information as to why an item has genuinely become more expensive or cheaper, if only because really exact information on the reasons for a price change cannot be expected in all cases. Above all, it has to be taken into account that the reporting firm is commenting on the situation only from its own point of view and often will mention only superficial aspects. Thus, it may attribute the fact that its export products are getting more expensive to "wage increases", though the actual reason is the extent of utilization of its production plant (which, however, need not be the ultimate reason either, because a price increase might not have occurred at all, despite an increase in production costs, if the market situation had not been favourable for realizing the price increase). However slight the actual information value of the reasons given for price changes may be ("price increases on the world market", "state of the market", "deterioration of the deutsche mark exchange rate" in the case of import price increases, "increased prices of material" and the like), it can nevertheless be considered reliable testimony to the fact that the reported price change is not due to a quality or quantity change or to a change in another price-determining characteristic.

5.3 Very often, however, the reporting firms do not state the reasons for price changes. If, in such cases, there is no indication concerning changes in price-determining characteristics either, it may well be assumed that there has been a genuine increase or decrease in the price. At first, however, there is no way of knowing for sure.

5.4 Sometimes it is possible to make sure through comparisons with the price series of other reporting firms for items in the same commodity groups, as in the case of relatively homogeneous commodity groups and transparent markets with strong price competition. Often, however, such comparisons do not provide the required certainty but only show that it is necessary to ask the reporting firm in order to clarify the real situation.

5.5 Often, it is not possible to make a comparison with other price series for exports and imports, especially in the case of groups of manufactured goods with a great diversity of products. Here, it is often helpful to make comparisons with similar price series or group indexes from other areas of price statistics, especially for exports of industrial goods, and with series on producers' prices of industrial products and series on wholesaling selling prices. Comparisons of this kind, however, do not help so much to clear up unanswered questions as to determine whether or not further questions should be posed, and if so, what the nature of the

inquiries should be. Comparisons with other price series and price indexes make it possible not only to distinguish between cases of genuine and non-genuine price change but also to expose errors in the stated extent of a price change.

5.6 It should also be mentioned that comparisons with appropriate price indexes calculated abroad or compiled for another country may help to reveal shortcomings in the price material used for the indexes of foreign trade prices in the Federal Republic of Germany. In respect of data concerning the import prices in the Federal Republic for goods in world trade, mention should be made of the indexes of world market prices of raw materials of Reuter and Moody, as well as the corresponding index of the Hamburg Weltwirtschaftsarchiv.

5.7 The Federal Statistical Office may also obtain some indications concerning the reliability of its own indexes of foreign trade prices, at least for individual commodity groups, from a comparison with the relevant partial indexes of foreign trade prices of other countries. In this connection, reference should be made to the investigations of the International Prices Division of the United States Bureau of Labor Statistics on comparisons of United States, Federal Republic of Germany and Japanese export price indexes. Although these studies are meant for purposes other than checking current index calculations, the relations described show that they can also be used for the purpose of improving the national series.

VI. TECHNIQUES FOR PROCESSING PRICE MATERIAL

6.1 There are no special processing techniques that apply only to the statistics of foreign trade prices compiled by the Federal Statistical Office or that are of importance only for those statistics. A brief description of the current procedure is presented below.

6.2 For reporting individual prices for individual items, the reporting firms use shuttle schedules ready for punching. ^{2/} These apply for a period of one year and are sent by mail on a monthly basis to the Federal Statistical Office. After checking and punching, they are returned to the respondents. For each individual item a separate shuttle schedule is used to facilitate handling at the Federal Statistical Office. This is also considered an advantage by the large export/import firms, which have to report prices for 10 to 20 or more items and are able to forward the individual shuttle schedules to the departments concerned inside the firm without having a summary report made by a central service. (One disadvantage of this system, however, is the higher forwarding cost.)

6.3 The checking of the shuttle schedule is limited to determining whether data are missing and to ascertaining any major inconsistencies that can be detected without making comparisons with other shuttle schedules or other records and that can be cleared up through simple inquiries. Other operations include the conversion of amounts in foreign currencies to deutsche mark values and the calculation of "comparable prices of the previous month" in those cases of non-genuine price changes where the reporting firm does not itself ascertain the comparative figures but provides the information required for the purpose.

6.4 After the current price data and any new basic prices have been punched, the computer calculates the price relatives (base year = 100) for the individual items. These are provided in a print-out classified by commodity type and group. This list makes it possible to make punching checks to compare individual price variation figures (inside a commodity group and between related commodity groups) and thus constitutes the most important record for checking the survey results.

^{2/} The forms of reporting export and import prices are presented in annexes II and III below.

VII. PRESENTATION OF RESULTS

7.1 The data processing equipment used permits the preparation, with only a little extra work, of a price index for a great variety of commodities presented in a highly detailed breakdown and according to differing commodity classifications. Thus, it is possible to comply with various user demands at the same time.

7.2 The classification of the export and import price indexes according to the commodity groups of foreign trade statistics must be considered the most important form of presentation, since this is the most common breakdown in which the reference values of the two indexes - the export and import values - are shown. Forty partial indexes for exports and 42 indexes for imports are published, in systematically integrated form, with such a breakdown, including the differentiation by EC and outside countries. This presentation (including partial indexes at a lower level of aggregation) must be drawn on if comparisons are to be made with the unit value indexes of foreign trade.

7.3 Two smaller tables, which are published on a continuous basis, present classifications according to predominant use (basic materials, investment goods and consumer goods, both excluding food and beverages and including food and beverages) and by main sector of consumption (agriculture and forestry, production industries and private consumption with a further breakdown). Concerning the first of these tables, it should be noted that basic materials - in the analysis by raw materials and semi-finished products - are also shown classified according to the commodity groups of foreign trade statistics. There, the raw materials and semi-finished products are considered from the point of view of sector of origin - that is as raw materials and semi-finished products of the industrial economy - while in the table comprising an analysis according to predominant use, basic materials are shown in their relation to the sector of intended use, which actually should be the more obvious approach.

7.4 Materially, the presentation of the indexes of foreign trade prices according to the interrelations in the production process should be the most important one, because this breakdown is more pertinent than the other groupings to price development relations. The reasons are obvious: a commodity group, whose constituent characteristics are the interrelations in the production process, is - both from the input side and the demand side - at least in part subject to homogeneous or similar price influences. In an integrated form, 46 partial indexes for exports and 51 partial indexes for imports are based on this classification.

7.5 This grouping is also important because it may be combined with price indexes relating to the domestic market. The combination of the partial index of export prices for industrial products and the index of producers prices for industrial products for domestic sales has already been mentioned (see para. 1.7 above). A corresponding combination for the products of agriculture and forestry in the Federal Republic of Germany would also be conceivable; owing to the small proportion of agricultural and forestry products in total exports, however, so far demands for such indexes have not been made. Such combinations have to be considered overall indexes of selling prices for the relevant branches of economic activity - that is, as indexes from the point of view of domestic sellers. Combinations of the same indexes of domestic prices with the corresponding partial indexes of import prices, on the other hand, would relate to the home supply and the point of view of domestic buyers. It would, however, first be necessary to

convert the import prices to the price level after the commodity had been brought into the country, so that the c.i.f. prices were increased by adding the import charges. This is actually being done in calculating the price index of basic materials, which constitutes an index of domestic supply prices for these materials (the reference sphere being, however, only production industries and not the economy as a whole).

7.6 In order to render the Federal Republic's indexes of foreign trade prices comparable for international purposes, these indexes are also analysed according to the Standard International Trade Classification, as revised in 1975. The relevant integrated presentation comprises 70 partial indexes for exports and imports.

7.7 The possibility of differentiating according to groups of countries in showing the development of export and import prices has already been discussed in chapter III above. When comparing the partial indexes for the various groups of countries, it should be remembered that the divergencies of the index figures are due not only to differences in price development but also to differences in the commodity composition of the foreign trade flows. These latter differences may be of decisive importance. Thus, the present high level of the index of import prices for goods from OPEC countries (1976 = 100) is attributable to the fact that this index almost exclusively relates to crude oil and does not reflect the possibility that the prices for commodities in general increased more than prices for commodities from non-OPEC countries.

7.8 The partial indexes calculated for groups of countries are also of importance because of their "mirror image". The partial index of import prices in the Federal Republic of Germany for goods from developing countries (excluding OPEC countries) may also be considered a combination of the indexes of prices in these countries for their exports to the Federal Republic (especially if it can be assumed that the sea freight rates and other costs by which the import prices in the Federal Republic exceed the export prices of the exporting countries did not take a strong differing course vis-à-vis the f.o.b. commodity prices). Such "mirror image" estimates can be of special value in so far as none of the developing countries have genuine indexes of export prices and many of them do not even calculate unit value indexes for exports.

VIII. UTILIZATION OF RESULTS

8.1 As indicated in the introduction to part one of the present report, the foreign trade price indexes of the Federal Statistical Office have varied functions as part of a highly integrated system for showing price developments in the commodity flows of the national economy. There is a corresponding diversity of macro-economic uses for these indexes. Some examples are given below.

8.2 A primary consideration is the analysis of price influences from abroad on price developments inside the country. This analysis has gained in importance, especially since the first oil crisis in 1973/74, since it shows the extent to which the price of the most important source of primary energy for the economy of the Federal Republic of Germany has been increasing. Together with the indexes of import prices for mineral oil products and for other sources of energy and their derived products, and in conjunction with the corresponding indexes for price developments on the domestic market, the index of import prices for crude oil shows how the oil production and price policies of a group of countries have changed the price level of the entire energy sector. Similar relationships can be shown if changes in the prices of other basic materials on the world market become equally pronounced.

8.3 When there are major shifts in the deutsche mark exchange rate, especially in respect of the United States dollar and the currencies of other major trading partners of the Federal Republic of Germany, the overall changes in import prices may have a strong effect on price developments inside the country. As in the recent past, the monetary balance of the national economy may be disturbed, especially if original price changes for major groups of import goods are in the same direction. This has been the situation in many countries in recent years. National agencies and international organizations frequently ask the statistician to show as precisely as possible the consequences of changes in import prices, for instance, by quantifying that part of the annual rate of change of the national consumer price index accounted for by the change in import prices. Reliable computations of this kind, of course, presuppose the existence of a genuine index of import prices.

8.4 The export side must also be considered in analysing the influence of price developments on the balance of trade and the balance of payments. A summary expression of the development of export and import prices is the change in the terms of trade defined as the quotient of the index of export prices divided by the index of import prices.

8.5 At certain international conferences involving negotiations between developed and developing countries and between OPEC countries and energy-consuming countries, the discussion has frequently addressed the question of how the export prices of one group of countries are changing as compared with the export prices of the other group. There, too, only genuine indexes of foreign trade prices can provide the required information. Unfortunately, however, the individual price series available for the index of export prices are not sufficient for a separate presentation for OPEC countries and for developing countries excluding OPEC countries, developing countries and state trading countries in combination by calculating the difference between the partial index for "outside countries" and the partial index for "other industrialized countries of the West".

8.6 Mention should also be made of the innumerable cases where individual firms obtain special information about the development of partial indexes of export or import prices for small commodity groups. These partial indexes as a rule are used as guiding data for market and price policies, as indicated by the relevant inquiries. They are also frequently used as price escalators in long-term export contracts and, to a lesser extent, in long-term import contracts.

8.7 For some years, the Federal Statistical Office has also been using its indexes of export and import prices for the deflation of the foreign trade values in its national accounts. For this purpose, the individual series are converted, by combination with the value weights of the reference year, to price indexes according to the Paasche formula. As a deflation is expected to yield volume series showing the complete development of the quantity component in the value series, genuine indexes of foreign trade prices are clearly more suitable as deflators than are the unit value indexes of foreign trade.

8.8 This opinion is not shared by the Central Statistical Offices of Finland and Sweden. For deflation, the former uses only unit value indexes of foreign trade. Sweden deflates its foreign trade values by means of a special "hybrid" set of individual indexes consisting of unit value indexes, price indexes and indexes established especially for this purpose. As far as can be seen, these special indexes are refined versions of the corresponding unit value indexes that may have been further subdivided to obtain homogeneous commodity groups.

8.9 The United States of America is also using only unit value indexes of foreign trade for deflation. However, the reason is not that they are considered to be better suited to this purpose but that the genuine indexes of foreign trade prices prepared by the Bureau of Labor Statistics do not yet cover the entire export/import value and that so far they have not been analysed in conformity with the national classification applied to foreign trade statistics.

Annex I

GUIDELINES FOR COMPLETING THE QUESTIONNAIRE ON SELLING-PRICE STATISTICS FOR EXPORT GOODS (EXPORT PRICES) AND PURCHASE- PRICE STATISTICS FOR FOREIGN GOODS (IMPORT PRICES)

I. Preliminary remarks

By the Price Statistics Act of 9 August 1958 (BGBl.I, p. 605), the legislative body ordered the conduct of running price surveys in the most important areas of the economy. By now there is hardly any doubt, at least among the people concerned with the economic process themselves, regarding the necessity and significance of a price-statistics system which will be as informative as possible. The price indexes calculated for various stages and areas of the economy are among the most important indicators of economic and business developments. Without them an effective State economic and monetary policy is no longer even thinkable. But even the economy itself, its associations and its enterprises, must take guidance constantly from the results of the official price statistics. Thus, comparisons with the development of one's own purchase and selling prices and comparisons between domestic and foreign price levels are set up, contracts with sliding price clauses are concluded, investments are written off on the basis of price-index series, etc.

Naturally, all these purposes can be effectively fulfilled only if the price indexes correctly reflect the actual price movements. For this, in turn, it is essential that the reporting firms, in giving their price reports and other data, should conform precisely to these directions.

A reliable demonstration of genuine price changes is, of course, not easy when there are constant variations in production and market relationships. In individual areas, there may be especially unfavourable conditions for the ascertaining of pure price movements, and such conditions may make it appear necessary to enter into special arrangements with the reporting enterprises concerning the way in which prices are reported. In such a case, please inform us. It would be best if you would submit an appropriate proposal at the same time.

Even apart from this, we are grateful for any communication that helps us to improve the official price statistics.

II. Choice of the goods and the price-determining characteristics

The designation of the products whose prices are to be reported is, as a rule, deliberately kept general by the survey authorities. Often what is needed primarily is a brief designation which forms part of a systematic nomenclature for the goods. The leeway thus provided makes it possible to go into details specific to the particular firm in connection with production conditions or marketing conditions. This means that refined choices of the product or products on which the price reports are based and a corresponding specification of the description or descriptions of the goods are - in the above framework - to be made by you yourself. Attention should be given to the following:

The product to which the running price data relate should, if possible, be one which has a large turnover that has been maintained over a long period. Moreover, it should be representative of the evolution of prices for similar products made by your enterprise. The price data are intended for the calculation of an index, and hence for a time-dependent comparison of prices; consequently, when considering a group of products that are all covered by the officially prescribed designation of the goods in question but have different prices, which, however, have a somewhat similar evolution over time, it is sufficient to select a single product variant, or at most a few product variants, for the price reports.

- (a) After you have made a choice, you should give a more detailed description of the quality, form, etc. to be considered on a running basis in the future for the goods in question (sort, model, type or similar data, and in the case of machinery and instruments sometimes specifying the usual auxiliary equipment) in the heading of the shuttle list ①. a/ It is desirable to give a detailed description, with advertising matter attached; however, it is sufficient to give a brief specification if that unmistakably defines the goods and the quality in question;
- (b) The unit of measure to which the price data will regularly refer should also be recorded ②. a/

In addition to the quality and quantity or size of an item of merchandise, there are also a number of other characteristics which determine the price, depending on the nature of the sale or purchase (the sale contract in question). We ask you to specify the clearly defined sale or purchase that occurs most frequently in connection with the item in question, i.e. that is especially representative, and, for this sale or purchase, to list all the terms of trade, delivery and payment which are relevant in determining the effective price, including in particular:

- (c) The quantity purchased or the value of the purchase to which the contract relates; and
- (d) The individual quantity delivered (in the case of several deliveries under one contract) if this quantity, in addition to the quantity contracted for, is significant in determining the actual price;
- (e) The receiving country in the case of export prices and the country of origin in the case of import prices; wherever possible, you should report at least one price series for a European Communities country and one price series for a third country ③; a/
- (f) The means of transport ④ a/ and other contractual, trade and delivery terms which serve to determine the magnitude of the actual price (e.g. minimum quantity purchased per year, where the fact of exceeding that quantity is a characteristic of the typical sale and where a special price discount is granted for larger quantities);

a/ See the appropriate paragraph of the explanations on the reverse side of the shuttle list.

- (g) The terms of shipment (e.g. from factory, free at frontier, f.o.b, c.i.f.); import price reports must in every case be referred to shipment terms of free at the German frontier or c.i.f a German port; where prices from factory, f.o.b foreign port, free at purchaser's, etc. have been agreed upon, they must be converted to the above-mentioned shipment terms; export price reports should, where possible, be referred to shipment terms of free at German frontier or f.o.b (5); a/
- (h) The manner of packing the goods (7); a/
- (i) The terms of payment (e.g., 30 days' credit) (9). a/

If the above requirements create any difficulties for your firm - possibly because it has no typical sale which remains the same month after month - we ask you to notify us accordingly, in order that we may make a special arrangement with you. This applies also to the case of single-order production, where not only the terms of sale but the goods themselves vary from one occasion to the next.

III. Concerning the magnitude of the sale price to be recorded each month

It would be a disservice to the users of the official price statistics, and would in fact be downright misleading, if the reporting firms submitted fictitious list prices, fictitious base prices or settlement prices not in conformity with the market. The price entries must relate to the true state of the contractual agreement and must indicate the genuine and actual price movements. The data supplied under section II should make it clear what contractual relations are in question.

- (a) The sale or purchase price to be recorded each month should refer precisely to the indicated description of the goods and to the other stated price-determining characteristics (see section II). It must be the authentic price which is actually in force for those characteristics, and rebates of any kind (6) a/ and other price discounts must already have been deducted. If, for example, the report states "delivery to import firm", the relevant functional rebate must no longer be included in the reported price. If pursuant to section II, subparagraph (c), it is stated that the quantity generally purchased is 1,000 items or 100 tonnes, the quantity rebate granted therefore must already have been deducted.
- (b) The import price data may not include the import turnover tax and other State taxes such as customs duties, price adjustment levies, and consumption taxes, which are collected only after the frontier has been crossed. Thus, in this sense they must be "net prices".
- (c) The prices should be given in deutsche marks, not in foreign currency. If a conversion is necessary, the type of rate of exchange (e.g., official spot quotation rate or customs rate) may not be arbitrarily changed, since that would give rise to price movements which are not authentic. If a conversion does not appear possible, the foreign currency should be indicated unambiguously (e.g., not \$US but \$Can). (10) a/

IV. Time of validity of the price to be recorded each month

Prices do not come into existence at the moment when the goods are delivered, or even when the payment is made. The time at which a price is established is the time of the conclusion of the contract. This point of view is important precisely for the use of price statistics for purposes of observing variations in business conditions, during which it is necessary to recognize changes in the prices at the proper time.

- (a) The price to be recorded for the reporting month should refer to the sale contracts concluded during the month in question.
- (b) The prices reported should, where possible, be monthly average prices or prices after the date on which the prices change. The price data should thus refer to all those sale or purchase contracts concluded during the reporting month for which the price-determining characteristics you have stated (section II) are valid.
- (c) In the recording of monthly average prices, assurance must be given that they are comparable from month to month, i.e., that the quality, quantity and other price-determining characteristics to which they relate are equal.

If during the reporting month no contract has been concluded for the specified product in the sale case used as the basis, please include a remark to that effect. If this condition is expected to continue for the foreseeable future - in other words, if no price report will be possible for a fairly long time - another form of merchandise of a related nature should be selected and used as the basis for the price reports (see section VI, subparagraph (a)).

V. Brief statement of the reason for the price changes

For every genuine change in price, please submit a very brief statement of the reason for it (e.g., in the case of price increases: increases in wages and/or material prices; increase in the price of raw materials on the world market; e.g., in the case of price reductions: successful rationalization; intensified competition; decline in raw-material prices on the world market; more favourable purchase opportunities).

VI. Changes in the reference bases for the price reports

An indication of "genuine" or "pure" price changes, which are the only data essential to the users, presupposes that the reporting firm bases its statements, month after month, on the same quality and quantity of the goods in question and the same price-determining characteristics in other respects. In reality, however, this is not possible everywhere over the long term. But that does not mean that in such a case price movements cannot be ascertained. Price statistics provide ways and means for dealing with such difficulties, even if it requires the use of makeshift solutions. Whether these makeshift solutions lead to satisfactory results depends decisively on the co-operation of the reporting firms.

First of all, therefore, the following fundamental principle applies:

The data concerning the quality and other price-determining characteristics, dealt with in section II and stated at the heading of the shuttle list, must be kept essentially unchanged from one reporting month to the next.

A departure from this fundamental principle is required or permissible if the goods in question are no longer sold or purchased in the quality described and/or in the quantity described and/or with the other price-determining characteristics or if the turnover in the goods has been sharply reduced, so that the goods are no longer representative.

We urge you to inform us clearly of all necessary changes by correcting the data in the heading of the shuttle list or by remarks under "Explanations".

Where there are changes in the fundamental situation serving as the basis for the report, the following three cases should be distinguished:

- (a) Prolonged decline in the previously considered production form of the goods.

If a previously considered quality/production form is not sold at all or is sold only in insignificant quantities, or if the turnover is expected to decline sharply in the near future, not only temporarily but for a longer period, you should change to another representative quality/production form of the same or a similar type of goods, and for this type you should give not only the price during the reporting month but also the price for the preceding month ("comparable preceding-month price"). The new quality/production form should, if possible, be one which has already had a considerable turnover for the past several months. In all other respects, the production forms referred to in section II are applicable, mutatis mutandis.

- (b) Changes in sales conditions

If the product itself does not decline but there is merely a change in its quantity or in specific conditions of its sale/marketing, then the price data for the reporting month should be referred to the new conditions. At the same time, they should also include the price which was valid during the preceding month under the new conditions ("comparable preceding-month price"). Indication of this price for the preceding month is necessary because the difference between the original price reported for the preceding month and the price stated for the reporting month under the new conditions involves a change in prices which is not genuine and which must be eliminated in calculating the index.

Examples:

A reporting firm in the food industry has in the past sold a particular product only in 80-litre containers and is now offering it in 100-litre containers. The measurements of a semi-finished product have changed. A product was previously sold in containers which were the property of the purchaser, but now the containers are supplied by the seller. The generally purchased quantity of 10 cubic metres has lost a great deal of its significance; nowadays 50 cubic metres is a common figure. A product

was previously picked up by the purchaser, and now it is delivered "free to the purchaser". In such cases it should not be difficult for the reporting firm to give a comparable preceding-month price for the new quantity, size, type of packing, quantity purchased and terms of shipment.

(c) Changes in quality

If there is a genuine case of change in quality - i.e. the item of goods in question is still a representative sales item but in a new quality - then it must first be investigated whether it is merely a minor change in quality which causes only an insignificant increase or decrease in the value of the goods for the consumer or investor. If this is the case, please include an appropriate indication of the new price. The surveying and data-processing authority will then immediately make the change from the actually reported (latest) price for the old quality to the price for the new quality.

If the previously considered item of goods, which is still a representative sales item, has undergone a noticeable change in quality, which clearly increases or decreases the value of the goods for the consumer or investor, please state in the shuttle list under "Explanations" (roughly estimated if necessary) what part of the difference between the last price (for the previous quality) and the new price (for the new quality) is attributable to the change in quality. The remaining portion then constitutes the genuine change in price, which is the only one of interest to the price statistician in calculating the price index.

A special case occurs when the quality of an item has clearly improved/deteriorated but its prices remain the same. In such a case, there is a price reduction/increase whose extent you should, at least approximately, ascertain and state.

VII. Confidentiality of statistical data

The legal claim of the surveying authority to information (on the basis of article 10 of the Act on Statistics for Federal Purposes, of 14 March 1980, BGBI.I, p. 289) is subject to the obligation of the surveying authority to maintain confidentiality of the statistics, an obligation backed by penal provisions (article 11). This confidentiality of statistics applies, of course, not only to the prices stated by your firm but also to all other entries, including information given in connection with changes in quality.

Annex II
SHUTTLE LIST
FOR IMPORT PRICE
STATISTICS

— Confidential —

Post Office:
 DATED MATERIAL—URGENT—VI A 2

| | | | | | |
|-----------|--|--|--|--|--|
| Case No.: | | | | | |
|-----------|--|--|--|--|--|

Please conform to the "Directives" when filling out this survey form. Please explain all price changes. Submission by the 5th of the current month is requested. Legal basis: Price Statistics Act of 9 August 1958 (BGBl. I, p. 605)

| | |
|--|--|
| | |
|--|--|

Processing office:
 Telephone:

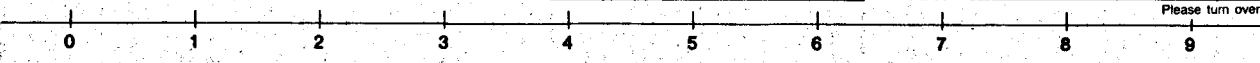
EXACT DESCRIPTION OF GOODS ①

Item Number ② **Country of origin ③**

FURTHER DATA CONCERNING SIMILAR SALES TO WHICH THE PRICE DATA RELATE

Type of dispatch (means of transport) ④
 Terms of shipment ⑤
 Price $\left\{ \begin{array}{l} \text{after deduction of following types of rebate ⑥} \\ \text{○ excluding/○ including packing; type of packing, where necessary ⑦} \\ \text{per (unit of quantity) for purchased quantity of ⑧} \end{array} \right.$
 Terms of payment ⑨

| Monthly average ⑩ | | Price in (currency) ⑩ duty-free, tax-free | To be filled out by Federal Statistical Office | | | | | | | | | | Explanation or "comparable preceding-month price" (If more space is needed, please use reverse side) | | |
|-------------------|-----|--|--|--|--|--|--|--|--|--|--|--|---|--|--|
| | | | | | | | | | | | | | | | |
| 198 February | 0 2 | | | | | | | | | | | | | | |
| March | 0 3 | | | | | | | | | | | | | | |
| April | 0 4 | | | | | | | | | | | | | | |
| May | 0 5 | | | | | | | | | | | | | | |
| June | 0 6 | | | | | | | | | | | | | | |
| July | 0 7 | | | | | | | | | | | | | | |
| August | 0 8 | | | | | | | | | | | | | | |
| September | 0 9 | | | | | | | | | | | | | | |
| October | 1 0 | | | | | | | | | | | | | | |
| November | 1 1 | | | | | | | | | | | | | | |
| December | 1 2 | | | | | | | | | | | | | | |
| 198 January | 0 1 | | | | | | | | | | | | | | |
| February | 0 2 | | | | | | | | | | | | | | |



Instructions for entries made to be on the front of this sheet
Please note also the "Directions" attached hereto

- Description of goods ①: Manufacturer/producer's mark/trade mark, type/model, production form, components, in the case of machinery/instruments, where necessary, also indicate other supplementary equipment, performance/cubic capacity/measurements/other technical data, DIN Standard, kind/sort/assortment, quality/variety, goods/trade class, degree of purity/content/volumetric percentage/mixing ratio/analysis data, heating value/boiling point/flash point/viscosity/specific gravity, special properties, special purpose/scope of use, degree of preparation/processing, amount of dry or liquid material in each container, and the like.
- Item Number ②: The seven-digit item number of the goods list for foreign-trade statistics.
- Country of origin ③: The country or region in which the goods were obtained or produced in their entirety should be listed as the country of origin.
- Manner of dispatch ④: E.g., truck, tank-truck, forwarding, railway freight, pick-up by purchaser.
- Terms of shipment ⑤: E.g., free at the frontier, free at receiving station, free at purchaser's premises, cif import harbour, from plant.
- Types of rebate ⑥: In particular, functional, quantity, goodwill or introductory rebate. Rebate rates should be listed as a percentage of the list or basic price.
- Type of packing ⑦: E.g., in sacks, chests, cartons, tanks, barrels, canisters, other containers or wrappers, or on pallets.
- Unit of quantity ⑧: kg, dt, t, m, m², m³, litres, hl, single units.
Quantity purchased: Frequently a multiple of the relevant unit of quantity.
- Terms of payment ⑨: Please indicate the payment deadline (foreign currency) in days or weeks, e.g. 30 days—where necessary, also list the net rebate for cash payment, expressed in per cent, e.g., 10 days=3 per cent discount, 20 days=2 per cent discount.
- Change in description of goods or in terms of trade, delivery and payment: Please check regularly whether the characteristics recorded on the reverse side still apply. If it is necessary to substitute at new description (e.g. in the case of changes in quality, discontinued production, sharp decline in turnover, etc.), please describe the new article or the new type of purchase on the bottom half of this page (attach advertising literature if necessary).
- Price data ⑩: In deutsche marks where possible. You should refer to the transactions concluded during the reporting month. If no transactions were concluded, the report should state those prices which—according to known market information—were obtainable during the month in question (reliably estimated; in such a case, please make a special note to that effect).
- Price changes: If price changes occur only at long intervals, it is sufficient in each case to make a single entry concerning a price, specifying the date of the change (e.g., "valid since ...", and where necessary, also stating "expected to remain valid until ..."). If there have been two or more genuine price changes within a reporting month, please submit the monthly average of purchases of the same kind. For all price changes, please give a brief explanation.

Explanations of the genuine price changes stated on the reverse side and the changes in the description of the goods, and/or in the terms of trade, delivery and payment

| Date of change | Explanation of genuine price changes (if the description of the goods and the terms of trade, delivery and payment remain unchanged) | Altered or new description of the goods, new terms of trade, delivery and/or payment |
|----------------|---|--|
| | | |

**Annex III
SHUTTLE LIST
FOR EXPORT PRICE
STATISTICS**

— Confidential —

| | | | | | | | |
|-----------|--|--|--|--|--|--|--|
| Case No.: | | | | | | | |
|-----------|--|--|--|--|--|--|--|

Post Office:
 DATED MATERIAL—URGENT—VI A 2

Please conform to the "Directives" when filling out this survey form. Please explain all price changes. Submission by the 5th of the current month is requested. Legal basis: Price Statistics Act of 9 August 1958 (BGBl. I, p. 605)

| | |
|--|--|
| | |
|--|--|

| | |
|--|----------------------------------|
| | Processing office: Telephone: |
|--|----------------------------------|

EXACT DESCRIPTION OF GOODS ①

Item Number ② Country of production ③

FURTHER DATA CONCERNING SIMILAR SALES TO WHICH THE PRICE DATA RELATE

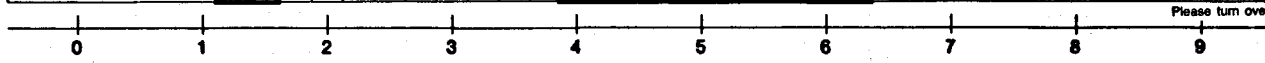
Type of dispatch (means of transport) ④

Terms of shipment ⑤

Price { after deduction of following types of rebate ⑥
 ○ excluding/○ including packing; type of packing, where necessary ⑦
 per (unit of quantity) for purchased quantity of ⑧

Terms of payment ⑨

| Monthly average ⑩ | Price In (currency) ⑩ duty-free, tax-free | To be filled out by Federal Statistical Office | | | | | | | | | | Explanation or "comparable preceding-month price" (If more space is needed, please use reverse side) | | |
|-------------------|--|--|--|--|--|--|--|--|--|--|--|---|--|--|
| | | | | | | | | | | | | | | |
| 198 February | 0 2 | | | | | | | | | | | | | |
| March | 0 3 | | | | | | | | | | | | | |
| April | 0 4 | | | | | | | | | | | | | |
| May | 0 5 | | | | | | | | | | | | | |
| June | 0 6 | | | | | | | | | | | | | |
| July | 0 7 | | | | | | | | | | | | | |
| August | 0 8 | | | | | | | | | | | | | |
| September | 0 9 | | | | | | | | | | | | | |
| October | 1 0 | | | | | | | | | | | | | |
| November | 1 1 | | | | | | | | | | | | | |
| December | 1 2 | | | | | | | | | | | | | |
| 198 January | 0 1 | | | | | | | | | | | | | |
| February | 0 2 | | | | | | | | | | | | | |



Please turn over

Instructions for entries made to be on the front of this sheet
Please note also the "Directions" attached hereto

- Description of goods** ①: Manufacturer/producer's mark/trade mark, type/model, production form, components in the case of machinery/instruments, where necessary, also indicate other supplementary equipment, performance/cubic capacity/measurements/other technical data, DIN Standard, kind/sort/assortment, quality/variety, goods/trade class, degree of purity/content/volumetric percentage/mixing ratio/analysis data, heating value/boiling point/flash point/viscosity/specific gravity, special properties, special purpose/scope of use, degree of preparation/processing, amount of dry or liquid material in each container, and the like.
- Item Number** ②: The seven-digit item number of the goods list for foreign-trade statistics.
- Country of consumption** ③: The country or region in which the goods are to be used or consumed is not known, please specify the last known country or region to which the goods are to be delivered.
- Manner of dispatch** ④: E.g., your own truck, tank-truck, forwarding, railway freight, pick-up by purchaser.
- Terms of shipment** ⑤: E.g., free at the frontier, free at receiving station, free at purchaser's premises.
- Types of rebate** ⑥: In particular, functional, quantity, goodwill, seasonal, early-order or introductory rebate. Rebate rates should be listed as a percentage of the list or basic price.
- Type of packing** ⑦: E.g., sea-packed, in sacks, chests, cartons, tanks, barrels, canisters, other containers or wrappers, or on pallets, or containerized.
- Unit of quantity** ⑧: kg, dt, t, m, m², m³, litres, hl, single units.
Quantity purchased ⑧: Frequently a multiple of the relevant unit of quantity.
- Terms of payment** ⑨: Please indicate the payment deadline (foreign currency) in days or weeks, e.g. 30 days—where necessary, also list the net rebate for cash payment, expressed in per cent, e.g., 10 days=3 per cent discount, 20 days=2 per cent discount.
- Change in description of goods or in terms of trade, delivery and payment** : Please check regularly whether the characteristics recorded on the reverse side still apply. If it is necessary to substitute at new description (e.g. in the case of changes in quality, discontinued production, sharp decline in turnover, etc.), please describe the new article or the new type of purchase on the bottom half of this page (attach advertising literature if necessary).
- Price data** ⑩: In deutsche marks where possible. You should refer to the transactions concluded during the reporting month. If no transactions were concluded, the report should state those prices which—according to known market information—were obtainable during the month in question (reliably estimated; in such a case, please make a special note to that effect).
- Price changes** : If price changes occur only at long intervals, it is sufficient in each case to make a single entry concerning a price, specifying the date of the change (e.g., "valid since ...", and where necessary, also stating "expected to remain valid until ..."). If there have been two or more genuine price changes within a reporting month, please submit the monthly average of purchases of the same kind. For all price changes, please give a brief explanation.

Explanations of the genuine price changes stated on the reverse side and the changes in the description of the goods, and/or in the terms of trade, delivery and payment

| Date of change | Explanation of genuine price changes (if the description of the goods and the terms of trade, delivery and payment remain unchanged) | Altered or new description of the goods, new terms of trade, delivery and/or payment |
|----------------|--|---|
| | | |

BIBLIOGRAPHY

The discussion of the activities of the Statistical Office of the Federal Republic of Germany is based on the author's experience and on the official records of that Office. In the remarks concerning the indexes of foreign trade prices in Finland, Sweden and the United States of America, the results of discussions between the author and officials in those countries have been considered. The following publications have also been drawn upon:

- Murphy, Edward E. The international price program of the Bureau of Labor Statistics. Proceedings of the Section on Survey Research Methods of the American Statistical Association. Washington, D.C., 1978.
- Pratt, Richard J. and Gwyn R. Ferguson. Alternative sample designs in the international price program. Proceedings of the Section on Survey Research Methods of the American Statistical Association. Washington, D.C., 1980.
- Sweden, Central Statistical Bureau. Price indexes in producer, export and import stages, 1968-August 1973. SCB statistical reports. Stockholm, 1973.
- Tuominen, Pentti. Producer price indices - methods and practice. Study No. 56 of the Central Statistical Office of Finland. Helsinki, 1980.
- United States of America, Department of Labor, Bureau of Labor Statistics. International prices indexes. Handbook of methods. Bulletin 1910. Washington, D.C., 1977.

Part two

THE UNIT VALUE APPROACH AS APPLIED IN NORWAY

INTRODUCTION

1. The present study is part of a series of technical reports and studies on price and quantity statistics which has been developed within the framework of Guidelines on Principles of a System of Price and Quantity Statistics, ^{1/} referred to hereinafter as Guidelines. Based on the experience of the Central Bureau of Statistics in Norway, this study describes the particular solution adopted in that country in response to problems that arise in the decomposition of value flows in foreign trade. It does not aim at a complete description of the national indexes; its main purpose is to describe the methods behind them and the practical procedures adopted for their completion.
2. A number of problems considered in the study have also been dealt with elsewhere. They have been included here mainly to make this study as self-contained as possible and to supply the background information needed for understanding the reasoning behind the solution adopted in Norway.
3. The present study is for the most part descriptive in nature and does not aim at presenting definite recommendations. The solutions presented to the problems relating to the decomposition of value flows in foreign trade statistics are sufficiently in accordance with international recommendations to be used as a model by anyone faced with conditions similar to those described. Both theoretical and practical aspects of the problems discussed have been treated. Attempts have been made to deal with the former separately in order to define the aims more explicitly before getting into the problems of obtaining practical approximations to these aims.

^{1/} United Nations publication, Sales No. E.77.XVII.9.

I. BACKGROUND INFORMATION

1.1 The system of price and quantity statistics described in A System of National Accounts, 2/ Guidelines on Principles of a System of Price and Quantity Statistics 3/ and Manual on National Accounts at Constant Prices 4/ provides the framework for an integrated approach in this field. The system suggested in these documents is sufficiently flexible to accommodate most of the traditional indexes of price and quantity, as well as price and quantity series directly related to national accounts.

1.2 Some of the traditional indexes have been developed for the particular purpose of describing either the price or the quantity side. The corresponding index for the other component might not even be regularly calculated, as in the case of the consumer price index; the index formulae for the price and quantity side might be deliberately chosen but not in a way that would link them directly as a pair to the corresponding value series. The last situation would not be uncommon, for example, in the case of the index of industrial production and the producer price index. The price and quantity indexes for foreign trade, however, quite often represent a decomposition of the corresponding value flow, in the sense that the combined effect of the changes in the price and quantity components corresponds to the change in the value series.

1.3 This relationship imposes a well-known restriction on the choice of index formulae for the two components. When one of the components is chosen, the other can be derived from the relationship between the components and the value. If preference is given to the price side, the formula for the price index is chosen with this aim in view; the same is done for the quantity index, if this is where the priorities lie. The main point is that for compatible sets of price and quantity indexes (compatible in the sense indicated above) the preferred solution will depend on the priority given to the individual components. For national accounts, the situation is straightforward, since the emphasis is normally placed on flows at constant prices - that is, on the quantity component.

1.4 The situation described for national accounts might be expected to influence the choice of the indexes for foreign trade. In particular, if agreement is required between the two sets, priority must also be given to the quantity side for the foreign trade indexes. In contributions to the discussion of indexes of foreign trade at the international level, the emphasis seems to a large extent to be on the price side and its problems. This may be due to one of two possibilities:

- (a) The interest focuses on prices, price comparisons and price analysis;
- (b) In spite of a greater interest in the quantity side, deflation of the value series to obtain the quantity index is favoured, so that even in this case problems related to price and price indexes come to the foreground.

2/ United Nations publication, Sales No. E.69.XVII.3.

3/ United Nations publication, Sales No. E.77.XVII.9.

4/ United Nations publication, Sales No. E.79.XVII.5.

It is important to realize that (a) and (b) above represent different situations that might require different solutions for the price component. Or, to put it differently, the "best" solution of the index problem for price analysis does not necessarily provide the best deflator for deriving quantity series for the study of real flows.

1.5 As mentioned previously, the present study is based on experiences in Norway, and consequently on priorities in that country with regard to price and quantity components. This implies that attention is focused heavily on the quantity component throughout. The emphasis on describing the changes in the volume of foreign trade must always have been strong in Norway. The original choice of a Laspeyres formula for the quantity index and, consequently, of a Paasche index for the price component points in this direction.

1.6 With the advent of national accounts, not only have the foreign trade statistics been co-ordinated with the national accounts, the index calculations for foreign trade have also been co-ordinated with the calculation of the national accounts at constant prices. This has further strengthened the emphasis on the quantity component for the indexes of foreign trade. The importance placed on the quantity component has also had its effects in connections other than the choice of index number formulae. This will be pointed out where appropriate in the more detailed description that follows.

II. SCOPE AND OBJECTIVES

2.1 The aim of this study is to describe the methods and procedures adopted in Norway for the decomposition of the value flows in foreign trade statistics into factors of price and quantity. The description is intended not only to explain the purely technical side of the procedures and the basic data available, but also how the data are utilized and processed in order to derive suitable measures of the components of the value series. It is also intended to provide adequate background material as a basis for judging why particular solutions have been selected. A discussion of some of the more theoretical aspects related to the decomposition will be included.

2.2 One of the main limitations of this study is that the possibilities for obtaining information supplementary to the foreign trade statistics will not be covered. This means that the scope of the study is limited to that part of the foreign trade statistics for which a solution can be devised from the basic data available - namely, to merchandise trade. Within this sector, the restriction implies that possible solutions attained through the use of additional or supplementary data collection are not taken into account.

2.3 When the methods and procedures described in this study were developed and adopted, most of the merchandise trade of Norway was covered by regular customs operations. Detailed information on transactions was given on standard customs forms for exports and imports. As in most other countries, these forms provided the data for the foreign trade statistics.

2.4 Recent developments have increased the sector of Norway's foreign trade that falls outside the scope of the unit value approach to decomposition of value flows. This is because a large part of the exporting and importing carried out in connection with off-shore oil activities on the Norwegian continental shelf is not covered by the standard customs routines referred to in the previous paragraph. This field is comparatively new and is changing; it exhibits a number of special characteristics that differ from those of traditional foreign trade. It is therefore not surprising that the practical treatment of the transactions involved has not yet attained its final form for the production of foreign trade statistics. For this study, it is sufficient to point out that the basic documents that provide the information used in the unit value approach are at present not available for this sector of foreign trade.

2.5 The unit value approach considered here is based only on information contained in the basic data for foreign trade statistics - relevant parts of the customers documents. A fairly detailed description of these data consequently forms a necessary part of this study.

2.6 The main problems discussed in the chapters that follow are related to the decomposition of the value flows within the framework of the traditional price and quantity indexes for foreign trade. The approach described was developed in connection with the latest complete revision of the Norwegian indexes for foreign trade. The fundamental framework that had been established for these indexes over the years was retained, while the technical solution of problems within this framework was the issue under review. The aim is therefore not a complete treatment of the problems related to price and quantity indexes for foreign trade in Norway. Problems outside the framework of the indexes have not been considered.

In addition, some of the solutions related to the traditional approach were simply not reconsidered and may therefore have received limited attention.

2.7 Another objective has been to emphasize the close link with the national accounts at constant prices. Even before adopting the methods now in use, the calculation of the indexes for foreign trade in Norway had been co-ordinated with the calculation of the national accounts at constant prices. When developing the present system, one of the aims was to improve this co-ordination wherever possible.

2.8 While there is conceptually a very close relationship between the Laspeyres quantity indexes used for the foreign trade statistics and the corresponding flows of the national accounts at constant prices, there are also differences between the two fields - for example, when it comes to commodity classifications. In order to explain more fully how the wish to accommodate the needs of the national accounts has influenced in detail the system for the foreign trade, some details on the national accounts, and in particular on the recording of foreign trade flows, will be necessary.

2.9 Previous solutions to some of the problems related to the foreign trade indexes have to a large degree rested upon the judgement of the subject-matter specialist and on a detailed knowledge of the commodities involved. With the development of high-speed processing equipment, possibilities developed for more comprehensive statistical analysis on the basic data. One of the main objectives of the study will be to illustrate these possibilities.

III. NATURE OF THE BASIC DATA

A. Customs documents

3.1 As indicated earlier, the basic data for the unit value approach to the decomposition of the value flows are largely the same records as those which form the basis for the foreign trade statistics. The description of the basic data for the foreign trade indexes must therefore cover the greater part of the basic data for the foreign trade statistics. The only parts not covered are those not included in the regular index calculations and those for which the regular procedures from the unit value approach would not be applicable.

3.2 The sources of data for the whole of the foreign trade statistics are administrative records of various kinds. For the purpose at hand, it will be sufficient to consider (a) the regular customs documents for exports and imports, and (b) more special records. The more special records cover such commodities as crude oil and natural gas, ships and oil rigs. Of these, ships and oil rigs are not covered by the regular index calculations. The basic information received on oil and gas does not lend itself to the procedures described in this study. For the reasons indicated, these fields will not be considered further in this study.

3.3 The regular customs documents are the forms filled in by exporters and importers and submitted to customs. These forms have been designed for joint use for customs and statistical purposes. The statistical form is a complete copy of the original document. The purpose of this arrangement is to co-ordinate the work of customs and the Central Bureau of Statistics so that duplication of effort can be avoided. In addition to the form itself, supplementary documentation is submitted to customs (e.g., the invoice). This also provides a basis for verification of the main body of information contained on the form.

B. Trade concept and coverage

3.4 The foreign trade statistics of Norway are based on the general trade concept. This means that the transactions (consignments) are recorded for statistical purposes at the time the goods cross the national boundary. As long as the decomposition of the value flow takes place on the basis of the information from the same file as that used for processing the value figures, the type of trade system, general or special, used in the statistics is not of particular importance when considering the relation between the value flow and its components. The trade system does, however, fix the time when the consignment is recorded - that is, included in the statistics. This is an important characteristic of the value flow and its components and thus of their comparability with other statistical series or flows.

3.5 The coverage of the data included in the index calculations follows that of the foreign trade statistics, with the exceptions mentioned in paragraph 3.2 above. In addition, certain categories of imports are not included in the foreign trade statistics in accordance with international recommendations and, consequently, are also excluded from the index calculations. The data on imports included refer to commodities cleared upon arrival or placed in bonded warehouses.

3.6 With the exceptions mentioned in paragraph 3.2, the basic data used for the indexes on exports cover commodities exported from Norway, including re-exports of imported goods whether or not the exports of re-exports are from bonded warehouses. As in the case of imports, certain categories of exports are not included in the statistics, in accordance with international recommendations, and consequently are also excluded from the basic data for the index calculations.

3.7 The only known loopholes in the administrative system for recording exports and imports are connected with direct imports related to the oil activities on the Norwegian continental shelf. These imports are estimated for the balance of payments but are not included in the foreign trade statistics. They could be spread over a variety of commodities. In spite of the total being comparatively insignificant, it still contributes to making the statistics not fully comprehensive. Again, this is more a problem related to the basic foreign trade statistics than to the indexes as such.

C. Editing and control of data

3.8 In addition to scope and comprehensiveness, accuracy is perhaps the most important characteristic when it comes to evaluating the quality of the basic data. When the forms are submitted to customs, they are immediately checked for comprehensiveness and other more formal requirements. At a later stage, but before copies of the forms are forwarded to the Central Bureau of Statistics for editing, coding and data transfer, a second and more thorough control, this time also of the numerical data, is conducted by customs in connection with the customs operations proper.

3.9 At the Central Bureau of Statistics, the forms are subject to further scrutiny before coding and transfer of data to tape. The data are then subjected to a repeated (up to three times) machine-editing programme for checking validity of codes and "plausibility" of values of numerical information and combinations of data. The last type of check also includes one which considers the price of the consignment as compared to reasonable values based on recent data.

3.10 At every succeeding stage of processing, the results are carefully scrutinized and possible errors checked and, if necessary, corrected. This process actually goes on up to the final preparation of the annual publication for foreign trade statistics. During this period, reports may be received from users on questionable figures in the preliminary releases - for example, in the monthly data on individual commodities.

3.11 From this brief outline of the control methods adopted for the basic data for the foreign trade statistics, it might be gathered that errors that would significantly influence the results are not likely to be included in the statistics. But there are still unchecked possibilities whereby errors might occur in the basic data or be introduced during the processing stages.

3.12 In order to obtain more objective measures of the quality of the basic data, it would seem necessary to conduct special surveys for this purpose. For example, by collecting, on a sample basis, detailed independent information related to separate consignments in order to supplement and check the data submitted on the customs form, overall measures of reliability could of course be derived. Owing to the practical problems involved and, not least, the resources that a project of

this kind would require, however, this cannot be considered a practical proposition. Considering the extensive use of the detailed commodity tables and the active co-operation of users in weeding out possible errors from the statistics, it might not be unjustified to accept the basic data as sufficiently accurate for the purposes at hand.

D. Value concept and currency conversion

3.13 The value concepts used in the foreign trade statistics are f.o.b. for exports and c.i.f. for imports. All values are given in Norwegian krone. When payment is stipulated in any other currency, the value figures are converted into Norwegian krone on the basis of exchange rates stipulated for the month in question. The stipulation of the rates of exchange for the month is done by customs in consultation with the Ministry of Finance.

E. Quantity information

3.14 On the customs form, information is submitted on gross weight, net weight, and for special commodities, also quantity in units other than weight. Only net weight and quantity in other units are used for statistical purposes. The gross weight figures, although not processed for statistical purposes, are used during the editing of the forms as a check on the net weight figures. (In addition to other checks at the editing stage, the mechanical control programme implicitly checks to some extent the quantity through the control on price.)

3.15 In addition to net weight, other units of quantity are given for certain commodities where the customs tariff so requires. The additional units used include number of units, litres and square metres. For each separate commodity, the aggregate quantity in the published figures is given in terms of weight for commodities whose quantity is not measured in other units, and in the alternative unit otherwise.

3.16 Value and quantity are basic concepts in connection with foreign trade flows and the decomposition of these flows into factors of price and quantity. These concepts will be considered also in the chapter IV, where concepts and definitions will be discussed in more detail.

F. Partner country references

3.17 The basic data for each consignment on the customs form also contain information on partner countries. For exports, both country of consumption and country of sale are recorded. Country of consumption is defined as the country where the goods are put to final use or are further processed. Country of sale is defined as the country where the foreign buyer is carrying out his business or lives, if the goods are sold through an agent.

3.18 For imports, both country of production (origin) and country of purchase are recorded. Country of production is defined, for raw materials, as the country where the goods are produced; and for processed goods, the country of final processing (not counting repacking), including the blending of tea and final assembly of vehicles. Country of purchase is defined as the country where the

seller of the goods carries out his business or lives, if the goods are purchased through an agent.

3.19 Country references in Norwegian foreign trade statistics is mainly based on country of consumption (exports) and country of production (imports). In this study, the term country will be used in this sense.

G. Possibilities for improvements

3.20 Within the present framework of customs-based data, the inclusion of all transactions related to activities on the continental shelf would tend to improve the basic information obtained for the foreign trade statistics. This, however, would depend on the necessary changes being made in the customs procedures. From a statistical point of view, additional control on the accuracy of the basic data would also be desirable. However, as all available sources have already been utilized as far as possible from a practical point of view, this would depend on the establishment of separate quality controls.

3.21 Improvements in the basic data of the type indicated above would mainly be of importance for the flows of the foreign trade statistics proper. Since these series represent the flows to be decomposed, the improvements could also have a direct effect on the components. The effects on the decomposition as such would be less straightforward.

IV. CONCEPTS AND DEFINITIONS

A. Basic Unit

4.1 The basic unit in foreign trade statistics is the separate transaction or consignment. The characteristics of these units are the fundamental variables to be considered. The aggregated data in the foreign trade statistics are derived from these variables.

4.2 The physical representation of the statistical unit is in the first instance the relevant part of the customs document. At the processing stage, the corresponding information will be contained in the basic data record in the file or data base for foreign trade statistics.

B. Commodity characteristics

4.3 The commodity characteristics of the transaction - the type or kind of commodity contained in the consignment - is of particular interest in connection with the regular statistics of foreign trade and of fundamental importance for the decomposition of the value flows.

4.4 The most detailed commodity specification available in the basic data corresponds to the specification in the customs tariff. This will be referred to in this study as the CT-specification or the CT-classification. The same specification is used for both exports and imports and is based on the Customs Co-operation Council Nomenclature (CCCN).

4.5 The commodity code in the customs tariff contains seven digits. The first four of these refer to CCCN. The next two are used for additional specifications common to the Nordic countries, while the last digit is reserved for special national subdivisions. All told, the present customs tariff contains some 4,000 specifications. In the discussion that follows, the term "commodity" will mainly be used with reference to these specifications. The separate transaction (consignment) will be considered to cover one commodity only. This implies that the commodity variable for each unit has only one value or code.

4.6 In addition to the CT-specification, commodities are classified on the basis of the Standard International Trade Classification, Revision 2 5/ (SITC, Rev.2) for the regular foreign trade statistics and on the basis of the Standard International Trade Classification, Revision 1 6/ (SITC, Rev.1) for the indexes of foreign trade. Owing to the relation between the CT-specification and the SITC, Rev.1 and Rev.2, all aggregates according to the two latter classifications are uniquely defined on the basis of the specifications in the customs tariff.

4.7 The decomposition of value flows in the foreign trade statistics has been co-ordinated with the calculation of the national accounts at constant prices. The

5/ United Nations publication, Sales No. E.75.XVII.6.

6/ United Nations publication, Sales No. 51.XVII.1.

third set of definitions of commodity groups related to the procedure of decomposition is therefore the special commodity classification of the national accounts - the NA-commodity classification. This is also defined in terms of the CT-specifications and might be considered part of the system already described.

C. Value concept

4.8 The value concept in foreign trade statistics is determined by that used by customs and recorded in the customs form. This concept has been described in previous paragraphs.

D. Quantity concept

4.9 For the quantity concept, the situation is more complicated than for value. While values are accepted as additive in a general way, quantities are only assumed to possess this characteristic when all the components are measured in equivalent physical units. This is the same as saying that the components should all consist of the same commodity. It may not be possible to get any closer to the quantity concept needed for the decomposition of value flows in foreign trade statistics than to claim that equivalent physical units should be available to measure the quantity of each commodity.

4.10 The main problem in applying this principle is that there is not always agreement on what constitutes equivalent physical units. This is true whether it is a question of principle or a question of practical choice. In connection with the approach outlined in this study, it will be shown that there may be ways of solving this problem other than by deriving a definition of equivalent physical units of measurement that can also be applied in practice.

4.11 For all consignments within the same CT-specification, the quantities are reported on the basis of the physical measure specified in the customs tariff. If there is no information available other than that on the customs form (and that is just what the situation is assumed to be for the unit value approach), the measure can either be accepted as a uniform physical measure of quantity for all the consignments, or not be accepted as such. In the latter case, the specification in the customs tariff cannot be regarded as representing one single commodity in the strict sense of the word.

4.12 How to decide whether the quantity measure is acceptable - that is, whether the corresponding specification in the customs tariff contains one commodity only or whether the quantity measure should be rejected as a uniform measure - will be discussed in connection with the practical problems of measurement. For the rest of this chapter, it will be assumed that the quantity figures for the commodities are accepted as measures of physical quantity.

E. Time of recording transactions

4.13 A third characteristic of the basic unit, in addition to value and quantity, is the point in time when the consignment (transaction) is registered or recorded.

In foreign trade statistics, this is when the consignment is cleared through customs. The flows can be regarded as the aggregated characteristics for groups of consignments (units) within certain time periods, such as months, quarters or years. If a different definition is adopted for the point in time when the consignment is recorded, this could change the value of the aggregate for the time period considered.

4.14 In connection with index number classifications when the basic information stems from different sources, often the question of compatibility between the various sets of data must be given full consideration. For foreign trade indexes, compatibility would also be connected with that definition of recording the transactions in time that is employed in the sets of data used in the calculations. For the unit value approach, where all the information used for the decomposition of the value flows is derived from the same basic units - namely, transactions - compatibility in this respect is ensured. The question of when the separate transactions are recorded will, however, still be of importance for the interpretation of the indexes and for their comparability with other statistical series.

F. Price concept

4.15 The concepts so far considered are directly related to traditional foreign trade statistics and are not in any way influenced by the problems of decomposing the value flows into price and quantity factors. The price concept, however, is not quite the same. The discussion of price must therefore be more extensive than has been the case for value and quantity. An added reason for this is that the label "price" is used for several concepts, and one of the tasks in outlining the procedure for the decomposition of the value flows is to choose the most appropriate price concept for the purpose.

4.16 Price might, of course, be considered an economic variable in its own right and be treated as such statistically. In collecting prices for some of the more important of the traditional indexes, this is normally the case. The information is then collected on price directly, without any reference necessarily to such other characteristics as value and quantity of the transaction or transactions involved. In addition, the transactions to which the price might be supposed to refer may even be indicated in general terms only. When price is considered separately, it is in the nature of a ratio and always has the denomination "per unit" of some physical measure of quantity.

4.17 The denomination of the price points to the most important characteristic of the concept - namely, that it depends on the existence of a physical measure of quantity for the transaction or groups of transactions to which it refers. Consequently, if there is no acceptable physical measure of quantity for a specific commodity, it is not permissible to talk of a price for this commodity. This is almost always pointed out at an early stage in papers on price and quantity statistics but the full consequences are not always taken into account throughout the ensuing discussion. Considered in relation to one separate transaction with the value v and the quantity q , the price p is defined in the usual manner as

$$p = \frac{v}{q}$$

This implies that the quantity of the transaction can be measured in physical terms.

4.18 The concept of price may be extended beyond the separate transaction to groups of transactions defined in various ways. If the value of transaction number i in the group is v_i and the corresponding quantity q_i , the value for the group is naturally $V = \sum v_i$ and the corresponding quantity $q = \sum q_i$, provided that all transaction in the group can be made subject to the same physical measure of quantity. The price for the group of transactions may be defined as

$$P = \frac{V}{q} = \frac{\sum v_i}{\sum q_i} = \frac{\sum q_i \cdot P_i}{\sum q_i}$$

- that is, as the ratio between the total value and the total quantity or the weighted average of the price for the separate transactions, using the corresponding quantities as weights.

4.19 The price concept indicated in the previous paragraph is not the only one possible in connection with groups of transactions (units), nor is it the only one met with in practice. Since price is not a unique concept in relation to a group of transactions, full details of the type of concept used will be necessary in order to judge if one particular price (or set of prices) is relevant to the problem being considered.

4.20 The price for a certain period will most probably be defined as the price for the transactions recorded in that period (considered as a group). Different definitions of the time for recording transactions might lead to different sets of transactions being recorded within the specified time interval and, consequently, the price for the period might also be different. These differences might be in the nature of a time lag, but for the situations most commonly encountered, in practicality, these lags would be difficult to evaluate.

4.21 Some of the concepts in general use - such as contract prices, list prices, order prices and spot prices - differ also with respect to the time location of the transactions to which they refer. For this reason also, the concepts cannot be considered equivalent. Nor would any of them be compatible with the value flows in the regular foreign trade statistics. For the decomposition of the latter, other concepts have to be considered. The basis for the choice of a price concept must be (a) that the main objective is the decomposition of the value series in foreign trade and (b) that preference is given to the quantity component.

4.22 The relation to the value series ties the statistical basis for the price concept to the units or transactions that have contributed to the corresponding value figures in the foreign trade statistics. In practical terms, this means that for one particular commodity in a certain quarter, the price concept in principle should refer to the consignments that have been cleared through customs during the same quarter. On the basis of the importance attached to the quantity component, it would seem reasonable to choose a price concept such that the quantity component in the case of a single commodity equals the actual quantity.

4.23 The two conditions for the choice lead directly to the price concept outlined above in paragraph 4.18 - the price concept that in principle is preferable for the decomposition of the value series in foreign trade is the average price defined as the ratio between the value and the corresponding quantity or the weighted average of the price for the transactions involved using the corresponding quantities as weights.

4.24 So far, the question of price has been considered on a purely formal basis and for one separate commodity only. The concept outlined in the previous paragraph is the theoretically preferable one for the type of decomposition of the value flow considered here. In practical terms, it represents the magnitude to be estimated as the price for separate commodities. How this price is to be estimated is a practical problem and will be considered in chapter VII below. The next problem is to establish the appropriate price concept for groups of commodities. This is an index number problem and will be considered in chapter VI below.

V. RELATION TO NATIONAL ACCOUNTING WORK

5.1 The starting point for the recommendations contained in Guidelines on Principles of a System of Price and Quantity Statistics 7/ is the formal set of concepts, classifications and aggregates contained in the System of National Accounts (SNA). By adopting this framework for the development of a consistent and integrated system of price and quantity statistics, possibilities are established for direct co-ordination with the corresponding flows in the national accounts, in particular with the national accounts series at constant prices.

5.2 Following the recommended framework for the price and quantity statistics does not mean that all the parts of the system will have to be part of the system of national accounts. However, it would seem to follow from the spirit of the recommendations that, whenever possible, price and quantity statistics should be directly co-ordinated with the relevant parts of the national accounts. This type of co-ordination has been one of the objectives in Norway for the system of price and quantity statistics for foreign trade.

5.3 The foreign trade statistics in Norway are partly published on the basis of the CT-specification and partly at various levels of SITC, Rev.2. The decomposition of the value flows into price and quantity indexes is related to SITC, Rev.1 aggregates only.

5.4 The last revision of the national accounts in Norway brought the system fully into line with SNA. Full co-ordination between the foreign trade statistics and the national accounts cannot extend to the formal SNA only. The particular approach to the national accounts within the SNA framework will also influence the type of co-ordination that can be achieved and how it should be implemented in practice.

5.5 Some of the relevant characteristics of the national accounting system in Norway are:

- (a) Annual input-output tables are incorporated in the national accounts;
- (b) Emphasis is placed on commodity flows and balances;
- (c) Detailed specifications form part of the system;
- (d) The main emphasis is on production and commodity accounts rather than on income and outlay and capital accounts.

The core of the Norwegian national accounting system is, in fact, the detailed industry-commodity and commodity-industry tables. For the co-ordination of the foreign trade statistics with the national accounts, the commodity side is the more important.

7/ United Nations publication, Sales No. E.77.XVII.9.

5.6 The most detailed commodity specification used in the national accounts contains approximately 1,750 separate groups. Of these, some 1,350 refer to the commodities in industry and foreign trade statistics. This detailed commodity specification has been aggregated into some 350 main commodity groups.

5.7 This commodity classification system has been developed for use within the national accounts. In order to comply with the special requirements of the accounting system, a special system had to be adopted. Direct comparability with SITC, for example, was not taken into account when the national accounts commodity classification system was derived. The commodities (or commodity groups) in the national accounts are, however, defined in terms of the most detailed commodity classification in general use in Norway for basic economic statistics. For foreign trade statistics, this corresponds to the CT-specification.

5.8 The commodity classifications in the foreign trade statistics both for the regular series and for the indexes and the commodity classification in the national accounts are accordingly based on the CT-specification. There is in general no other direct link between the classification systems used in the foreign trade statistics and the national accounts. In practice, the situation outlined in no way prevents a co-ordinated approach in the two fields. The lack of a direct link at a more aggregated level, however, has considerable influence on the type of joint solution that can be achieved.

5.9 Exports and imports appear both in the balance of payments and in the commodity accounts of the national accounts. Since the relation to national accounting work treated here concerns the decomposition of the value flows in the foreign trade statistics, it is only necessary to consider the case of the commodity accounts. The calculations at constant prices do not involve the balance of payments.

5.10 The relation of exports and imports to the commodity accounts is straightforward. Exports form part of the disposition of goods, and imports are registered as part of the supply of goods. The value concepts used in this connection in the national accounts are the same as those used in the foreign trade statistics - f.o.b. for exports and c.i.f. for imports.

5.11 The final figures in the foreign trade statistics are entered unchanged into the national accounts. They therefore also form part of the magnitudes in the national accounts for which values at constant prices are calculated. It seems reasonable to ensure that the relationship between the value flow of foreign trade statistics and the corresponding flow in the national accounts should also extend to the price and quantity indexes and the relevant magnitudes at constant prices in the national accounts.

5.12 The flows in the national accounts at constant prices are usually not calculated in the way this requirement suggests. They are, in most cases, derived through deflation of the flows at current prices by appropriate price indexes. In the national accounts at constant prices, current values for exports and imports are deflated separately. This means that the total supply of goods at constant prices consists of two components that have been derived separately - namely, the supply from domestic production and the supply from imports. Also, on the disposition side, exports are deflated separately.

5.13 The deflation does not take place at the most detailed level of the commodity specification in the commodity accounts but only for the 350 main commodity groups. This has been done purely for practical reasons and should not affect the principles underlying the calculation of the flows at constant prices.

5.14 In addition to the differences between the foreign trade statistics and the national accounts in the matter of commodity classification, there are differences stemming from the fact that the decomposition of foreign trade flows is calculated on a quarterly basis while the national accounts at constant prices are calculated on an annual basis. Even before the present system of price and quantity statistics for foreign trade was developed, the corresponding calculations had been co-ordinated with those of the national accounts at constant prices. It was therefore a condition for the present system that the index calculations for foreign trade should supply the necessary data for the corresponding calculations of the national accounts at constant prices and that the two sets of figures should be fully consistent.

5.15 Consistency in this connection meant that whenever aggregates from the two fields were identical in scope and the comparison base for prices was the same, the quantity figures derived from the index calculations and the constant-price calculations should also be identical. The practical solution that has been adopted in order to ensure this type of consistency is based on the deflation of the value flows at the CT-specification level, aggregation of these deflated values and implicit derivation of the appropriate price indexes. Further details on this method of calculating the indexes will be given in chapter IX below.

VI. INDEX NUMBER FORMS AND REQUIREMENTS

6.1 The basic problem considered in this study might formally be written

$$V = PQ \quad (6.1.1)$$

where V represents the value of the flow and P and Q the price and quantity components. This representation of the problem is formally the same as the one used previously in the case of a single commodity, the difference being that the definition of price and quantity for a single commodity cannot be applied to groups of commodities.

6.2 From the relationship (6.1.1), it is obvious that it is only necessary to agree on a method either of expressing the quantity of a group of commodities or of defining the price component for the group in order to solve the problem. If one component is defined, the other follows from (6.1.1). This implies also that price and quantity cannot be defined independently of each other if (6.1.1) is expected to hold good.

6.3 Traditionally, in Norway, the quantity component in the decomposition of the flows of foreign trade has been defined as the value of the current quantities measured at constant price. The corresponding price component has then been determined through the relationship (6.1.1). This traditional approach to the measurement of the quantity component for foreign trade statistics also fits in with the definition of the quantity component in the national accounts - that is, the national accounts at constant prices. This has meant that complete co-ordination between the index number calculations for foreign trade and the calculation of the national accounts at constant prices does not require any fundamental changes in approach to the decomposition of value flows in the foreign trade statistics.

6.4 It has been customary to express both the value flows and the quantity components for the foreign trade indexes as relative figures - that is, as percentages of the corresponding figures in a base period - while the national accounts at constant prices are given in absolute figures. In the discussion that follows, it will be assumed, if it is not otherwise implied, that the value flows for foreign trade are expressed in absolute figures as current values and that the quantity components are expressed in the same way as the quantity component in the national accounts. The difference for the foreign trade indexes is a scale-factor that is irrelevant for the system as such.

6.5 For the derivation of the appropriate index number formulae, the following symbols are used:

v_{ijt} = value (at current prices) for commodity
 i in quarter j in year t
 $i=1,2,\dots,N; j=1,\dots,4; t=0,1,\dots,T,\dots$

q_{ijt} = quantity (in physical terms) of commodity
 i in quarter j in year t

$p_{ijt} = \frac{v_{ijt}}{q_{ijt}}$ = current price of commodity
 i in quarter j in year t

$v_{it} = \sum_{j=1}^4 v_{ijt} = \sum_{j=1}^4 p_{ijt} q_{ijt}$ = value for commodity
 i in year t

$q_{it} = \sum_{j=1}^4 q_{ijt}$ = quantity of commodity
 i in year t

$p_{it} = \frac{v_{it}}{q_{it}} = \frac{\sum_{j=1}^4 q_{ijt} \cdot p_{ijt}}{\sum_{j=1}^4 q_{ijt}}$ = price of commodity
 i in year t

Q_{ijt} = value (at constant prices) for commodity
 i in quarter j in year t

p_i = "the constant price" for commodity i

(Additional symbols will be introduced below when needed.)

6.6 The flows for commodity i are:

(a) Value at current prices:

On a quarterly basis,

$$v_{ijt} = p_{ijt} \cdot q_{ijt}, \text{ for } j=1,\dots,4 \text{ and } t=0,1,\dots,T,\dots \quad (6.6.1)$$

On an annual basis,

$$V_{it} = P_{it} \cdot q_{it} = \sum_{j=1}^4 V_{ijt} = \sum_{j=1}^4 P_{ijt} \cdot q_{ijt}, \text{ for } t=0, \dots, T, \dots \quad (6.6.2)$$

(b) Value at constant prices:

On a quarterly basis,

$$Q_{ijt} = P_i \cdot q_{ijt}, \text{ for } j=1, \dots, 4 \text{ and } t=0, 1, \dots, T, \dots \quad (6.6.3)$$

On an annual basis,

$$Q_{it} = \sum_{j=1}^4 Q_{ijt} = P_i \sum_{j=1}^4 q_{ijt} = P_i \cdot q_{it}, \text{ for } t=0, 1, \dots, T, \dots \quad (6.6.4)$$

The corresponding price indexes or deflation factors are:

On a quarterly basis,

$$P_{ijt} = \frac{V_{ijt}}{Q_{ijt}} = \frac{P_{ijt}}{P_i} \quad \text{for } j=1, \dots, 4 \text{ and } t=0, 1, \dots, T, \dots \quad (6.6.5)$$

On an annual basis,

$$P_{it} = \frac{V_{it}}{Q_{it}} = \frac{\sum_{j=1}^4 P_{ijt} \cdot q_{ijt}}{P_i \sum_{j=1}^4 q_{ijt}} = \frac{P_{it}}{P_i}, \text{ } t=0, 1, \dots, T, \dots \quad (6.6.6)$$

Consequently,

$$Q_{ijt} = \frac{V_{ijt}}{P_{ijt}} \quad (6.6.7)$$

and

$$Q_{it} = \frac{V_{it}}{P_{it}} \quad (6.6.8)$$

This indicates the rather obvious fact that for calculating the value at constant price one for commodity i it is sufficient to know the value and the price relative - that is, the ratio between the current and the base price.

6.7 The corresponding situation for a group of commodities consisting of, say, commodities i , $i=1,2,\dots,n$, would be:

(a) Value at current prices:

On a quarterly basis,

$$V_{jt} = \sum_{i=1}^n v_{ijt} = \sum_{i=1}^n P_{ijt} \cdot q_{ijt} \quad (6.7.1)$$

On an annual basis,

$$V_t = \sum_{i=1}^n v_{it} = \sum_{i=1}^n P_{it} \cdot q_{it} \quad (6.7.2)$$

(b) Value at constant prices:

On a quarterly basis,

$$Q_{jt} = \sum_{i=1}^n Q_{ijt} = \sum_{i=1}^n P_i \cdot q_{ijt} \quad (6.7.3)$$

On an annual basis,

$$Q_t = \sum_{i=1}^n Q_{it} = \sum_{i=1}^n P_i \cdot q_{it} \quad (6.7.4)$$

The corresponding price indexes or deflation factors are:

On a quarterly basis,

$$P_{jt} = \frac{V_{jt}}{Q_{jt}} = \frac{\sum_{i=1}^n P_{ijt} \cdot q_{ijt}}{\sum_{i=1}^n P_i \cdot q_{ijt}} = \frac{\sum_{i=1}^n v_{ijt}}{\sum_{i=1}^n v_{ijt} \cdot \frac{P_i}{P_{ijt}}} \quad (6.7.5)$$

On an annual basis,

$$P_t = \frac{V_t}{Q_t} = \frac{\sum_{i=1}^n P_{it} \cdot q_{it}}{\sum_{i=1}^n P_i \cdot q_{it}} = \frac{\sum_{i=1}^n v_{ijt}}{\sum_{i=1}^n v_{it} \cdot \left(\frac{P_i}{P_{it}}\right)} \quad (6.7.6)$$

The correspondence between the quarterly and the annual price components or price indexes is:

$$P_t = \frac{V_t}{Q_t} = \frac{\sum_{j=1}^4 v_{jt}}{\sum_{j=1}^4 Q_{jt}} = \frac{\sum_{j=1}^4 v_{jt}}{\sum_{j=1}^4 v_{jt} \left(\frac{1}{P_{jt}}\right)} \quad (6.7.7)$$

Similar to (6.6.7) and (6.6.8):

$$Q_{jt} = \frac{V_{jt}}{P_{jt}} \quad (6.7.8)$$

and

$$Q_t = \frac{V_t}{P_t}$$

6.8 The formulae presented in paragraphs 6.6 and 6.7 contain all that is required for the formal establishment of a system for the decomposition of the value flows represented by the Vs. The system in principle depends on two factors only:

(a) That the aim is the decomposition of the value flow into factors of price P and quantity Q, satisfying the relationship $V = PQ$;

(b) That the quantity component is defined for groups of commodities as the value at constant prices.

6.9 In this system, the character of the quantity component is that of the normal Laspeyres or base-weighted quantity index. All that is needed for expressing it in this form is (a) a division of the series of quantity measures indicated in the formulae above by the value in the base period and (b) the presentation of the result as a percentage. As the quantity component is of the Laspeyres type, the price component must be a Paasche type (current weighted) price index.

6.10 While the Laspeyres indexes for more aggregated groups can be derived as weighted arithmetic means of the component indexes, the Paasche indexes must be combined for groups through the use of weighted harmonic means of the component indexes. This is clearly expressed in the formulae (6.7.5), (6.7.6) and (6.7.7).

6.11 It should be noted that additivity is accepted for the quantity measure - value at constant prices - in the same way as for value at current prices. One difference is that value at current price for a commodity exists independently of whether the quantity is measurable in physical terms, while the value at constant price depends on the existence of a physical unit of measurement for the quantity.

6.12 The formulae indicate basically two ways to approach the solution for the decomposition - either through the quantity component or through the price component. The fundamental magnitude for the approach through the quantity component, the value at constant price for the separate commodities, is defined by equations (6.6.3) and (6.6.4) or (6.6.7) and (6.6.8). The first equations are based on the assumption that both the current (physical) quantities and the constant price are available for each commodity. The second set of equations - (6.6.7) and (6.6.8) - require the value and the price relative (the ratio between the current and the constant price) only. Once the fundamental magnitudes - Q_{ijt} or Q_{it} in the formulae - have been obtained, the quantity component for any group of commodities can be derived directly through summation.

6.13 In order to achieve a solution through the price component, the price relatives are sufficient for each separate commodity. For groups of commodities, the current value for each of the commodities must be available in addition to the price relatives. For further aggregation of groups of commodities, the values for the groups and the price indexes are needed. From the formulae, it is obvious that the work of calculating the components for aggregates will be simpler using the quantity approach.

6.14 Underlying the possible need for alternative approaches - either through the quantity component or the price component - is the fact that the situation that will have to be faced in practice may not always be the same. If the price relatives are available for each commodity, the procedure based on direct development of the quantity component will probably be preferable because it is computationally simpler. But sometimes price data for the separate commodities are not available for one reason or another, though a price index covering those commodities may be estimated at a higher level of aggregation. In that case, it will be necessary to use the alternative approach, even if this means estimation of the price component by using such formulae as (6.7.5) or (6.7.6). At the level where price indexes are available, the corresponding quantity components can be derived through (6.7.8) or (6.7.9). The quantity components for higher levels of aggregation will then be obtained through summation of the newly derived quantity measures.

6.15 Instead of deflating the value at current prices for the group, the value for each of the component commodities might be divided by the common price index:

$$Q_t = \frac{V_t}{P_t} = \frac{\sum_{i=1}^n v_{it}}{P_t} = \sum_{i=1}^n \frac{v_{it}}{P_t} \quad (6.16.1)$$

In this case, aggregation of the deflated values can proceed from the commodity level. This might be an advantage for purely practical reasons, particularly when different types of aggregation are performed on the same basic data.

6.16 The system outlined above may be considered the theoretical goal for the decomposition of the value flows under the conditions specified. The corresponding flows for any type of aggregation of the basic commodities may be derived provided the definition of the aggregates relates to known (recorded) characteristics of the commodities. If different conditions are specified, this may influence methods and procedures for decomposition, and a system different from the one described may be needed.

6.17 If specific conditions are laid down for the price component instead of for the quantity component as above, an entirely different set of indexes may be derived. A new and different interpretation of the quantity component, which may not be equally well-suited for co-ordination with the national accounts, may also be necessary. This situation should not be confused with the one often met with in practice when all the information needed for the full implementation of the above system is not available, and consequently the magnitudes needed, or some of them, have to be estimated or approximated. Insufficient or imperfect data do not alter the aim represented by the system outlined above. It is against this that the practical approach should be gauged.

6.18 The system described above has been developed on the assumption of ideal conditions - that is, without regard to the possibility that the basic information required for the suggested index calculations will not be available. It cannot be expected that these requirements will be met in all cases under real conditions.

6.19 The least demanding alternative and the one that suits the approach through either the quantity or price components is based on (a) values at current prices and price relatives at the commodity level or (b) value and relevant (Paasche-type) price index at one of the aggregation levels.

6.20 The value side does not represent any problem in connection with foreign trade data as long as no greater detail is required than that of the product specification in the customs tariff. On the price side, the theoretical requirements are the same as those that have to be fulfilled so that meaningful price relatives shall exist. For the separate commodities, these requirements can be expressed in terms of the measurability of the commodity in physical units. In chapter VII, the practical aspects of these requirements will be treated in more detail.

6.21 The first and most basic of these requirements is that the price concept must be applicable to the commodity (or commodities) in question. As previously stated, the condition is that there must be an accepted unit for measuring the physical quantity of the commodity. For the most detailed commodity specification in the foreign trade statistics, this implies that the same physical measure is applicable to the separate transactions (consignments) contained in the value figure considered.

6.22 If there are to be price relatives for the whole period for which the flows are considered, the first and obvious condition is that each commodity must have been in existence during the entire period. The second condition is that the same physical unit must have been valid for the measurement of the quantity of the commodity for the whole period. This condition is needed to ensure that the price for the commodity is comparable at various point in time. Only if these conditions are fulfilled can decomposition be performed directly on the basis of the formulae given above. However, this cannot be expected for all parts of the flows in the foreign trade statistics under real conditions.

6.23 The possible solutions to the problems caused by non-compliance with the conditions mentioned above might to some extent depend on the practical situation. Basic data might be improved through utilization of other sources, including special collections of data. When these possibilities are exhausted or are not applicable, customary procedures are based on adopting suitable assumptions that will permit the approximation of the price changes. The special solutions based on suitable assumptions are not part of the basic system and will be considered in connection with other practical problems related to the operation of deriving the price and quantity components of the actual flows in the foreign trade statistics.

VII. PROBLEMS OF PRICE MEASUREMENT

7.1 The value flows - that is the magnitudes to be decomposed - present no particular problem since the problems that may have existed can be regarded as having been solved in the process of preparing the regular foreign trade statistics. Whatever solutions may have been chosen, the result is the flow to be factored into price and quantity components. The value series produced by the regular foreign trade statistics are the reference series to which other magnitudes should be related in order to form part of a consistent system.

7.2 In spite of the priority given to the quantity component, the procedure for decomposing the value series is based on information on prices or price relatives for the separate commodities in addition to information on values. The emphasis on the quantity component does, however, have its influence on the choice of price measures, since it is on the basis of its usefulness for deriving the desired quantity component that the price concept is judged.

7.3 If the process of obtaining the required price data is launched as a separate operation, one of the principal aims is to get data that are compatible with the value figures. In the case of a unit value approach based on the data for foreign trade statistics, the price data will fulfil this condition.

7.4 The main problem in connection with the unit value approach lies in another direction. The concepts and definitions used in the records for the foreign trade statistics have not been adopted primarily for statistical purposes. In addition, the statistician has little possibility of having the concepts altered to something more suitable for these ends. The major question thus becomes how far the customs data can safely be used for the purpose at hand.

A. Problem of unit value bias

7.5 The main objection to the unit value approach has been that even the most detailed commodity specification in the foreign trade statistics is not detailed enough for the price data required for the decomposition of the value flows. There might not be a single simple answer to this objection. For example, the answer might not be the same when emphasis is on the price component as when it is on the quantity component. In order to comment on this problem in more detail, more realistic models for the decomposition of the value flows may be useful.

7.6 The first step is to point out a rather trivial fact that seems to be at the bottom of all discussions concerning the unit value approach. In order to illustrate it, let it first be assumed that consignments in two periods can be matched. The basis for the matching might be that the consignments are shipped by the same dealer, or that the consignments have other characteristics in common that are not shared by other consignments. It is, in the first instance, not necessary to consider more than two pairs of consignments. The following symbols will be used:

q_0' = quantity of consignment no. 1 in period 0

p_0' = price of consignment no. 1 in period 0

v_0' = $p_0' q_0'$ = value of consignment no. 1 in period 0

q_1' = quantity of consignment no. 1 in period 1

p_1' = price of consignment no. 1 in period 1

v_1' = $p_1' q_1'$ = value of consignment no. 1 in period 1

and, correspondingly, q_0'' , p_0'' , v_0'' , q_1'' , p_1'' , v_1'' , for consignment no. 2.

7.7 In addition, the following assumptions are made:

(a) The quantities may be added (at least formally);

(b) The total quantity in the two periods is the same -

$q_0' = q_0' + q_0'' = q_1' = q_1' + q_1''$. This is the same as to assume that any change in one set is offset by the change in the other or that we have $q_1' = q_0' + \Delta$ and $q_1'' = q_0'' - \Delta$ at the same time;

(c) Prices are unchanged from period 0 to period 1 in the sense that $p_0' = p_1' = p'$ and $p_0'' = p_1'' = p''$.

7.8 The change in the total value from period 0 to period 1 is then:

$$v_1 - v_0 = v_1' + v_1'' - (v_0' + v_0'') = \Delta (p' - p'').$$

If both Δ and $(p' - p'')$ are different from zero, this shows that for an aggregate, changes in total value may occur without changes in the total quantity or of the prices of component parts, but simply through shifts in quantities between components.

7.9 In order to accommodate the type of change indicated in the previous paragraph, the multiplicative model for decomposition of the value flow will be expanded into:

$$V = P^* Q^* S \quad (7.9.1)$$

where

V = value

P* = "pure" price component

Q* = "pure" quantity component

S = shift component

It is assumed that all quantities relate to one particular CT-specification.

7.10 In the case of n consignments and two time periods, the following symbols can be used:

$q_t^{(i)}$ = quantity of consignment i (i=1, ..., n) in period t (t=0, 1)

$p_t^{(i)}$ = price of consignment i in period t

$v_t^{(i)} = p_t^{(i)} \cdot q_t^{(i)}$ = value of consignment i in period t

7.11 The components in (7.9.1) related to period 0 and 1 may be defined as follows:

The value change:
$$V_{0,1} = \frac{\sum_i v_1^{(i)}}{\sum_i v_0^{(i)}} = \frac{\sum_i p_1^{(i)} \cdot q_1^{(i)}}{\sum_i p_0^{(i)} \cdot q_0^{(i)}} \quad (7.11.1)$$

The "pure" quantity change:
$$Q^* = \frac{\sum_i q_1^{(i)}}{\sum_i q_0^{(i)}} \quad (7.11.2)$$

The "pure" price change:
$$P^* = \frac{\sum_i q_1^{(i)} \cdot p_1^{(i)}}{\sum_i q_1^{(i)} \cdot p_0^{(i)}} \quad (7.11.3)$$

The shift component S is then defined by (7.9.1) and (7.11.1 - 7.11.3) - that is,

$$S = \frac{\sum p_1 \cdot q_1}{\sum p_0 \cdot q_0} \cdot \frac{\sum q_0}{\sum q_1} \cdot \frac{\sum q_1 p_0}{\sum q_1 p_1} = \frac{\sum q_1 p_0}{\sum q_1} \cdot \left(\frac{\sum q_0 p_0}{\sum q_0} \right)^{-1}$$

$$= \frac{\sum_i q_1^{(i)} \cdot p_0^{(i)}}{\sum_i q_0^{(i)} \cdot p_0^{(i)}} \quad (7.11.4)$$

7.12 Even if (7.9.1) is considered a realistic description of the actual situation for a value flow - in other words, that it consists of three components relating to "pure" price, "pure" quantity and shift - the decomposition of the flow is still required according to (5.1.1) - that is, into two factors, one called the price component and the other called the quantity component. The simplest solution to this situation seems to be either to put

$$P = P^*S^* \text{ and } Q = Q^* \quad (7.12.1)$$

which is the same as accepting the shift as part of the price change, or to put

$$Q = Q^*S^* \text{ and } P = P^* \quad (7.12.2)$$

and to consider the shift as a quantity change.

7.13 The implications of (7.12.1) are that

$$Q = Q^* = \frac{\sum_i q_1^{(i)}}{\sum_i q_0^{(i)}} \quad (7.13.1)$$

and

$$P = P^*S = \frac{\sum q_1 p_1}{\sum q_1 p_0} \cdot \frac{\sum q_1 p_0}{\sum q_1} \cdot \left(\frac{\sum q_0 \cdot p_0}{\sum q_0} \right)^{-1} \quad (7.13.2)$$

$$= \frac{\sum q_1 p_1}{\sum q_1} / \frac{\sum q_0 p_0}{\sum q_0}$$

- that is, the ratio between the average price in period 0 and period 1.

7.14 In a similar manner, (7.12.2) will give

$$P = P^* = \frac{\sum q_1 p_1}{\sum q_1 p_0} \quad (7.14.1)$$

and

$$Q = Q^*S = \frac{\sum q_1 p_0}{\sum q_0 p_0} \quad (7.14.2)$$

which is the same as the Paasche index for the price and the Laspeyres index for the quantity if paired consignments were considered separate commodities.

7.15 The model outlined above applies equally well to cases of n groups of consignments in the two periods. If the model is applied in the case of one specific commodity as defined in the most detailed specification of the customs tariff (CT-commodity), one of the following two situations will apply:

(a) The case is treated as one single commodity for which the quantity (value at constant price) is required to move parallel to its quantity in physical terms;

(b) The case is treated as several separate commodities that are sufficiently similar to be classified under the same specification in the customs tariff.

7.16 In the first case - 7.15 (a) - equation (7.12.1) applies and decomposition proceeds according to (7.13.1) and (7.13.2) - that is, the shift is included in the price component. In other words, in this case the unit value change gives the correct factor for deflation purposes. If, on the other hand, decomposition has taken place on the basis of (7.14.1) and (7.14.2) - that is, the shift is included in the quantity component - a bias will be introduced into the quantity component and this bias will be proportional to the factor S defined in (7.11.4). With the unit value approach, there is no danger that this type of error will occur.

7.17 In the second case - 7.15 (b) - decomposition proceeds on the basis of (7.14.1) and (7.14.2). If, in this case, the unit value of the combined transactions is used, a bias will be introduced in the price component and, through the deflation, a similar bias will occur in the quantity component. It is this bias that constitutes the unit value bias.

7.18 When the decomposition is based on the unit value approach, the most detailed information available relates to the CT-specification. In the case outlined in the previous paragraph - when there is a case of product mix within the CT-specification - the unit value for this CT-commodity should not be used. A solution may be achieved if data are available on separate products within the CT-specification. For the approach considered in this study, this possibility does not exist and, consequently, there is no direct solution to the situation outlined in the previous paragraph.

7.19 The shift factor is only of importance if the expression in (7.11.4) is different from unity. It should also be pointed out that the effect has only been studied in connection with separate commodities. In order to be of more than theoretical interest where practical work is concerned, the effect must also be significant for the aggregates into which the value flows are being decomposed. This problem will not be pursued further in this study.

7.20 So far, the treatment has been based on two assumptions:

(a) That within each particular commodity, as defined by the most detailed specification in the customs tariff, a true price exists for each consignment for each of the time periods considered;

(b) That for matched consignments, the price is comparable in the two periods.

7.21 For the first assumption - 7.20 (a) - two alternatives have been considered:

(a) That in spite of the differences in price for the separate consignments, they all consist of the same commodity (product) and are subject to the same unit for measuring their physical quantity; or

(b) That not all consignments consist of the same commodity in the strict sense of the word, but that each of these commodities has its own physical quantity and corresponding physical unit of measurement. In this case, a true physical measure does not exist for the CT-specification as a whole.

7.22 The second assumption - 7.20 (b) - implies that the same unit of physical measurement is applicable to each of the matched consignments in both periods.

B. Quality changes

7.23 The two assumptions referred to in paragraph 7.20 imply that there are no deviations from the basic conditions indicated in paragraph 6.21 and 6.23. These are that the pure physical quantities of the commodities are defined and measurable and that the same commodities exist in the time periods considered. The two assumptions cannot, however, be expected to apply to all commodities met with in the value flows in foreign trade. This is the case in particular for those subject to quality changes or seasonal and other discontinuities and those labelled new commodities or unique goods. In order to secure decomposition of the whole of the value flow, or at least as great a part of it as can be statistically justified, the problem of how to deal with these non-regular cases will have to be considered. The starting point for an explanation of what the quality changes or differences might involve is usually the physical description of the commodity.

7.24 The discussion of quality differences usually refers to largely similar products. This implies, inter alia, that the differences should not be so great that it would be more reasonable to talk about entirely different products, even if they served fundamentally the same purpose. The differences, even if they are small, should, however, be of some significance.

7.25 There are no hard and fast rules for deciding when there is a quality difference and when the products should be considered different commodities or, for that matter, when the differences should be considered of some significance or of no significance at all. Within a specific and narrow time period, price differences might give an indication of quality differences, at least if the question of difference commodities has been settled first.

7.26 The term quality change refers to quality differences encountered in different time periods. Under these circumstances, one should be careful not to use price differences as an indication of quality differences, since the changes under study and the changes that the data should measure are the real price changes. This measure should not be influenced by subjective judgement.

7.27 In some cases, a more detailed study of the physical characteristics of the commodities might give the required indication. But the question would still remain, when differences have been observed, whether these should be considered significant from the point of view of price or quantity comparisons. In the end, some subjective judgement will have to be exercised in order to reach a conclusion. At one extreme, the problem would be to distinguish between cases of different commodities and mere quality differences. At the other extreme, the problem would be to decide when differences, which might conceivably be related to quality, should be considered significant. In between, would be the cases that could be classified more easily as quality differences.

7.28 By presenting numerous suitable examples, the area of doubt could be narrowed. This has been done with skill in other papers on price and quantity statistics. However, for the further treatment of the problems in this study, the indications given will probably suffice.

7.29 The critical point in connection with the problem of decomposition of the value flows is that changes in the physical characteristics of a commodity might indicate that the unit in which physical quantity is measured are no longer the same. Quantities before and after the change has taken place would not, strictly speaking, be comparable.

7.30 When considering quality changes - quality differences that occur over time - the problem would be solved if it were possible somehow to re-establish the comparability of the physical measure of quantity. The methods employed toward this end might range from (a) obtaining some sort of adjustment factor to the original physical units to (b) making an elaborate analysis of the relation between price and a long list of physical characteristics of the commodity in question.

7.31 The possibilities available under a unit value approach are rather restricted. In most cases, the type of detailed treatment indicated in the previous paragraph would not be feasible even in the simplest forms. Essentially, the options available under the unit value approach are either to accept the data as sufficiently comparable for practical use, or to reject them as a basis for the decomposition of the value series. Even if the possibilities for adjustment might seem more promising under other methods of approach, it is rarely stated that fully satisfactory solutions have been achieved in practice. The situation might, however, be considered more serious for the unit value approach.

7.32 Since the adverse effects of quality changes normally increase with time, the most obvious solution would seem to be frequent revisions of the comparison base combined with some sort of linking procedure. However, when considering these options, due regard must be given to the requirements of those other fields of statistics with which foreign trade indexes are co-ordinated - for example, the national accounts at constant prices. This would seem to restrict the use of this procedure somewhat.

C. New products

7.33 In discussion above, the term "different product" has been used to indicate a degree of alteration in the physical specifications of the product outside the range ascribed to mere quality changes. Another word for the same is simply "new" products or commodities. New commodities might include something more than those commodities created by sufficiently large changes in commodities that already exist. They also cover those commodities that have no previous counterparts. For the problems considered in this study, it will suffice to describe new commodities as commodities whose physical characteristics are so different from those of any commodities previously included in the flows that no mere adjustments of units of measurement can create comparability of quantities.

7.34 In addition to physical non-comparability with previous products, new commodities are understood not to have existed during the base period for the price and quantity components. New commodities might thus be described as commodities with zero value and quantity and unknown price in the based period (and perhaps also for some time afterwards).

7.35 When the new commodity makes its appearance, it obviously will have a value. It is assumed that it has a proper quantity and, consequently, a price in the current period. The only information then missing for the regular treatment of the

commodity in the decomposition process is the base price, or the information that would permit the imputation of a base price. With the current price available, a measure of the assumed price change would suffice for this purpose.

7.36 There can be no standard or recommended source or method for imputing the base price. What could be adopted as an acceptable substitute for the price relative for the new commodity can only be decided through specialized knowledge in the field concerned and some measure of subjective judgement. However, since it is a question of price changes for a commodity in foreign trade, it should be remembered that the required information may be available from other countries or from other outside sources. If this should not be the case, it is permissible to use price changes for commodities that at least in part seem similar to the new one. If the new commodity replaces a previous commodity, some sort of linking procedure may also be permissible. The last procedure suggested resembles some of the methods used for dealing with problems of quality change.

D. Unique goods

7.37 Unique goods are just what the term implies - commodities that are different from anything encountered in the same line before and/or that are not expected to be duplicated according to the same specification again. Unique goods range from comparatively small items of custom-made clothing or furniture to ships and oil rigs built to special order.

7.38 For unique goods, the only data available of interest for the subject covered in this study are the values at the time they appear as items in the foreign trade statistics. As far as other characteristics are concerned, it does not seem possible to apply any of the usual concepts of price and quantity. That these goods, by definition, do not exist except at one particular point in time defeats all attempts even to see them in terms of a flow. In other words, unique goods seem to lack all the characteristics necessary for inclusion in the value flows and in their price and quantity components.

7.39 The story of unique goods and their relation to indexes of foreign trade could have ended with the last paragraph had not their combined values formed perfectly legitimate value flows and made a not insignificant contribution to the total foreign trade of Norway. The obvious direct solution to the problem would be to find some sort of substitute series for the price change. This could possibly be done for groups of unique goods that fit into one of the commodity specifications for foreign trade or into an aggregate level in the commodity classification used.

7.40 This is no doubt implicitly done in many cases. The commodity specification in the customs document may not identify unique goods as such, since they may be classified with other goods under a common designation. Some of these cases may be identified at the editing stages or through their effect on the unit value. For those cases that are not so identified - and that may imply that they have not influenced the unit value to an appreciable extent - the price changes for the regular consignments within the same CT-specification may contribute significantly to the deflation factor for the unique consignment as well. In some ways, the principle involved is similar to that underlying the deliberate choice of a substitute series for the price change.

7.41 For complex unique goods, such as ships and oil rigs, the method based on the selection of a suitable substitute price-change indicator is hardly acceptable. This means that as far as the foreign trade indexes are concerned, these types of goods cannot possibly be covered under the regular procedure. It is thus necessary to adopt special procedures in order to accommodate these commodities in the foreign trade indexes. However, the need for special procedures puts the treatment of the problems involved outside the scope of this study.

E. Seasonal and other discontinuities

7.42 In some cases, commodities disappear from the market during certain periods. This may occur according to some more or less regular pattern or may be quite haphazard. If the more regular pattern is connected with specific periods during the year, the corresponding discontinuities are referred to as seasonal.

7.43 Seasonal commodities may also be subject to some of the characteristics causing problems for the decomposition of the value flows, such as quality changes and the sudden appearance of new commodities. The methods for dealing with these problems are the same for seasonal commodities as those suggested for regular commodities. Only their seasonal character, therefore, needs to be given special consideration here.

7.44 If the base period is one whole year, the seasonal commodities can be expected to exist for that period. This means, in particular, that information on the price or unit value for the base period is available. For the current period, both the value and the quantity exist. For periods when the commodity appears on the market, these magnitudes are directly observable, while in other periods they are clearly zero. The only problem may be the non-existence of a current price. The methods chosen for the calculation of the price and quantity components may be such that the missing price information causes technical difficulties. In principle, however, it should not represent any problem when emphasis is on the quantity component.

7.45 One type of seasonality that deserves mention is where the commodity as such is available the year round but the source of supply - namely, the country of origin - varies with the season. If each source is considered as the supplier of a separate commodity, there are as many seasonal commodities as there are sources of supply. Each of these then has to be treated accordingly in the calculations of the price and quantity components. If the total quantity in any period, irrespective of source of supply, is considered of prime interest, the best procedure may be to treat the commodities jointly as one, possibly non-seasonal, commodity.

7.46 In latter case, the average price for the base year should be used for calculating the commodity's constant-price contribution to the quantity component. Any shift between sources of supply should, if the separate prices are different in the base year, be considered as a price change and not as a quantity change. This corresponds to (7.12.1) above.

7.47 In the case of separate (seasonal) commodities, the shift should be included in the quantity component. In the case of two seasonal commodities, the ratio between the values at constant prices in the current and in the base year would be (using the same symbols as before):

$$\frac{Q_1}{Q_0} = \frac{q_1' \cdot p_0' + q_1'' \cdot p_0''}{q_0' \cdot p_0' + q_0'' \cdot p_0''} = \frac{\left(q_1' + q_1'' \cdot \frac{p_0''}{p_0'} \right) \cdot p_0'}{\left(q_0' + q_0'' \cdot \frac{p_0''}{p_0'} \right) \cdot p_0'} \quad (7.49.1)$$

The last expression shows that this is the same as considering the second seasonal commodity as a different quality of the first and making the corresponding correction in the quantity of the second commodity on the basis of the price per unit in the base year.

7.48 Other types of discontinuities, such as commodities that appear or disappear at irregular intervals, present a problem only if the base price is missing. This, however, is not a problem peculiar to irregularly available commodities. New commodities suffer from the same deficiency and the solution must be the same in both cases - namely, that of imputing a base price for the commodity in question.

7.49 The attitude towards the problems and the types of solutions suggested above are to a large extent based on the assumption that priority should be given to the quantity component. This, as explained earlier, has always been the case in Norway and is therefore the natural starting point in this study. For the opposite point of view - that priority should be given to the price component - different solutions would perhaps be more acceptable. Such would be the natural course if analysis of pure price changes were primarily to be considered.

VIII. NATURE OF THE SOLUTIONS

A. General conditions for validity of unit values

8.1 In spite of the various conceptual problems discussed above, the practical situation in applying the unit value approach in Norway is rather simple in character. This is not because the solutions are without complications, but more because of the restricted possibilities for alternative courses of action.

8.2 The basic file for the foreign trade statistics is the only source of data that is assumed to be available for the task of decomposing the value flows into factors of price and quantity. This file contains information on kind of commodity, value, quantity and country of production or consumption for each separate consignment (transaction).

8.3 The value flows to be decomposed consist of aggregates of consignments recorded during the appropriate time periods - that is, quarters or years. The corresponding quantity aggregates are also available for each commodity. It has already been shown that conceptually the appropriate price for the decomposition is the average price, in the sense of value, divided by quantity, when both aggregates relate to the whole time period considered.

8.4 For the foreign trade statistics, the corresponding magnitude is the ratio between the value and quantity aggregate for each of the commodities as defined in the specification of the customs tariff - that is, the unit value. Before these can be fully accepted as representing the conceptually appropriate price, it must be established that each of them do fulfil the other necessary conditions.

8.5 Various conditions that might influence the validity of the unit values for decomposition purposes were considered in the previous chapter. The problem of quality changes was directly related to the question of whether the unit of measurement used for physical quantity could be considered the same over periods of time. A second problem was related to that of shifts and the possible danger for unit value bias.

8.6 When emphasis is on the quantity component, the basic magnitude is $q_1 p_0$, or the value at constant price for each commodity. If the commodity specification is that of the customs tariff, this magnitude represents a valid term in a quantity component only if the commodity is not significantly influenced by quality changes over the period considered, or by those conditions that tend to create unit value bias.

8.7 The commodities as defined in the customs tariff may or may not satisfy these conditions. If they are satisfied for a particular commodity, it is accepted for the calculation of the value at constant prices. If, on the other hand, the commodity does not satisfy the conditions mentioned, there is very little that can be done to adjust for this, when the basic file for the foreign trade statistics is the sole source of data. The only alternative left in this case is to exclude the unit value of that commodity from the calculation at constant prices.

8.8 The fundamental problem when using the unit value approach is thus how to identify the commodities that should be used - that is, included in the value-at-constant price calculations - and those that should not. It is a simple

choice in principle, but supplying the rules for making the choice is actually not so straightforward. Previously, this question was answered on the basis of specialized knowledge of the commodities involved - that is, without very much support from analysis of the basic data available in the file. This was to some extent due to the large number of units, or consignments, involved and the limitations of the processing equipment. With the advent of electronic data processing, the situation has become rather different.

8.9 When the basic term in the aggregate for value at constant prices is written in the form $q_1 p_0$ - that is, current quantity times price in the base period - the first factor (q_1) is the one subject to the effects of possible quality changes. The second factor (p_0) would in that case harbour the features that could lead to possible unit value biases.

8.10 If the commodity is subject to quality changes, the appropriate procedure is to make some sort of adjustment to the quantity term q_1 in order to make it measurable by the same unit as that used for the quantity q_0 in the base year or, to put it differently, to re-measure q_1 in units that would make it correspond to the base price p_0 . The information needed for this type of correction procedure is not included in the basic file and therefore has to be sought outside the system considered here. A more important point, perhaps, is that a method has not been found that can be used in identifying cases of possible quality changes on the basis of the data available in the file for the foreign trade statistics. As in other types of approach, the monitoring of quality changes and the introduction of possible corrections have to be based on information from outside.

B. Basis for analysis of acceptable unit values

8.11 The possibilities for unit value bias imply that the specification in the customs tariff, to which p_0 refers, contains different products. In order for this to lead to unit value bias, the price of the products in the base year must be different, and at the same time, the relative quantities of the products must have changed (see 7.11.4).

8.12 When it comes to identifying the unit value bias potential of commodities in the customs tariff, a more detailed analysis of the data in the basic file may be of help. The analysis towards this end is based on the assumption that even if the customs-tariff-defined commodity does contain different products, each consignment will contain only one.

8.13 If differences in price are assumed to be possible indications of the corresponding products also being different, variations in price between consignments may indicate product mix within the corresponding CT-commodity. But different products are not the only cause for price differences. This raises the question of when the price variation should be regarded as an indication of product mix and when it should not. No clear-cut answer will be attempted to the last question, but a few examples may illustrate the type of situation where price variation can appear and where the assumption of product mix may not be the most satisfactory explanation.

8.14 Since consignments recorded during, say, one year can be distributed over the whole 12-month period, general price changes over time will be sufficient to cause some variation in prices between consignments. The same can, of course, be the

case for a period of one quarter. If the distribution of the consignments changes over time, this can by itself cause a change in value of the type that was termed a shift in the previous chapter. The alternatives are to include this shift either in the price component or in the quantity component. In the case of the Norwegian indexes for foreign trade, the choice was that any shift caused by price differences of this type should not be included in the quantity component but should be regarded as a price change.

8.15 The price for separate consignments may well vary between consignments of different size, even if the commodity in physical terms is the same for all consignments considered. Again, a different combination of consignments by size can result in a shift in the aggregate value even if the "pure" price - that is, the price for each size-category of consignments - is unchanged and the aggregated physical quantity remains unaltered. If emphasis is on the quantity component, it seems preferable not to include this shift in the quantity component but to accept it as a change in the average price.

8.16 When the price for one particular commodity is not the same when related to different countries, a shift in value can be obtained simply by changing the relative quantity share for each country. This type of situation can occur when it is, in fact, a question of different commodities, say, one for each country within the same specification in the customs tariff. But price differences may also be observed in cases when the product that goes to one country is identical with the product going to the other - that is when in fact it is physically a case of the same commodity.

8.17 If it is a genuine case of different commodities, they should be treated as such, even if they all are classified under the same specification in the customs tariff. In other words, if all commodities within the specification of the customs tariff are treated as one, a bias will be introduced in the price component, and the same bias, but in the opposite direction, will appear in the quantity component. With the correct procedure - treating the different CT-specification/country consignments as separate commodities - no bias from this source will distort any of the components.

8.18 If, however, the commodity is physically the same, irrespective of country, then to treat the consignments related to each of the countries involved separately, places the shift in the quantity component. This implies that changes in value at constant prices for this particular commodity could be different from changes in the quantity measured in physical terms. This is not acceptable of course, when emphasis is placed on the quantity component.

8.19 The problem remains how to identify those cases in which the commodity is the same, irrespective of country, and those cases in which it is not. Since the basic data file does not contain any information on this, the solution must be sought on the basis of information from outside.

8.20 The key words in the description of a commodity in this situation are "physically the same". It should perhaps be added "for practical purposes", in order to avoid drifting towards a situation where each and every consignment is regarded as containing a unique commodity. In most cases it is not difficult to find minor differences between the same product exported to different countries and, therefore, to draw the conclusion that the consignments are not physically the same. But these differences may be insignificant, at least as far as price is

concerned, compared to differences arising from the terms of the trade agreements, the effects of trade policies, exchange rates and so on, all of which are factors that seem difficult to classify as physical characteristics of the commodities.

8.21 In many cases, it will be difficult even for a commodity specialist to advise on the right course - that is on whether or not a specific commodity in foreign trade should be considered one commodity, irrespective of the country relationship. In less obvious cases, however, it seems easier to reach a conclusion through considering directly in which of the components it seems least desirable to have a shift located.

8.22 All three cases described above indicate that some variation in prices between consignments may be expected and tolerated, even when considering one separate commodity. The last case also illustrates that variation in prices between countries need not be considered relevant when evaluating variation in prices due to possible product-mix within the CT-specification.

8.23 In addition to the above remarks on variation in prices between consignments, it should also be mentioned that the price in the basic magnitude q_{1p0} is the unit value for the aggregate of the consignments. Consequently, the real effect of the variation in prices on the quantity component is that transmitted to the unit value from the consignment prices.

C. Method and procedure for analysis

8.24 On the basis of the above evaluation, the following type of analysis of the basic file was adopted in Norway for the selection of commodities to be used directly in the decomposition procedure:

(a) On the basis of the price for each consignment, the corresponding (unweighted) average and the standard deviation for the distribution were calculated for each commodity (seven-digit) in the customs tariff (which was, of course, included in the basic file and which possessed a physical quantity measure);

(b) Commodities for which the coefficient of variation of the price for each consignment was less than or equal to 5 per cent were listed as acceptable and termed "price-homogeneous commodities";

(c) For commodities that failed to meet the criterion specified in subparagraph (b), above, the corresponding comparison was made after the elimination of the variation between countries from the coefficient of variation. Commodities for which the "adjusted coefficient of variation" was less than or equal to 5 per cent were also listed as price-homogeneous.

8.25 The main reason why the criterion for accepting a commodity for the index number calculations is based on the variation of the average for the price for each consignment rather than on the variation of the unit value, is largely a practical one. The chief argument in favour of the procedure selected is that it simplifies the calculations. At the same time, it provides information on price variations between consignments and the effects of these on a magnitude closely related to unit value.

8.26 There is no objective reason for choosing exactly the 5 per cent level of the coefficient of variation for accepting a commodity as "price-homogeneous". However, for the coefficient of variation in the average for the price of each consignment to be as low as 5 per cent, either the variation between consignments must be small or the number of consignments must be large. In the latter case, radical changes in the size distribution of the consignments would seem less likely and the shift effect of less importance according to (7.11.4).

8.27 In this connection, it should also be remembered that the final choice of commodities for the index number calculations is a separate operation based on the list of commodities identified under the 5 per cent rule. In fact, the 5 per cent level was a preliminary choice that was later adopted for the complete operation because it proved useful. The final list was found not to include too many commodities of the type that were discarded in the screening that followed, nor did it exclude many of those that, according to the commodity specialists, ought to be included.

8.28 The actual processing of the data file for the foreign trade statistics covers the file for one calendar year. The same procedure is used for both exports and imports. For the basic calculations, the CT-commodities are classified in groups defined by the commodity classification of the national accounts (NA-commodities). The results of the calculations are listed under the following headings:

- (1) Commodity code for the national accounts (NA-commodity);
- (2) Commodity code for the foreign trade statistics (CT-commodity);
- (3) Indication for "index commodity" in previous index calculations (previous price-homogeneous commodity);
- (4) Number of consignments;
- (5) Quantity;
- (6) Value;
- (7) Arithmetic mean of price per unit for the consignments;
- (8) Variance of price per unit for the consignments;
- (9) Unit value;
- (10) Indicator of variation of price per unit for the consignments due to variation in size of consignments;
- (11) Indicator for variation between countries of price per unit for consignments;
- (12) Indicator for variation within countries of price per unit for consignments;
- (13) Coefficient of variation squared of price per unit for consignments.

8.29 Items (10), (11), (12) and (13) above require further explanation. The following symbols will be used with reference to a particular CT-commodity:

n_i number of consignments to (from) country i , ($i=1, \dots, k$)

q_{ij} quantity for consignment j to (from) country i

v_{ij} value for consignment j to (from) country i

$p_{ij} = v_{ij}/q_{ij}$ price per unit for consignment j , country i

$q_i = \sum_{j=1}^{n_i} q_{ij}$ quantity to (from) country i

$v_i = \sum_{j=1}^{n_i} v_{ij}$ value to (from) country i

$\bar{p}_i = \frac{1}{n_i} \sum_{j=1}^{n_i} p_{ij}$ arithmetic mean of price per unit for consignments to (from) country i

$n = \sum_{i=1}^k n_i$ total number of consignments (for the CT-commodity in question)

$q = \sum_{i=1}^k q_i = \sum_{i=1}^k \sum_{j=1}^{n_i} q_{ij}$ aggregate quantity

$v = \sum_{i=1}^k v_i = \sum_{i=1}^k \sum_{j=1}^{n_i} v_{ij}$ aggregate value

$$\bar{p} = \frac{1}{n} \sum_{i=1}^k n_i \bar{p}_i = \frac{\sum_{i=1}^k \sum_{j=1}^{n_i} p_{ij}}{\sum_{i=1}^k n_i} \quad \text{arithmetic mean of price per unit}$$

$$s_i^2 = \frac{1}{n_i} \sum_{j=1}^{n_i} (p_{ij} - \bar{p}_i)^2 \quad \text{variance of price per unit to (from country i)}$$

$$s^2 = \frac{1}{n} \sum_{i=1}^k \sum_{j=1}^{n_i} (p_{ij} - \bar{p})^2$$

$$= \frac{1}{n} \sum_{i=1}^k n_i \cdot s_i^2 + \frac{1}{n} \sum_{i=1}^k n_i (\bar{p}_i - \bar{p})^2 \quad \text{variance of price per unit}$$

$$CV_p^2 = \frac{s^2}{\bar{p}^2} \quad \text{coefficient of variation squared for price per unit}$$

$$p = \frac{v}{q} = \frac{\sum_{i=1}^k v_i}{\sum_{i=1}^k q_i}$$

$$= \frac{\sum_{i=1}^k \sum_{j=1}^{n_i} v_{ij}}{\sum_{i=1}^k \sum_{j=1}^{n_i} q_{ij}} = \frac{\sum_{ij} q_{ij} p_{ij}}{\sum_{ij} q_{ij}} \quad \text{unit value}$$

8.30 The indicator of variation of price per unit for consignments due to variation in size of consignments is simply:

$$\frac{s_p}{\bar{p}} - \frac{s_q}{\bar{q}} = \frac{\text{covar}(p,q)}{\bar{q}}$$

where $\bar{q} = \frac{1}{n} \sum q_i$: average quantity per consignment
and

$$\text{covar}(p,q) = \frac{1}{n} \sum_{i=1}^k \sum_{j=1}^{n_i} (p_{ij} - \bar{p})(q_{ij} - \bar{q})$$

covariance between price per unit for each consignment and the quantity for each consignment.

8.31 In the expression above it is shown that the variance of the price per unit for consignments, s^2 , may be written as the sum of two components. The second,

$$\frac{1}{n} \sum_1^k n_i (\bar{p}_i - \bar{p})^2,$$

refers to the part of s^2 due to variation in price per unit

between countries and is the quantity given in item (11) above. The first term of

$$s^2, \frac{1}{n} \sum_1^k n_i s_i^2,$$

expresses the part due to variation within countries and is given

in item (12) above.

8.32 The quantity in item (13) is simply

$$CV_{\bar{p}}^2 = \frac{CV_p^2}{n} = \frac{1}{\bar{p}^2} \cdot \frac{s^2}{n}$$

8.33 The purpose of these calculations is to provide a basis for the final selection of the commodities for which the unit value is acceptable for index number calculations. A second complete list of all CT-commodities is therefore prepared. This list includes indications for the commodities meeting the criteria for acceptance indicated above. The list is subject to critical examination by commodity specialists of the division for foreign trade statistics.

8.34. The proposal contains the CT-commodities that:

- (a) Can be accepted directly - that is, commodities with $CV_{\bar{p}} \leq 0.05$;
- (b) Are subject to similar variation within countries of price per unit.

Under category (b), commodities not in (a) are included if they satisfy the condition

$$\sqrt{\frac{1}{n} \sum_{i=1}^k n_i s_i^2} \cdot \frac{1}{\bar{p}} = \sqrt{cv^2 \bar{p} \cdot \frac{\frac{1}{n} \sum_{i=1}^k n_i s_i^2}{s^2}} \leq 0.05$$

8.35 The final list contains, in addition to the proposed set of commodities to be accepted as price homogeneous, (a) information on commodities included in the previous index number calculations and (b) the indication referred to above for commodities that may have been influenced by price variation due to differences in the size of consignments.

8.36 Some aspects of the procedure for "mechanical" selection of price-homogeneous commodities ought to be mentioned, since they are among the reasons why the results of the first part of the selection outlined above are not accepted without further critical review.

8.37 The measure of variation will attain the same magnitude whether the differences in price between consignments appear in an irregular manner over the year or as the result of a marked price trend. The rejection of a commodity from the basic file for the index number calculations may therefore be the result of the latter. This will not necessarily be relevant to the problem at hand.

8.38 The rejection of a commodity may also be due to marked variation in price because of variation in the size of consignments. The calculations provide indications of correlation between price and size of consignment. If the commodity appears to be the same in consignments of different size, the price differences may be ascribed to causes unrelated to the physical description of the commodity and therefore not relevant to the rejection of the commodity from the basic file for the index number calculations. However, close correlation between a price and the size of consignment does not exclude commodity-differences that may be relevant in this connection.

8.39 Acceptance under criterion (b) in paragraph 8.34 above does not take into account the nature of the variation in price between countries, which has been excluded from the measure in this case. In particular, if the component indicating the variation between countries is large, acceptance of the commodity under criterion (b) is carefully scrutinized.

8.40 When the final choice is made of the commodities to be included in the basic file for the index number calculations, the problem still remains of how to deal with the commodities not included. The problem, of course, refers only to commodities covered in the index.

8.41 Since the values for these commodities are available, the only information needed for the decomposition of the value figures is on the price relatives - the current price in relation to that of the base period. This will have to be established on the basis of reasonable assumptions. In order to be of practical use for the case under consideration, these assumptions must relate the price relative for the not-accepted commodity to a relative of one or more of the accepted commodities. As explained in chapter IX below, the procedure adopted is

mainly based on the assumption that the price relatives for the not-accepted commodities may be represented by the price index for the accepted commodities within the same SITC-group.

8.42 The decomposition of the value flows is based on deflation at the CT-specification level and aggregation to the commodity-groups for which the indexes are published or disseminated for other purposes. In order to carry out deflation at the CT-specification level for the commodities for which the unit values have not been accepted for the index number calculations, the substitute deflation-factors (price indexes) must be related to each single not-accepted commodity. The purpose to be served by assigning substitute price series to separate commodities has been indicated above in paragraph 6.15. In relation to the main index number calculations, it is a computational device that adds flexibility to the system when different aggregates are required, as in the case of the regular indexes and for the commodity groups defined for the national accounts.

8.43 The use of price data for a sample of commodities to represent the price changes for all is not peculiar to the unit value approach. The principle of using "specimen commodities" is applied on a far more extensive scale when the price basis for the index number calculations is established through special surveys.

IX. INDEX NUMBER CALCULATIONS

A. Summary of procedure

9.1 A number of theoretical problems connected with the decomposition of the value flows in the foreign trade statistics of Norway have been reviewed in previous chapters and some solutions to these problems have been suggested. Some practical problems and their possible solutions have also been indicated. Both theoretical and practical solutions presented are closely linked with the particular purposes specified. Before going on to the actual index number calculations, it may be useful to summarize the basis so far established for these calculations and to specify any additions needed before the procedure for the actual calculations can be specified.

9.2 The main problem considered is that of decomposing the value flows for foreign trade into factors of price and quantity. In this particular relationship, the value shall not be derived or estimated. For the problem at hand, it exists as an established magnitude provided by the foreign trade statistics. The main problem thus has one degree of freedom in the sense that only one of the components can be determined independently. After one of the components is determined, the other will be determined implicitly through the basic relationship.

9.3 The value represents not only an established magnitude in relation to the main problem but also a reference base for the components. For the decomposition to give meaningful results, the component to be determined must be derived so as to make it compatible with the value series.

9.4 In Norway, the component given first priority, and the one defined separately in relation to the value series, is the quantity component. When dealing with one separate commodity, its physical quantity is the natural choice as the quantity component. For a group of commodities, the quantity component chosen is the aggregate value of the separate commodities at constant prices. The expressions used previously for the quantity component for groups of commodities, have either been $Q = \sum p_0 q_1$ or $Q = \sum v_1 \left(\frac{p_1}{p_0}\right)^{-1}$. The last equation expresses the quantity

component as the aggregate of the deflated values of the separate commodities. A similar form exists for an aggregate of groups of commodities, where the appropriate price index replaces the price relative $\frac{p_1}{p_0}$.

9.5 The price component corresponding to the quantity component chosen is the Paasche formula price index. As the calculation of this index for successive levels of aggregation is less straightforward than the corresponding aggregation for the quantity component, the latter procedure is preferred wherever possible in the index number calculations.

9.6 The basic information used for the calculation of price relatives is the data file for the foreign trade statistics. In so far as these data can be safely used for the calculation of price relatives, this procedure has the advantage of ensuring full compatibility between the price relatives and the corresponding

values. A disadvantage is that the commodities according to the specification in the customs tariff may not all be suitable for the particular statistical purpose considered.

9.7 When using the information from the basic file for index number calculations - or to put it differently, for the decomposition of the value flows into factors of price and quantity - it becomes necessary to identify the commodities for which the unit value can be used. Previously, the choice was made by commodity specialists without much support from analysis of the basic data. However, modern processing equipment has opened up new possibilities. The methods based on these possibilities, which have been adopted, have been described in detail in previous chapters.

9.8 The aim of the analysis is to identify commodities for which the variation in the price of the consignment is below the limits believed to be acceptable for decomposition purposes. The resulting list of commodities is subject to careful scrutiny by commodity specialists in order to delete commodities that, in spite of the observed variation in price per consignment, are not considered acceptable. The final check is also necessary to include suitable commodities that, on the basis of the information for the period considered, have been rejected.

9.9 The final result of this process is a list of commodities for which the unit values are considered acceptable for direct use in the decomposition of the value flows. To these commodities, the term "price-homogeneous" has been applied. This term should, however, only be understood in the sense previously explained.

9.10 The value figures are available for all commodities from the basic file. The price-homogeneous commodities first and foremost serve as basis for the calculation of the corresponding price relatives. Since the price-homogeneous commodities also fulfil the function of specimen commodities in the index number calculations, they also provide the basis for establishing suitable substitute price series for the non-price-homogeneous commodities.

9.11 In addition to the preparation of the basic file and the list of price-homogeneous or specimen commodities, the base period and the time-interval for the current periods have to be selected before proceeding with the index number calculations. As in the previous index number calculations, annual average prices are selected as base prices. For the present Norwegian indexes, the base period is the year 1970. This year was chosen so as to satisfy the requirements of the national accounts.

9.12 For the foreign trade indexes, quarters have been selected as current periods - that is, the price and quantity indexes are calculated on a quarterly basis. The regular foreign trade statistics are published on a monthly basis and, previously, the indexes were also calculated each month. The main reason why the more frequent calculation of the indexes was discontinued in favour of the quarterly series was simply that considerable variation was recorded in the number and kinds of specimen commodities available during the respective months. Apart from being a separate source of variation for the indexes, this created technical problems for their calculation. The change to quarterly indexes greatly reduced these problems.

B. Deflation procedure

9.13 The elements for the quantity indexes for the CT-commodities are derived through deflation of current value by the appropriate measure of price change from the base period to the current period. For the specimen commodities, the appropriate measure of price change is simply the corresponding price relative - the unit value for the current quarter divided by unit value for the base year.

9.14 The price-change series for the separate non-price-homogeneous commodities are based on the specimen (price-homogeneous) commodities within the same three-digit SITC group. Whenever this procedure cannot be used - that is, when no specimen commodity is available within a three-digit SITC group - the corresponding procedure is applied on the basis of two-digit or one-digit SITC groups. In one case - namely, for SITC section 9: "Commodities and transactions not classified elsewhere in the SITC" - the substitute price series is calculated on the basis of all specimen products in the foreign trade statistics.

9.15 The procedure for the decomposition of the value flows for the non-price-homogeneous commodities is, in principle, different from the one employed for the specimen commodities. For the specimen commodities, in principle the quantity component is chosen, while the price component is derived from this and the basic relation between the value and the quantity components. For the non-price-homogeneous commodities, the price component is chosen initially and the quantity component is derived.

9.16 The index number formula for the deflation factors for the non-price-homogeneous commodities depends on how the relation with the price movements for the specimen commodities is defined. In the case of the Norwegian indexes, it has been considered prudent to let the assumption cover just the pure price movements (that is, the changes in unit value for the specimen commodities), which leads to the choice of a fixed-weight index number formula. The base-period quantities for the specimen commodities are used as weights (or the values if the price relatives are weighted together).

9.17 In the previous index number calculations, the implicit price component for the non-specimen commodities was a changing-weight type of index. When the index was revised, however, it was considered more appropriate not to include the effects of the current quantity changes for the specimen commodities in the assumptions for the price component for the non-specimen commodities.

C. Data files for the index calculations

9.18 The following information is thus available for each current period and for each seven-digit commodity according to the customs tariff (except for those commodities outside the scope of the unit value approach):

- (a) The value at current price;
- (b) The price relative or substitute price-change indicator in the form of a fixed-weight index; and
- (c) Through the deflation of the value in (a) by the price information in (b), the value at constant price.

This information forms an important part of the files established for the decomposition of the value flows or, to use a more common description for the operation, for the calculation of the indexes for foreign trade.

9.19 The full set of information used in the index number calculations is contained in two files - the base file and the current file. Each of the two files contains separate records for each CT-commodity.

9.20 The base file contains the following data: code for export or import, five-digit SITC code, seven-digit CT-commodity code, unit value for the base period, weight, value for the base period, and code for specimen commodity/non-specimen commodity. The weight in the base file is only relevant for specimen commodities. It is simply the value in the base period divided by the aggregate for the corresponding value for all specimen commodities within the same three-digit SITC group.

9.21 The relevant part of the current file contains code for export or import, five-digit SITC code, seven-digit CT-commodity code, value and quantity for the current quarter.

D. Main lists of the index number calculations

9.22 The main lists produced in connection with the index number calculations are the following:

(a) List for separate commodities. This list is sorted by export/import, five-digit SITC group and seven-digit CT-commodity. For each CT-commodity, the list contains information on specimen commodity, value for current period, deflated value and one quarter of value in base period. The appropriate values are aggregated for each SITC-level up to the totals for the commodities covered. These aggregates form the basis for the calculation of the value, price and quantity indexes.

(b) Results of the index number calculations. This list is basically by export/import and five-digit SITC group and contains the value, price and quantity indexes for all five-digit, three-digit and two-digit SITC levels.

(c) Index numbers for publication. This list contains mainly the index numbers for the commodity groups (SITC) specified in the published tables. The present indexes go back to 1970 and the index is published on the basis of SITC, Rev.1. Indexes are calculated down to the two-digit level for all relevant groups and in some special cases also to the three-digit level. The full specification used appears in the table annexed below.

9.23 The concepts export/import and specimen commodity/non-specimen commodity require no further explanation. Neither should there be any need to repeat the basis for the value and quantity figures. The price is actually the unit value - that is, value divided by quantity - and is calculated for the base period (at present the year 1970) and for the current period (quarters) for the specimen commodities. The price relatives are the current price divided by the price for the base period. The deflated value is, for the specimen commodities, the value at constant (base period) price - that is, the current value divided by the price relative. For non-specimen commodities, the deflated value is the current value

divided by the substitute price relative for the corresponding three-digit SITC group (or higher whenever necessary). The substitute price relative for a three-digit SITC group is simply the product sum of the weights and the unit values for the specimen commodities within the same group. When data are missing for a specimen commodity in any particular quarter (current period), a correction is made when calculating the substitute price relative.

E. Index calculations proper

9.24 The basis for further calculations is, thus, for each seven-digit CT-commodity, the value for the base period, value for current period and value at base price (deflated value) for the current period. The calculations involved for the quarterly indexes for any SITC group are:

(a) The value index: the sum of the values for all CT-commodities in the group divided by one quarter of the value in the base year.

(b) The quantity index: the sum of the deflated values for CT-commodities in the group divided by one quarter of the value in the base year.

(c) The price index: the value index divided by the quantity index.

It is these indexes and the underlying aggregates that appear in the lists mentioned above in paragraph 9.22.

9.25 The annual indexes are calculated in the same way but are based on the annual aggregates of the value in the base period and the current value and deflated value in the current year. The deflated value here simply means the sum of the deflated values for the quarters. The price index calculated as the ratio between the current value and deflated value is, as previously stated, the weighted harmonic mean of the price indexes for the quarters, and the weights are the current values for the quarters. The actual number index calculations have been greatly simplified because of the form in which the basic information is available and the way the basic problem has been formulated.

9.26 In order to carry out the calculations in the manner outlined above, both the value and the appropriate deflation factor must be available for each CT-specification. This is also the basis for deriving the value and quantity aggregates at all levels through simple additions. At each stage the price indexes are derived through the corresponding value and quantity aggregates.

9.27 The only step in these calculations that does not follow directly from the basic definitions of the components is the deflation of the non-specimen commodities by the substitute price series. This type of procedure is, of course, not uncommon in index number calculations. It corresponds, in principle, to the assumption that the price movements of specimen products are "representative" for the whole group. The purely technical solution - that of choosing a fixed-weight index for the substitute series and the explicit deflation for each non-specimen commodity - may be unusual.

9.28 There are two main reasons why this procedure has been adopted in the form chosen. One is the advantage of being able to use the same procedure for all commodities covered at the most detailed level. The other is the need for

flexibility with regard to aggregation, owing to the differences between the SITC and the commodity classification of the national accounts.

F. Keeping base and current files up to date

9.29 In principle, the index calculations are simple and straightforward. In practice, however, it is necessary to exercise considerable care in order to exclude from the basic input the effects of changes that may influence the source material.

9.30 As pointed out previously, the two main files for the index number calculations are the base file and the current file. In addition, other files that are often in the form of catalogues, have been established for use in connection with the index number calculations. One of these catalogues is a list of CT-commodities and their relation to the commodity classification in the national accounts. Both the base file and the current file contain information on export/import, CT-commodity, five-digit SITC group and specimen/non-specimen commodity status in addition to other data. It is imperative that the information on the two files be identical.

9.31 From the outset, the base and the current files are matched in the sense indicated in paragraph 9.30. However, every year, and sometimes more often, changes occur that would separate the two files if proper action were not taken. Corrections may be introduced either in the base file or in the current file. Because of the annual indexes, it is practical to let the basic file remain unaltered for each calendar year.

9.32 The selection of a completely new set of specimen commodities is a major operation and normally takes place only in connection with a more complete revision of the indexes. On a current basis, there may be a need for minor changes in the list of specimen commodities. Existing specimen commodities may have to be deleted and new commodities added to the list. These changes are made in the catalogue used for introducing the appropriate code in the current file. In addition, the corresponding alteration is made in the base file, together with all other corrections following from the change in specimen commodity status. This may influence "unit value for the base period" and "weight". Since this affects the base file, it is not introduced during a calendar year.

9.33 Since the basic commodity classification is that of the customs tariff, changes in the commodity specification are usually introduced for other than statistical purposes. All such changes are taken into account when using the customs data for statistical purposes and the necessary adjustments and corrections introduced in the statistical files. The simplest case is when there is a change of code. The substitution of the new for the old code is made in all relevant files and catalogues.

9.34 The subdivision into two or more separate commodities of one CT-commodity does not create any serious problems. The procedure is to recode the new commodities by their old code in connection with the index calculations. When two or more CT-commodities are combined into one, there is a choice of correcting either the base file or the current file. For the Norwegian indexes, the solution selected is that of adjusting the base file - that is, combining the data for the components of the new commodity into one single record for the base file.

9.35 Various other types of changes occur, some rather complicated. In all cases, the aim is the same as in the more straightforward cases mentioned above - namely, to establish complete correspondence between the base file and the current file by introducing the necessary adjustments in one or the other.

9.36 There are certain limits to what ought to be attempted in the way of corrections and adjustments of the files before a complete revision of the indexes is needed. Something like this situation occurred in Norway in connection with the change to SITC, Rev.2 for the regular foreign trade statistics. The transition from SITC, Rev.1 to SITC, Rev.2 took place in 1976. The actual solution selected was to retain the previous classification for index number purposes. The SITC, Rev.1, which was discarded for the regular foreign trade statistics, was carried forward for the purpose of deriving data comparable to that of the base file for the index number calculations.

9.37 The main difficulty in 1976 did not stem from the change to SITC, Rev.2, but from the fact that, at the same time, the number of specifications in the customs tariff increased considerably. As a complete revision of the indexes could not be undertaken at that time for a number of reasons, the solution had to be along the lines of adjusting the major files. Since an adjustment of the base file would be rather comprehensive and to a large extent based on assumptions, the final choice was to adjust the current file back to the specification in the base file. This implied also that the previous specification, which was related to the SITC, Rev.1 and which was used for the publication of the indexes, would have to be retained.

G. Index number calculations as a basis for quality control

9.38 In spite of careful scrutiny of the original forms by the customs authorities, manual and machine editing at the processing stage and checks based on preliminary tabulations, certain errors still present in the basic data may be discovered during the calculation of the indexes.

9.39 The main lists produced in connection with the index number calculations are described above in paragraph 9.22. The lists permit the checking of "reasonable" changes in the indexes down to the five-digit SITC level. From there, the deviations can be traced back to the CT-commodity and, further, to individual consignments.

9.40 Deviation traced to individual consignments may be due either to an exceptional case that is correctly recorded or to a genuine error. In the first case, the question of the status of the commodity as price-homogeneous should, perhaps, be reconsidered. If an error is the cause of the discrepancy, the basic data should be corrected. Over the years, cases of both types have been recorded. In most cases, the deviations reflected genuine error rather than the sudden appearance of consignments with exceptional unit values.

H. Preliminary final figures

9.41 Not all errors are discovered and corrected before the deadline for the current index number calculations. Moreover, the documents for some consignments may be delayed in customs and arrive for processing too late for inclusion in the proper month or quarter. In the current foreign trade statistics, corrections can

be made in the accumulated figures without adjusting the figures for months already published. Similar possibilities are not available for the index number calculations. Instead, the quarterly indexes are published as preliminary and are re-calculated on a final basis when all corrections for the year have been carried back to the correct month or quarter in the basic files for the annual statistics on foreign trade.

I. Choice of base period

9.42 The choice of base period for the foreign trade indexes is made with due regard to the corresponding solution for other related series. In particular, the requirements of the national accounts as a user of data exercised their influence on the choice. Under normal circumstances, the main operation in connection with the choice of a new base period is that of establishing a new base file.

9.43 Before any base file can be established for the index number calculations, the price-homogeneous (or specimen) commodities will have to be identified. The methods described previously in this study can be used for this purpose and the procedure can also be used as a check on the set of commodities already selected. One may also wish to change the base period without necessarily changing the set of specimen commodities completely at the same time.

9.44 If no general change in the set of specimen commodities is required or if there have been no major changes in the commodity classification system underlying the preparation of the foreign trade statistics, the change of base period presents no particular problem. All the data needed for the establishment of a new base file should be available from the old one and from the current file for the period chosen for the new base.

X. ORGANIZATION OF WORK

A. Co-operation with customs authorities

10.1 The basic data for the index number calculations - the foreign trade statistics - form perhaps the oldest and best established series in economic statistics. In principle, the information collected for customs purposes is simply submitted for processing. Even if there is no separate operation of data collection controlled by the statistical authority, this does not mean that statistical purposes have not been taken into account. The close co-operation between customs and the Central Bureau of Statistics in Norway has brought about a procedure that satisfies statistical requirements to a large extent. The integration of the work has reached the stage where the transfer of information from customs forms to a machine-readable medium is carried out as part of statistical processing even for data solely used by customs. The information in machine-readable form is then transferred back to customs and other public authorities.

10.2 As explained previously, the second major operation in preparing the data for processing is checking the information and correcting the errors detected. In this operation, close contact and co-operation with customs is maintained. This is, in a way, a step-by-step procedure that goes on up to the preparation of the annual publication on foreign trade statistics. The major part of these corrections will come as a result of the machine editing of the data and will therefore be completed before the initial calculation of the indexes. Even then, a number of corrections may be expected in the basic data after the first release of the quarterly indexes of price and quantity. Some of these corrections will be due to late-comers - consignments belonging to one particular quarter but whose forms are delayed and arrive for processing too late for inclusion in the correct quarter. This type of addition can be considered only in the final figures.

B. Statistical work involved

10.3 Compared to that of the regular foreign trade statistics, the work involved in the preparation of the price and quantity indexes is rather insignificant. Since all data needed for the index number calculations are part of the foreign trade statistics, these calculations can be regarded as part of the regular routine of the latter.

10.4 The separate work for the preparation of the indexes consists of two essentially different operations on the basic data for the foreign trade statistics. One of these operations is aimed at the identification of the price-homogeneous commodities that form the basis for the final selection of the specimen commodities for the index calculations. The other operation covers the index number calculations proper.

10.5 The first of these operations, which is described in chapter VIII above, uses the basic file, including data for each separate consignment. It is conducted in Norway on the basis of data for a whole year, a rather large-scale operation as far as input is concerned. The calculations performed on each unit also exceed those done in connection with the regular processing of the foreign trade statistics. Partly because of the size of the job and partly because of the current check on

the specimen commodities, which forms part of the current index number operation, the full analysis of the price for each consignment has not been included as a regular feature except in connection with the more comprehensive revisions of the indexes.

10.6 The second operation - the one connected with the current index number calculations - is performed on the aggregate file for the CT-commodities. The actual number of records involved in this part of the processing is rather small. Owing to the basic information available and the procedure adopted, the calculations needed for the derivation of the indexes are the simplest possible.

10.7 The foreign trade statistics were among the first to be subject to regular machine processing. At present, the whole operation is computerized, taking full advantage of the high-speed input and large capacity of modern equipment. Of the operations related to the index number calculations, the first - the identification of the price-homogeneous commodities - is fully dependent on a computerized procedure. The basic file for the foreign trade statistics contains some 2.0-2.5 million transactions for imports and 0.5-0.6 million for exports. Since the basic file is already on tape as part of the processing of the foreign trade statistics, the only extra work involved is, in principle, the time required for programming the operations for the computer and the actual machine run. The actual index number calculations, on the other hand, are a very small operation computer-wise, because of the small number of records involved and the straightforward calculating procedure.

10.8 In chapter IX above, the procedure for calculating the indexes was indicated. The two files needed - the base file and the current file - normally have to be prepared from the processed data for the foreign trade statistics. The establishment of the base file is, in principle, a one-time operation for each period between revisions of the indexes (change of comparison base). All the information needed is available at the CT-commodity level either in the regular foreign trade statistics or in the relevant catalogues for commodity classifications. Since the base file refers to a full calendar year, no additional aggregations are involved. The current file is more directly connected with the current figures for the foreign trade statistics. The basic difference is that, for the current index number file, the monthly data for foreign trade have to be aggregated to the appropriate quarters.

10.9 The need for strict comparability between the two files involved in the index number calculations has already been stressed. Some of the more common changes encountered under practical conditions that influence comparability have been mentioned and the steps to be taken in order to restore comparability indicated. These operations and the accompanying checks and controls account for a considerable part of the work involved in preparing the indexes. Even this part is fairly modest in absolute terms, since the total work involved on an annual basis for the preparation of the indexes claims less than one man-year, all operations included.

C. Publication of indexes

10.10 Not only in the operational sense are the indexes for foreign trade part of the regular foreign trade statistics. The indexes are not normally published separately but are included in the special publications on foreign trade

statistics. The only exception to this rule is the publication at the earliest possible moment of the indexes for the main totals in a general press release. The same information is then included in the following Weekly Bulletin of Current Statistics.

10.11 The quarterly value, price and quantity indexes are later published according to the full specification for the indexes (see the annex table below) in the appropriate issue of the Monthly Bulletin of External Trade. There is a two-month lag for the indexes, compared to the regular monthly totals issued for foreign trade. For example, the indexes for the second quarter will appear in the August issue of the Bulletin, together with the monthly figures for August and the accumulated figures for the first eight months of the year. The indexes published in the Monthly Bulletin of External Trade are, as previously explained, preliminary.

10.12 Quarterly figures, together with the indexes for the whole year, are also published in volume II of the annual publication on external trade. These are the final figures recalculated on the basis of the fully corrected files. These calculations also form the basis for the deflation factors for the national accounts.

10.13 At all stages, from the first publication of current indexes for total exports and imports, all information available is released to the general public upon request. The users of the statistics avail themselves to a considerable extent of this possibility, in particular through the telephone service provided. This service constitutes a not insignificant part of the dissemination of index number information.

D. Scope of statistical operations

10.14 The Central Bureau of Statistics receives copies of the original customs documents, and all the work on the foreign trade statistics, including every operation needed for the index number calculations, is done by the Bureau. In fact, the co-ordination of work between customs and the Central Bureau of Statistics has resulted in larger parts of the operations being performed by the Bureau than is strictly necessary for the preparation of the statistics. This relates in particular to data transfer to a machine-readable medium. Complete access to the basic returns provides the freedom of action specifically needed for the application of the methods developed for the identification of price-homogeneous commodities.

XI. ROLE OF FOREIGN TRADE INDEXES IN AN INTEGRATED SYSTEM

11.1 The framework for a comprehensive system of price and quantity statistics has been given in Guidelines on Principles of a System of Price and Quantity Statistics. 8/ The basis for this framework is the formal integrated classification system of the SNA.

11.2 Guidelines does, however, go further than to propose only components for price and quantity directly related to magnitudes in the SNA. The basis for a consistent and integrated system is in the specifications and classifications, and most of the different traditional demands can be met on the basis of data conforming with the basic system, even if some of these demands require indexes that are not direct parts of the SNA. This seems to indicate that an integrated approach should aim at an integrated framework at the most detailed level in order to retain flexibility in the choice of price and quantity measures to be derived and in the types of possible classifications for use in aggregations.

11.3 In chapter V, the relation of the traditional foreign trade statistics and the foreign trade indexes to the national accounts in Norway was described. The concepts and definitions in the foreign trade statistics have also found a place directly in the national accounts, so that complete correspondence exists at the current level, even if classifications in the two systems are not identical.

11.4 It has also been explained that there is a direct connection between the SITC-based regular indexes for foreign trade and the NA-commodity-based national accounts series at constant prices. This connection is established through the common basis of the data for CT-commodities at constant prices. The indexes for foreign trade can therefore be considered fully co-ordinated with the national accounts system. In that sense, the indexes for foreign trade might be considered an integral part of a system of price and quantity statistics within the framework of the SNA.

11.5 To the extent that other price and quantity series have been co-ordinated with the national accounts, these will also form part of the system to which the indexes for foreign trade are related. However, this might not mean more than correspondence at a certain level of aggregation in the preparation of the national accounts. Taking into account the present level of deflation for the national accounts, correspondence between different series at the three-digit level of the NA-commodities is the most probable.

11.6 Since freedom of choice is not a prominent feature of the unit value approach, except in accepting or rejecting commodities for direct inclusion in the price basis of the index number calculations, close integration between the foreign trade price and quantity data and other series depends on how much can be achieved in this direction from the latter sources.

8/ United Nations publication, Sales No. E.77.XVII.9.

11.7 Further suggestions along these lines are not within the scope of this study. It should, however, be mentioned that closer co-ordination with the foreign trade unit value data was considered in connection with the revision of the wholesale/producer price statistics. Even if there are conceptual differences that have to be reconciled, this type of co-ordination is expected to contribute to the strengthening of the price basis for deflation purposes in fields where the coverage achieved through unit value data needs to be improved.

XII. PRIORITIES FOR INITIATING OR IMPROVING WORK

12.1 The methods and procedures described in the previous chapters are general in character and could, in principle, be applied to any series of foreign trade statistics, provided that these have been derived from basic data approximately similar to those used in Norway.

12.2 The choice of methods and procedures in this case has also been influenced by the purpose of the index number calculations - namely, that of decomposing value flows into factors of price and quantity, with the quantity component of principal interest. For anyone pursuing the same aims, attempts to adapt the methods described here to their own situation may be the best way to establish price and quantity statistics for foreign trade or to improve existing procedures.

12.3 Being derived from administrative records, the basic data for the foreign trade statistics are normally closely linked with legal and other conditions surrounding the administrative uses of the data. Definite recommendations on appropriate ways of adapting the methods and procedures described here can only be made in particular cases where the practical conditions and limitations are specified. In a general way, however, it is possible to highlight the more important aspects of these procedures and, in this manner, to provide a better basis for selecting the appropriate action to take.

12.4 The whole operation starts from the value flows of the foreign trade statistics - the flows to be decomposed into factors of price and quantity. If these flows are available at aggregated levels only, the problem of calculating these flows at constant prices will normally be the same as the problem of calculating a price index for the aggregate that can be used as a deflation factor. From a practical point of view, this is a somewhat different approach from the one described in this study. A different approach is, of course, perfectly legitimate, but the problems involved in obtaining the data needed for the conceptually correct deflator are not insignificant. Attempts at changing the basic situation may therefore be considered a viable alternative.

12.5 To change the basic situation means to obtain value flows for the most detailed commodity specification that the customs records permit. In the most favourable case, this information is already transferred from customs to the statistical agency, or the data transferred permit this information to be extracted. The reason why more detailed information is not available will be found in the processing routine for the foreign trade statistics. The remedy will be to introduce breakdowns at a more detailed commodity level at the processing stage. If, however, the transfer of information from customs takes place in the form of aggregated data, a more fundamental change in the pattern of co-operation between customs and the statistical agency may be necessary in order to obtain the results required.

12.6 Whatever the reason why the value flows are not available at the most detailed level, in order to proceed along the lines of the unit value approach, the first priority is the improvement, as far as possible, of the commodity detail available for the value flows.

12.7 The first step in the actual decomposition of the value flows is the calculation of the value at constant prices at the most detailed commodity level. This is technically done by deflating the current values by the price relatives for the price-homogeneous commodities, or by the appropriate substitute price-change measure (price indexes) for the non-price homogeneous commodities.

12.8 Since the chances of product-mix are less the more detailed the commodity specification, it is particularly important to employ the most detailed commodity specification available for the calculation of the unit values. If the most detailed commodity specification already has been introduced for the processing of the value flows, it may also be available at the stage of calculating unit values.

12.9 The need for detailed commodity specification, both for value flows and for unit values, imposes an additional demand on the quality of the editing and coding of the basic data. Inaccuracies in the value and/or quantity or in the actual classification of the separate consignments by commodity will directly influence the totals for the commodity and, consequently, the unit value also. Detail without adequate quality may therefore create the illusion that the basic data are suitable for the purpose at hand.

12.10 One major problem in connection with the unit value approach has always been the selection of the specimen commodities - those commodities for which the unit values are accepted for direct inclusion in the index number calculations. In the approach indicated above, a method has been suggested for identifying suitable commodities. The method is based on analysis of the price for each consignment of the respective commodities.

12.11 This type of analysis depends on the data for the separate consignments being available. In practice, it is not feasible unless the basic data are available in machine-readable form and unless the possibilities exist for a fully computerized operation. Obviously, the information on each separate consignment must be available at the initial stages of processing the foreign trade statistics. To ensure that it is also available for statistical analysis, the detailed information should be retained in that form after being used for the production of the desired aggregates.

12.12 Not only should the detailed information be retained, it should also be retained in the form of a final, fully corrected file. It seems necessary to stress this point, because foreign trade statistics often pass through a series of preliminary releases, each of which is produced by adjusting the aggregates of the previous one. The basic data may therefore be available in the form of the original file, together with one or more "correction files". For deriving the aggregates of the regular statistics for foreign trade, these types of files may be satisfactory. They may, on the other hand, render any other type of statistical processing difficult.

12.13 For the reasons mentioned, any statistical agency wishing to employ the methods presented in this study for evaluating the data for the separate commodities for direct inclusion in the calculation of the indexes for foreign trade should aim at (a) obtaining access to the relevant information for each separate consignment and (b) making provision for this information to be retained as one final, fully corrected file.

12.14 As indicated above, for the calculation of the indexes according to the methods and procedures described in this study, information at the most detailed commodity level should be available on value, quantity and so on, both for the base period and the current period. In addition, in order to utilize the methods for evaluating the unit value for the separate commodities for the index number calculations, the basic information should be available for each separate consignment.

12.15 The actual calculations, both for the indexes and for evaluating the commodities, are quite simple and do not require any advanced equipment. The basic material, in particular the material for the separate consignments, is, however, normally of a size that requires both high-speed input and high-speed computing operations to make the methods and procedures described a viable proposition.

XIII. CONCLUSION

13.1 The methods described in this study are based on the traditional unit value approach. This approach has a longer history in connection with decomposition of value flows in foreign trade, and is still more widely used for this purpose, than any other method.

13.2 It is well known that the unit value method may fail to give satisfactory results for commodities affected by product-mix and may therefore be liable to unit value bias. By careful analysis of the basic material for the foreign trade statistics, much can be achieved in avoiding significant effects from this source of error.

13.3 When the quantity component is in the foreground, the unit value approach has certain conceptual advantages that are rather difficult to match by other methods. It also has certain practical advantages for the statistician hampered by budgetary constraints. On the other hand, it is clear that the advantages of the approach do not extend to all commodity groups and that its effective coverage may be significantly limited.

13.4 When the possibilities of the unit value approach seem to have been fully exploited, the question will normally arise how further progress should be achieved when budgetary conditions permit. Within an integrated approach in the field of price and related statistics, the answer may be that the possibilities offered by data collection for a system of producer price indexes should be exploited.

13.5 Further improvement in the basic data for decomposition will inevitably result in data from different sources being used for the decomposition of different parts of the value flows. Even under the most favourable budgetary circumstances, however, the part treated on the basis of the unit value approach, according to the procedures described in the present study, can be a not insignificant part of the total.

Annex

Table. Quarterly index numbers of external trade of Norway:
value of specimen commodities and coverage

(1970 = 100)

A. IMPORTS 1970

| SITC | Commodity group | Total | Coverage | |
|------|---|-------------------------|-------------------------|------------|
| | | (millions of kroner) | (millions of kroner) | percentage |
| 0 | FOOD AND LIVE ANIMALS | 1 743 | 1 579 | 91 |
| 04 | Cereals and cereal preparations | 385 | 383 | 100 |
| 041 | Wheat | 176 | 176 | 100 |
| 05 | Fruit and vegetables | 462 | 383 | 83 |
| 051 | Fruit, fresh | 287 | 266 | 93 |
| 06 | Sugar, sugar preparations and honey | 169 | 166 | 98 |
| 07 | Coffee, tea, cocoa, spices and manufactures thereof | 435 | 431 | 99 |
| 071 | Coffee | 337 | 337 | 100 |
| 1 | BEVERAGES AND TOBACCO | 209 | 198 | 95 |
| 2 | CRUDE MATERIALS, INEDIBLE, EXCEPT FUELS | 2 871 | 2 741 | 95 |
| 22 | Oil-seeds, oil-nuts and oil-kernels | 215 | 193 | 90 |
| 24 | Wood, lumber and cork | 657 | 633 | 96 |
| 242 | Wood in the rough or roughly squared | 444 | 440 | 99 |
| 25 | Pulp and waste paper | 182 | 181 | 99 |
| 26 | Textile fibres and their waste | 97 | 91 | 94 |
| 27 | Crude fertilizers and crude minerals | 225 | 209 | 93 |
| 28 | Metalliferous ores and metal scrap | 1 321 | 1 302 | 99 |
| 3 | MINERAL FUELS, LUBRICANTS AND RELATED MATERIALS | 2 033 | 2 001 | 98 |
| 32 | Coal, coke and briquettes | 249 | 248 | 100 |
| 33 | Petroleum and petroleum products | 1 759 | 1 728 | 98 |
| 331 | Petroleum, crude | 895 | 895 | 100 |
| 332 | Petroleum products | 864 | 833 | 96 |
| 4 | ANIMAL AND VEGETABLE OILS AND FATS | 113 | 84 | 74 |
| 5 | CHEMICALS | 2 190 | 1 853 | 85 |
| 51 | Chemical elements and compounds | 1 003 | 879 | 88 |
| 513 | Inorganic chemicals: Elements, oxides and halogen salts | 640 | 602 | 94 |
| 53 | Dyeing, tanning and colouring materials | 120 | 112 | 93 |
| 54 | Medicinal and pharmaceutical products | 189 | 169 | 89 |
| 58 | Plastic materials, regenerated cellulose and artificial resins | 434 | 406 | 94 |

Table (continued)

A. IMPORTS 1970 (continued)

| SITC | Commodity group | Coverage | | |
|-------|---|----------------------------------|-------------------------|------------|
| | | Total (millions of kroner) | (millions of kroner) | percentage |
| 6 | MANUFACTURED GOODS CLASSIFIED CHIEFLY | | | |
| | BY MATERIAL | 5 307 | 4 506 | 85 |
| 62 | Rubber manufactures, n.e.s. | 238 | 219 | 92 |
| 63 | Wood and cork manufactures (excluding furniture) | 200 | 151 | 76 |
| 64 | Paper, paperboard and manufactures thereof ... | 257 | 203 | 79 |
| 65 | Textile yarn, fabrics, made-up articles and related products | 1 053 | 955 | 91 |
| 651 | Textile yarn and thread | 269 | 261 | 97 |
| 652 | Cotton fabrics, woven | 86 | 71 | 83 |
| 653 | Textile fabrics, woven, other than cotton fabrics | 282 | 251 | 89 |
| 657 | Floor coverings, tapestries, etc. | 142 | 139 | 98 |
| 66 | Non-metallic mineral manufactures, n.e.s. | 379 | 295 | 78 |
| 664 | Glass | 117 | 112 | 96 |
| 67 | Iron and steel | 1 659 | 1 607 | 97 |
| 673 | Iron and steel bars, rods, angles, shapes and sections (including sheet piling) | 372 | 365 | 98 |
| 674 | Universals, plates and sheets of iron or steel | 798 | 794 | 99 |
| 675 | Hoop and strip of iron or steel | 109 | 101 | 93 |
| 678 | Tubes, pipes and fittings of iron or steel . | 235 | 231 | 98 |
| 68 | Non-ferrous metals | 711 | 657 | 92 |
| 682 | Copper | 360 | 357 | 99 |
| 684 | Aluminium | 202 | 192 | 95 |
| 69 | Manufactures of metal, n.e.s. | 732 | 360 | 49 |
| 7 | MACHINERY AND TRANSPORT EQUIPMENT | 6 396 | 2 937 | 46 |
| 71 | Machinery, other than electric | 3 071 | 929 | 30 |
| 712 | Agricultural machinery and implements | 275 | 175 | 64 |
| 714 | Office machines | 255 | 97 | 38 |
| 72 | Electrical machinery, apparatus and appliances | 1 556 | 835 | 54 |
| 722 | Electric power machinery and switchgear | 381 | 213 | 56 |
| 724 | Telecommunications apparatus | 313 | 99 | 32 |
| 725 | Domestic electrical equipment | 243 | 209 | 86 |
| 73 ex | Transport equipment (excluding ships) | 1 769 | 1 173 | 66 |
| 732 | Road motor vehicles | 1 190 | 1 109 | 93 |

Table (continued)

A. IMPORTS 1970 (continued)

| SITC | Commodity group | Total | Coverage | |
|------|--|-------------------------|-------------------------|------------|
| | | (millions of kroner) | (millions of kroner) | percentage |
| 8 | MISCELLANEOUS MANUFACTURED ARTICLES | 2 486 | 1 964 | 79 |
| 82 | Furniture | 165 | 140 | 85 |
| 84 | Clothing | 904 | 818 | 90 |
| 85 | Footwear | 185 | 178 | 96 |
| 86 | Professional, scientific and controlling instruments; photographic and optical goods, watches and clocks | 421 | 248 | 59 |
| 89 | Miscellaneous manufactured articles, n.e.s. .. | 664 | 466 | 70 |
| 891 | Musical instruments, sound recorders and reproducers and parts and accessories thereof | 139 | 120 | 86 |
| 9 | COMMODITIES AND TRANSACTIONS NOT CLASSIFIED ACCORDING TO KIND | - | - | - |
| 0-9 | TOTAL (excluding ships) | 23 464 | 17 864 | 76 |
| 0+1 | Of which: Food, beverages and tobacco | 1 953 | 1 777 | 91 |
| 2+4 | Crude materials (excluding mineral fuels) | 2 985 | 2 825 | 95 |
| 3 | Mineral fuels | 2 033 | 2 001 | 98 |
| 5-9 | Manufactured goods (excluding food beverages and tobacco) | 16 494 | 11 261 | 68 |

B. EXPORTS 1970

| | | | | |
|-----|---|-------|-------|-----|
| 0 | FOOD AND LIVE ANIMALS | 2 001 | 1 903 | 95 |
| 02 | Dairy products and eggs | 90 | 89 | 99 |
| 03 | Fish and fish preparations | 1 359 | 1 305 | 96 |
| 031 | Fish, fresh and simply preserved | 1 093 | 1 049 | 96 |
| 032 | Fish in airtight containers n.e.s. and fish preparations | 226 | 255 | 96 |
| 08 | Feeding stuff for animals (n.i. unmilled cereals) | 416 | 414 | 100 |
| 1 | BEVERAGES AND TOBACCO | 27 | 26 | 96 |
| 2 | CRUDE MATERIALS, INEDIBLE, EXCEPT FUELS | 1 762 | 1 665 | 94 |
| 21 | Hides, skins and furskins, undressed | 208 | 195 | 94 |
| 24 | Wood, lumber and cork | 58 | 44 | 76 |
| 25 | Pulp and waste paper | 754 | 750 | 99 |

Table (continued)

B. EXPORTS 1970 (continued)

| SITC | Commodity group | Total | Coverage | |
|------|---|-------------------------|-------------------------|------------|
| | | (millions of kroner) | (millions of kroner) | percentage |
| 26 | Textile fibres and their waste | 89 | 85 | 96 |
| 27 | Crude fertilizers and crude minerals | 210 | 201 | 96 |
| 28 | Metalliferous ores and metal scrap | 403 | 358 | 89 |
| 3 | MINERAL FUELS, LUBRICANTS AND RELATED MATERIALS | 387 | 291 | 75 |
| 33 | Petroleum and petroleum products | 320 | 226 | 71 |
| 4 | ANIMALS AND VEGETABLE OILS AND FATS | 320 | 307 | 96 |
| 41 | Animal oils and fats | 133 | 129 | 97 |
| 43 | Animal and vegetable oils and fats, processed, etc. | 180 | 171 | 95 |
| 5 | CHEMICALS | 1 331 | 1 229 | 92 |
| 51 | Chemical elements and compounds | 444 | 427 | 96 |
| 53 | Dyeing, tanning and colouring materials | 91 | 87 | 96 |
| 56 | Fertilizers, manufactured | 379 | 359 | 95 |
| 58 | Plastic materials, regenerated cellulose and artificial resins | 267 | 262 | 98 |
| 6 | MANUFACTURED GOODS CLASSIFIED CHIEFLY BY MATERIAL | 6 940 | 6 687 | 96 |
| 61 | Leather, leather manufactures n.e.s., dressed furskins | 64 | 52 | 81 |
| 62 | Rubber manufacturers n.e.s. | 75 | 68 | 91 |
| 63 | Wood and cork manufactures (excluding furniture) | 90 | 77 | 86 |
| 64 | Paper, paperboard and manufactures thereof ... | 1 342 | 1 306 | 97 |
| 65 | Textile yarn, fabrics, made-up articles and related products | 250 | 225 | 90 |
| 651 | Textile yarn and thread | 100 | 98 | 98 |
| 66 | Non-metallic mineral manufactures n.e.s. | 148 | 139 | 94 |
| 67 | Iron and steel | 1 280 | 1 268 | 99 |
| 671 | Pig iron, spiegeleisen, sponge iron, iron and steel powders, etc. | 777 | 777 | 100 |
| 673 | Iron and steel bars, rods, angles, shapes and sections | 192 | 191 | 99 |
| 674 | Universals, plates and sheets of iron or steel | 117 | 115 | 98 |
| 68 | Non-ferrous metals | 3 319 | 3 312 | 100 |
| 682 | Copper | 370 | 368 | 99 |

Table (continued)

B. EXPORTS 1970 (continued)

| SITC | Commodity group | Total | Coverage | |
|-------|--|-------------------------|-------------------------|------------|
| | | (millions of kroner) | (millions of kroner) | percentage |
| 683 | Nickel | 761 | 760 | 100 |
| 684 | Aluminium | 1 852 | 1 851 | 100 |
| 686 | Zinc | 103 | 103 | 100 |
| 69 | Manufactures of metals n.e.s. | 372 | 240 | 65 |
| 7 | MACHINERY AND TRANSPORT EQUIPMENT | 1 893 | 901 | 48 |
| 71 | Machinery other than electrical | 947 | 275 | 29 |
| 72 | Electrical machinery, apparatus and appliances | 592 | 357 | 60 |
| 724 | Telecommunications apparatus | 194 | 136 | 70 |
| 725 | Domestic electrical equipment | 137 | 125 | 91 |
| 73 ex | Transport equipment (excluding ships) | 354 | 270 | 76 |
| 8 | MISCELLANEOUS MANUFACTURED ARTICLES | 653 | 512 | 78 |
| 82 | Furniture | 121 | 114 | 94 |
| 84 | Clothing | 117 | 93 | 79 |
| 89 | Miscellaneous manufactured articles n.e.s. ... | 290 | 222 | 77 |
| 0-9 | TOTAL (excluding ships) | 15 486 | 13 521 | 87 |
| 0+1 | Of which: Food, beverages and tobacco | 2 038 | 1 929 | 95 |
| 2+4 | Crude materials except mineral fuels etc. | 2 081 | 1 972 | 95 |
| 3 | Mineral fuels, lubricants and related materials | 387 | 291 | 75 |
| 5-9 | Manufactured goods except food etc. | 10 865 | 9 329 | 86 |