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BASE YEAR FOR INTERNATIONAL STATISTICS

Rationale, methodology and likely effects of the "rebasing" of external trade indices

by

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Rationale, Methodology and Likely Effects of the "Rebasing" of External Trade Indices

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G A T T
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Introduction

At the ACC Sub-Committee on Statistical Activities that met in Vienna in June 1990, the item of "Base Year for Statistics" was discussed on the basis of oral reports. The substance of the discussion was summarized by the Sub-Committee which noted the different practices and the difficulties faced by organizations concerning adoption and implementation of a base year for statistics, and recognized that this was a challenge for coordination. The ACC Sub-Committee recognized that a number of factors were involved in any decision on the choice of base year. These included:

(a) the desirability of using a relatively recent year as the base year for many kinds of analysis;
(b) the desirability of using a year that reflected relatively stable conditions with respect to the phenomenon being measured;
(c) the desirability of using a year that could be as uniform among as many organizations and fields of statistics as possible;
(d) national practices and the availability of statistics at the international level; and
(e) the special circumstances in individual fields of statistics and the special requirements of different groups of users.

The ACC Sub-Committee considered that individual organizations, in response to requirements within their organization and of their main external users would necessarily take their own approaches to this question although this would create some difficulties in the use of data by analysts using statistics from a number of international sources. Indeed, even within some organizations different approaches may be taken with respect to different data sets. The ACC Sub-Committee decided to consider this matter again at a future session based on written reports prepared by the concerned organizations.

A. <u>Background</u>

The System of National Accounts (SNA) consists of a conceptually consistent and statistically integrated framework of macroeconomic statistics designed for economic analysis either of the economy as a whole or at a more disaggregated level, permitting the structural analysis and investigation of the interaction of different variables.

The aggregates of the system are composite values considered from a particular point of view, for example the production side or the expenditure side.

The goods and services produced by establishments or enterprises may be either used up within the same accounting period as intermediate consumption by other establishments or allocated for final uses including:

- final consumption of goods and services;
- capital formation;
- <u>exports of goods and services</u>;
- <u>imports of goods and services</u>.

The SNA also provides a framework in which an integrated set of price and volume measures can be compiled.

For individual goods or services there is a fundamental identity which reads: <u>value</u> = <u>price</u> * <u>quantity</u>.

For an aggregate flow consisting of several different goods and services the corresponding identity reads:
<u>value index</u> = <u>price index</u> * <u>quantity index</u>.

This identity explains the important role of index numbers theory in the measuring process of the economy.

The fundamental identity: value index = price index * volume index implies that in principle if the values are known it is necessary to calculate either the price or volume index as the other can be derived indirectly from the equation. The calculated index is called the <u>direct index</u> and the derived one the <u>implicit index</u>.

A well-known relationship is that a <u>direct index</u> of Laspeyres corresponds to an <u>implicit</u> index of Paasche and vice-versa.

For a flow of goods or services we obtain a time series of value indexes, price indexes and quantity indexes; the quantity or volume index measures the real growth, i.e., the growth at constant prices of a given <u>base year</u>. The <u>base year</u> data on value, price and quantity determine the structure of price and quantity relationships used for weighting purpose in the construction of aggregative measures.

B. The Base Year in Statistics: The Yardstick of Measurement

B1. The Importance of the Base Year in Statistics

Due to its importance, the question arises if there are any objective criteria in selecting the base year.

From the theoretical point of view the period chosen as yardstick should be a period when all the commodities and products covered are in approximate supply and demand equilibrium and the price relationship of the components should be approximately normal.

From the practical point of view, the choice of the base year depends on the year when major censuses are undertaken and those censuses are planned well in advance. The integrated System of National Accounts presumes that all the components have the same base year; but due to volatility of external trade structures in comparison with the relative stability of the structure of the other national accounts components, the choice of the base year of external trade could transgress this rule because common sense has to prevail over abstract concepts.

Annex I shows the value, value indices, volume and unit value indices with the reference year of 1970=100. Part A of the Annex shows the total exports time series split into agricultural products, mineral products and manufactures. When the aggregation uses actual weights, it represents a close picture of each year. Part B.1 compares the actual weighted results with direct unit value indices weighted first with the 1970 structure, second with 1980 structure and third with 1989. The quantum indices are derived. The comparison of changes between 1980-70, 1989-80 and 1989-70 show substantial differences depending on the choice of base year. Part B.2 compares the same indices but taking the quantum indices as direct indices and the unit values derived. Equally significant differences of changes over the three periods are found.

This simple example shows how quickly a certain structure of commodities changes, and its impact on the calculation of price and quantum trends.

International statistical agencies and in particular the UNSO have used as base year in the past 1953, 1958, 1963, 1970, 1975 and 1980. Measuring the economy in the 1990s with 1980 basic weights does not accurately reflect the extraordinary changes which have occurred in the last decade.

Ideally, for each comparison that is made over time, a specific base period should be used reflecting the price structure of the period of comparison as closely as possible.

This is not practicable however, and the need to keep abreast of changing price structures is met by choosing a sequence of base years, each of which is used for volume comparison over defined periods surrounding the base data. Rebasing therefore becomes necessary to ensure that volume comparisons made over more recent periods are not distorted by the use of an obsolete price structure.

B. The Base Year in Statistics: The Yardstick of Measurement

B2. Rebasing

Usually, the comparison at constant prices is met through the use of a base-weighted volume index number where current quantities are weighted by the relative prices of a fixed base period.

To maintain the reliability of measurement, the price structure should closely reflect the real world, necessitating rebasing every five or ten years; in fact, production and trade are composed of a vast mixture of different types of goods and services, and the pattern of prices is constantly changing as a result of a multitude of factors such as productivity, technological development, exchange rates and other regular or irregular changes.

Again due to the far more rapid changes in the structure of trade than production, the rebasing of trade indexes ought to be undertaken much more often than the rebasing of other components.

Rebasing does not entail recalculating the entire series of constant prices using the relative weighting of the new base year since to do so would impose inappropriate relative weights for earlier periods. Developments in the 1960s cannot be measured satisfactorily in terms of the relative prices of 1985 or 1990. Hence, the relative price structure in a base year is used only over a limited time period. The series are linked by scaling or re-referencing the earlier period using a link-ratio, for example:

$$\frac{\text{1983 value at 1985 prices}}{\text{1983 value at 1980 prices}}$$

The year 1983 is then called the link year. Similar scaling is undertaken for periods surrounding earlier base years.Thus, although the constant price estimates are referred to as being at 1985 prices, the estimates prior to 1983 are calculated using relative prices more closely in line with the periods in question.

In other words, each series has several weighting base years but only a single reference year. Each volume series is in the form of a chain-linked index with the typical length of each link about five years instead of what might be considered the ideal of one year. An important consequence is that when a new base year is introduced comparisons are only affected for periods as far back as the link year; comparisons made over earlier periods are unaffected.

The operations involved in rebasing can be summarized as follows:

From the link year

1) Producing re-weighted price indices for deflating the individual components
2) Re-weighting the deflated components according to the value of the new base year and calculating new aggregate series

From periods prior to the link year

Re-referencing all components and aggregate series to the new base year, for example, 1985=100 by multiplying the existing series by the link ratio. For example:

Original base year: 1980
New base year: 1985

Link ratio: $\frac{\text{1983 value at 1985 prices}}{\text{1983 value at 1980 prices}} = 0.80$

	1980	1981	1982	1983	1984	1985
Base year:1980	100	105	110	115	120	125
Base year:1985	80	84	88	92	96	100
	Re-referencing by multiplying base year 1980 indices by the link ratio			New aggregate series		

B. The Base Year in Statistics: The Yardstick of Measurement

B3. The Effects of Rebasing

The most obvious effect of rebasing is that the level of the rebased constant price estimates is quite different from that of the earlier base year estimates. The reason is that inflation has led to prices being higher in the later base year for most goods and services. The constant price estimates of a series calculated using a different base year generally have different movements.

For most types of expenditures the theoretical effect of rebasing and reweighting is to reduce the overall growth of GDP. This is a reflection of price elasticities; the growth of demand is likely to be greater for those goods and services whose unit prices have grown less than the average, and conversely, less for those goods and services whose unit prices have grown more than the average. Indeed, experience shows that rebasing has reduced the overall growth in the volume of domestic expenditure. However, this has been frequently offset by the effect of rebasing imports and exports because of the volatility of external prices without a proportionate contraction or expansion of trade volume.

As the rebasing consists not only of using the same components but also of reviewing the composition of series in order to improve coverage, the effects tend to be much larger.

The experience of recent rebasing has shown that they can produce overall revisions in a direction opposite to that which might have been expected from the point of view of price elasticities alone.

The same experience has shown that on the expenditure side the export and import components underwent by far the largest revisions.

If we reconsider Annex I the share of trade in the three products was the following:

	1970	1980	1989
Agricultural products	0.2098	0.1531	0.1361
Mineral products	0.1672	0.2862	0.1395
Manufactured goods	0.6230	0.5607	0.7244

The results with the four weighting structures are:

Using the unit values as direct indices:

	Absolute Change		
	1980-70	1989-80	1989-70
Value Indices	541.6	333.8	875.4
Quantum			
Actual weight	93.6	69.8	163.3
1970 weight	93.0	74.2	167.2
1980 weight	76.4	81.0	157.4
1989 weight	99.8	71.8	171.6
Unit Value			
Actual weight	231.5	38.9	270.4
1970 weight	232.4	32.6	265.0
1980 weight	263.7	15.2	278.9
1989 weight	221.1	38.0	259.2

The above data show the marked changes in the relative importance of the unit value and volume of world trade. During the 1970s the major contributor to the increase in the value of world trade was the rapid acceleration in export unit values due to the increases in the price of oil and other primary commodities. In the 1980s the increase of the value of trade was due mainly to volume growth, because from 1985 onwards there was a marked decline in primary commodity prices.

C. The External Trade Indices

C1. Use of External Trade Indices in Empirical Research and Analysis

All economic statistics center around three basic measurements: Value, price and quantity. As the economic analysis of external trade entails studying the relationship of trade and other economic variables, the estimation of the price and volume components of external trade is essential. Some examples of analysis are:

- analysis of the competitiveness (as determined by price and non-price factors) of an economy in individual product categories;
- comparison of domestic and external trade price trends;
- assessment of change in import and export values as opposed to purely inflationary rises in prices;
- analysis of comparative advantage and disadvantage of an economy,
- investigation of the structural effects of changes in exchange rates;
- estimation of price elasticity of supply and demand and of substitution elasticity in the external trade sector;
- terms of trade calculations;
- investigation of the effects of trade on standards of living;
- analysis of the effects of changes in the prices of major raw materials.

The empirical research and analysis of external trade uses a set of relative price and cost indices such as:

$$\frac{\text{Index of the home country's export unit values}}{\text{Index of the competitors' export unit values}}$$

$$\frac{\text{Index of export unit values}}{\text{Index of wholesale prices}}$$

$$\frac{\text{Index of export unit values}}{\text{Index of consumer prices}}$$

$$\frac{\text{Index of export unit values}}{\text{Index of unit labor costs}}$$

$$\frac{\text{Index of the home country's wholesale prices}}{\text{Index of competitors' export unit values}}$$

$$\frac{\text{Index of the home country's import unit values}}{\text{Index of competitors' wholesale prices}}$$

The above indices are expected to depict relevant price (or cost) competitiveness; all the indices used have a number of well-known deficiencies. Despite these deficiencies, however, they may serve as a starting point in assessing the competitiveness of specified categories of traded goods.

C. The External Trade Indices

C2. Computational Procedures

Customs declarations include information on value and quantity for many commodities; the calculation of the unit value is possible for an item i and equals:

$$\frac{Vi}{Qi}$$

The commodity descriptions and codes requested on customs declarations are the subject of international standards and classifications. For statistical purposes, countries can either report trade according to the Standard International Trade Classification (SITC) or the Harmonized System, although some are still reporting on the Customs Co-operation Council Nomenclature (CCCN).

The formulae most commonly used in compiling price and quantity indices are the base-weighted Laspeyres, the current-weighted Paasche and the cross-weighted Fisher formula. The periodicity of rebasing depends, among other things, on whether the indices used are chained.

C2. Computational Procedures

C2.1 Alternative Index Number Formulae

	Unit Value	Quantum
Laspeyres (L)	$\dfrac{\sum PtoQto\left(\frac{Ptn}{Pto}\right)}{\sum PtoQto}$	$\dfrac{\sum PtoQto\left(\frac{Qtn}{Qto}\right)}{\sum PtoQto}$
Paasche (P)	$\dfrac{\sum PtnQtn}{\sum PtnQtn\left(\frac{Pto}{Ptn}\right)}$	$\dfrac{\sum PtnQtn}{\sum PtnQtn\left(\frac{Qto}{Qtn}\right)}$
Fisher (F)	$\sqrt{\text{Laspeyres} * \text{Paasche}}$	$\sqrt{\text{Laspeyres} * \text{Paasche}}$

Over the long-term Laspeyres and Paasche indices drift apart; the Fisher index has a number of attractive properties and at the same time attenuates the medium-term or long-term "drift apart" tendency of Laspeyres and Paasche.

C. The External Trade Indices

C2. Computational Procedures

C2.2 Fixed Base Versus Chained Indices

The base year in chained indices is revised every year and therefore the index weights are derived from recent values and quantities traded. For year n the base period is n-1, for year n+1 the base period is n, for year n+2 the base period is n+1, etc.

For year n+1:

Laspeyres Unit Values

$$\frac{\sum PtnQtn\left(\frac{Ptn+1}{Ptn}\right)}{\sum PtnQtn}$$

Paasche Unit Value

$$\frac{\sum Ptn+1Qtn+1}{\sum Ptn+1Qtn+1\left(\frac{Ptn}{Ptn+1}\right)}$$

Fisher

$$\sqrt{\text{Laspeyres} * \text{Paasche}}$$

Value Index

$$\frac{\sum Ptn+1\ Qtn+1}{\sum Ptn\ Qtn}$$

Laspeyres Volume Derived

$$\frac{\text{Value Index}}{\text{Paasche Unit Value}}$$

Paasche Volume Derived

$$\frac{\text{Value Index}}{\text{Laspeyres Unit Value}}$$

Fisher Volume Derived

$$\sqrt{\text{Paasche Derived} * \text{Laspeyres Derived}}$$

Example of chaining a Laspeyres Unit Value:

1984	1985	1986
$\frac{\sum P84\ Q83}{\sum P83\ Q83}$	$\frac{\sum P85\ Q84}{\sum P84\ Q84}$	$\frac{\sum P86\ Q85}{\sum P85\ Q85}$

C. The External Trade Indices

C3. Some Important Factors Undermining Price Measurement

C3.1 The Issue of New Products

The commodity universe is not stable over time. How to deal with goods which are found in only one of the two base years compared is a serious problem. If we consider, for instance, only the revisions of international classifications, the SITC passed from 570 to 3118 basic items over time, and the Harmonized System contains 5019 items compared to 1011 in CCCN (Refer to Annex II and III). If any comparison is to be possible an important proportion of products must be found in both points of comparison.

It may be necessary to compile price and volume indices which are intended to cover all goods in both base years when the change in the total values in both situations has to be factored into its price and quantity components. In this case the information available with respect to prices and quantities is not symmetrical.

One approach is to use the implicit assumption that the price development for the goods that are found in only one base year follow the same trends of the goods available in both base years.

Annex IV shows the absolute change in shares of SITC Rev.1 sections in total exports and imports of developed countries.

Annex V shows that for both exports and imports of developed countries, considerable increases in the share of passenger cars and computers occurred between 1989-1980 and 1980-1970. On the export side the third substantial increase occurred for electrical apparatus and on the import side for clothing. The most significant decreases occurred for petroleum crude and refined products. There is a striking stability in the shares of the majority of the other groups. The important changes are therefore concentrated in a dozen product groups.

Imports of Developed Countries
Shares of SITC Rev.1 by groups ranked according to the changes 1980-89

SITC/Rev.1	Description	Change 1980-70	Change 1989-80	Change 1989-70
732	Road motor vehicles	-0.5	3.4	2.9
714	Office machines	-0.2	2.6	2.4
841	Clothing (except fur clothing)	0.3	1.2	1.5
729	Other electrical machinery and apparatus	0.1	1.1	1.2
719	Machinery and appliances (other than electrical) and machine parts, nes	-0.6	1.1	0.5

Exports of Developed Countries
Shares of SITC Rev.1 by groups ranked according to the changes 1980-89

SITC/Rev.1	Description	Change 1980-70	Change 1989-80	Change 1989-70
732	Road motor vehicles	0.1	2.2	2.3
714	Office machines	0.0	2.1	2.1
729	Other electrical machinery and apparatus	0.3	1.0	1.3
861	Scientific, medical, optical measuring and controlling instruments and apparatus	0.1	0.9	1.0
891	Musical instruments, sound recorders and reproducers and parts and accessories thereof	0.1	0.4	0.5

C. The External Trade Indices

C3. Some Important Factors Undermining Price Measurement

C3.2 The Issue of Quality Change

This is probably the most important conceptual problem that statisticians are faced with in the construction of index numbers. The question at issue is whether the physical characteristics of a pair of goods are sufficiently similar to compare their prices directly, or, if characteristics differ to some extent, how to make the necessary quality adjustments. Statisticians have been experimenting with hedonic indices but this issue is so important that further research is urgently needed.

The idea of the hedonic approach is a derivation of adjusted quality prices by regression techniques. Multiple-regression analysis applied to cross section data on prices and characteristics of varieties serve to estimate the "adjusted for quality change" prices. Another approach is called the "commodity expert" approach which is probably widely used. Whatever the approach or the combination of approaches with the increasing and continuous process of quality change the measurement of price changes is becoming an extremely difficult task where the results can vary considerably depending on the method of adjustment.

A customs code may cover a number of different goods, each of them having a range of physical and economic qualities which vary from item to item. The distinguishing features of cars, for example, are models, engine size, equipment, etc. For each combination of qualities there will be an average price. Foods, beverages and raw materials have a low variability in quality. Chemicals and simple manufactured goods have a medium variability in quality. The high variability category consists of manufactured products either capital equipment or consumer goods.

This issue of quality change has also brought up the use of export and import price indices instead of unit values; the price versus unit value approach has been a point of controversy throughout the past two decades.

There are important issues in need of clarification in this field, in particular the extent to which measured changes in quality should relate to the attributes or performance of the goods from the point of view of the consumer or whether they should be restricted to quality changes attributable to the use of more or fewer resources in the production of different versions of models of the same good.

C3. Some Important Factors Undermining Measurement

C3.3 The Issue of Valuation

Pricing some transactions poses a serious problem because of deviations from the notion of `transaction value'. With the globalization of the economy this issue becomes very important. A significant amount of trade is composed of transactions between branches, subsidiaries or affiliates of transnational corporations. An increasing part of trade is carried out under barter arrangements because of the debt problems of some countries. The development of leasing due to rapid technological changes also poses valuation problems. The above developments mean that true pricing becomes almost an exception in international trade.

The globalization of the world economy has as a consequence an increasing share of world trade being conducted by fewer actors, i.e., the transnational corporations which in many cases are involved in the diversification of production and trade of a large variety of products. Such corporations trade with themselves, through exports and imports of goods from one country to another in which they are located. The number of transactions for a certain product can involve three to four countries with an additional undetermined value added in each country; customs authorities in general accept the valuation given at each stage of the transaction. But even if a customs authority replaces the corporation's valuation with its own, it is also a rough estimate. If the corporation changes the valuation over time because of taxation or other reasons the price measurement is further distorted.

The trend of globalization appears to be increasing. It is easier for transnationals today to detect and respond to changes in the various domestic markets, to surmount protectionist walls and to adapt their production policy as a function of exchange rate movements. Foreign-owned companies account for 50 percent of manufacturing output in the newly industrialized countries. The 600 biggest companies in the world create more than one fifth of the world's total value added.

The barter arrangements, for example, between oil producing countries and exporters of capital equipment, consumer goods or even military equipment are conducted under fictitious pricing which is independent of any normal economic market transaction.

Leasing of capital goods such as computers and telecommunications equipment is becoming almost the rule and not the exception. The trend is due to the high cost of capital equipment and its obsolescence due to very rapid technological development.

In conclusion, it would appear to be that more than 50 percent of trade transactions are conducted under non-competitive market conditions with the resulting uncertainty about true pricing.

C. The External Trade Indices

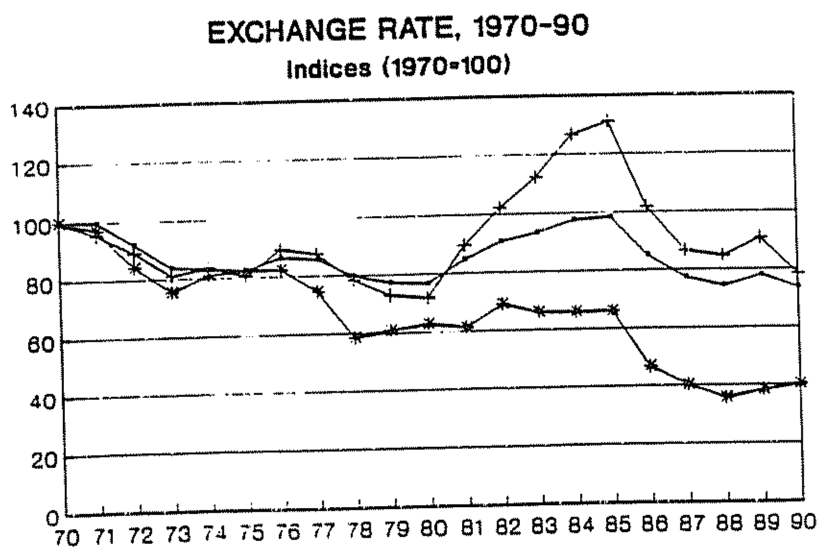
C3. Some Important Factors Undermining Price Measurement

C3.4 The Issue of Exchange Rate Conversion

Trade invoices expressed in foreign currencies are converted into the currency of the compiling country. The same trade data are in turn converted into a common unit of account to make international comparisons. The degree of conversion problems varies according to the countries and the commodities involved. The conversion problem cannot be analyzed in isolation by abstracting it from the structure and pattern of currency invoicing and product composition of exports and imports. Time lag between exports and imports adds a further difficulty in the two stages of conversion mentioned above. The use of administrative rates by some countries complicates even further the presentation of trade data under a common unit of account.

Annex VI shows the effect of fluctuations in exchange rates on the measurement of unit values in Germany and Japan, where indices are shown both in US dollars and national currency together with the index of exchange rate for total imports, and total exports. Indices are also shown for EC(12) exports and imports in ECU and US dollars.

The following table shows the relation of the US dollar to SDR, ECU and Yen, from 1970 to 1990:



D. Examples of Trade Indices Calculated by UNSO

D1. Total Exports and Imports

Index Numbers of Quantum, Unit Value and Terms of Trade (1980=100)
Published quarterly in the UNSO, Monthly Bulletin of Statistics

Presently, indices are obtained by revaluing current trade at the dollar price of 1980. The unit value indices are of Paasche type and the derived quantum indices are of Laspeyres type. The indices are linked at 1950, 1956, 1961, 1968, 1970 and 1975. The national unit value indices are first expressed in dollar terms and then aggregated with current weights, for regional aggregates.

Unit Value = Paasche

Quantum = Laspeyres

$$\text{Terms of Trade} = \frac{\text{Unit Value of Exports}}{\text{Unit Value of Imports}}$$

The concepts and methodology underlying the compilation of national trade indices are different. Summarization into one aggregate of a number of dissimilar indices has to be considered only indicative of the movements in the levels of volume and prices in world trade. World and area totals for exports and imports are compiled by aggregating national indices expressed in US dollars. The calculation of area totals and averages takes into account that for some countries data are not available, by assuming the rate of change in unreported country data to be the same as the rate of change in the weights of the area totals.

For certain countries for which data are not available, indices are compiled by using volumes of major traded commodities. Another method of estimating missing data is the use of partner statistics' trade indices.

Annex VII shows that only one third of the countries provide reliable and documented external trade indices. Even if these countries are the major traders, the coverage of total world unit value and quantum indices is not very satisfactory. In particular, the external trade indices of developing regions are extremely poor, resulting in external price and volume developments of these regions which are extremely difficult to analyse.

D. Examples of Trade Indices Calculated by UNSO

D2. Index Numbers of Manufactured Goods Exports
(1980=100). Published quarterly in the UNSO, Monthly Bulletin of Statistics

The table provides value, unit value and quantum of manufactured exports of SITC sections 5 to 8 of SITC Rev.2. Unit value indices obtained from national sources are re-referenced to 1980=100 and converted into US dollars using conversion factors obtained by dividing the weighted average exchange rate of a given currency in the current period by the weighted average exchange rate in the base period. Unit value indices are current period weighted and quantum indices are derived. The aggregates of the unit values are current value weighted and the aggregates of quantum are base year weighted. Prior to 1975, this index comprised only exports of developed countries but presently it includes twenty developing countries.

The developing countries included are: Argentina, Brazil, Chile, Taiwan, Hong Kong, India, Indonesia, Korea, Malaysia, Mexico, Pakistan, Peru, Philippines, Singapore, Thailand, Trinidad and Tobago, Tunisia, Turkey, Yugoslavia, and Zambia.

This index of manufactured goods has been published by UNSO since 1950. The shift from one version of SITC to another affected the aggregate unit value and quantum indices. For manufactured goods the number of basic headings of SITC increased from 1363 in SITC Rev.2 to 2398 in SITC Rev.3.

Annex VIII shows that the composition of manufactured goods is changing at a rapid pace because of technological developments, production techniques and consumer behaviour. The example shows imports and exports of the 11 groups with significant structural changes. If such a level of change occurs at this aggregate level one can assume that the same is taking place at a more disaggregated level with much more significant changes in the compositions of the goods.

D. Examples of Trade Indices Calculated by UNSO

D3. Export Price Index Numbers of Primary Commodities and Non-ferrous Base Metals (1980=100)
Published monthly in the UNSO, Monthly Bulletin of Statistics

Each price index is intended to measure world price movements in international trade. The indices represent as far as possible changes in actual transaction prices. Beginning in 1978, the export price indices published by UNSO have been computed with weights determined by the patterns of primary commodities and non-ferrous metals exports in 1980. The index is a Laspeyres index. In the area of commodity price indices a large number of indices are compiled by various agencies; the best known are the Economist Index, the Reuters Index, the HWWA Index, the IBRD Index, the UNCTAD Index and the IMF Index. In a period of relative price stability, the movement of the various indices do not show any marked difference; however in a period marked by considerable turbulence in commodity and exchange markets, the base year weighting, the commodity composition of each index and the price series used result in considerable differences of commodity price developments.

Annex IX shows the share of selected primary commodities in total exports and imports from and into total developed countries. The decline of many intermediate commodities is a consequence of technological advances and the discovery of cheaper substitutes as inputs in the production process.

Annex X shows the volatility of prices and of exports and imports of selected commodities in developed countries.

Annex XI compares price movements of selected commodities reported by UNSO and IMF. As there is a relative profusion of published commodity price indices, there is a need for harmonization in this area to attenuate the confusion raised by several price developments for the same commodity.

A considerable number of studies have analyzed the long-term movements of commodity prices in nominal and especially in real terms. It is generally accepted to deflate the nominal series by some measure of the price of manufactured goods. Those real indices are alternatively referred to as the net barter of trade between primary commodities and manufactures and as such it is sometimes interpreted as an approximate measure of the terms of trade between developing and industrialized countries. The result of these studies suggest that there is probably a long-term declining trend. However, the subject is not as simple as it looks. Long-term movements of nominal and deflated prices are influenced by so many factors that only suggestive conclusions can be provided.

Conclusion

Measured rates of prices and real changes are based on index numbers. There are a variety of different index numbers to choose from, all of which will be registering different rates of change at any given moment in time. There is no consensus as to what is the best type of index number and there are biases in the measure of all of them.

A common feature of all these measures is the use of a base year. The impression which emerges at this stage is that if fixed weights are to be used in external trade indices, where regular and irregular structural changes take place, an average of years is preferable to any single year. For example, the average of 1984-1986 could be used to rebase the 1980 indices and then the average of 1989-1991. The periodicity of rebasing should not exceed five years. This practice can attenuate the bias effects of change in composition and quality.

The main problem confronting trade statisticians is not the choice between the various index numbers formulae, but the practical difficulty of how to deal with the rapidly changing pattern of trade composition. When the set of products is continuously changing with the disappearance of old products and the entrance of new products or new models with improved qualities, the proportion of products that can be compared directly tends to diminish the further apart the periods become.

This phenomenon is directly relevant to the use of chain indices; if a chain index is employed, the amount of price information which can be exploited is greatly increased. When comparisons are made between consecutive time periods, the overlap between the sets of commodities found in both periods is likely to be greatest. The chain index makes it possible to use almost all of the price information available in both periods, and the problem created by new and disappearing products will tend to be diminished.

Our preference goes to chained Fisher indices with annual rebasing using at year tn+1 the weight of year tn. For example, the 1986 indices would have 1985 as base year, the 1987 indices would have 1986 as base year and the 1990 indices would have 1989 as base year. Each index can be expressed in terms of 1985=100 (reference year) by chaining all the links back to 1985.

In the case of imports and exports, goods consist of primary, intermediate and final products, which may be used for purposes of intermediate consumption, final consumption or capital formation. Moreover these exports and imports are used together with products of domestic origin. Thus there are no separate economic activities which are uniquely associated with imports and exports, and in the case of the external trade index, the economic theoretical approach to index numbers is not very relevant so that we can limit our research within the area of the so-called axiomatic approach which works entirely with actually observed price and quantity data.