

An assessment of the sensitivity of the national accounts constant price estimates to changes in the base year and alternative methods of calculation

National accounts estimates of expenditure and output revalued at 1970 prices were first published in *National Income and Expenditure 1973* (the Blue Book) and have since been used as the basis for measuring changes in the gross domestic product at constant factor cost in the quarterly articles published in *Economic Trends*. In the

October 1973 issue of *Economic Trends* the following preliminary assessment was given of the effects of rebasing on the estimated changes between 1963 and 1970 shown by the expenditure-based estimate of gross domestic product at constant factor cost and its main components.

Analysis of revisions to estimated changes between 1963 and 1970 in the expenditure-based estimate of gross domestic product at constant factor cost

	Previous published estimate	Effects of revisions to current price estimates	Effects of changes in methodology	Effects of rebasing on 1970	1973 Blue Book estimate
<i>Percentage changes in:</i>					
Consumers' expenditure	+16½	-¼	-¾	-1	+14½
Gross domestic fixed capital formation	+42½	-1	-	+1½	+43
Exports of goods and services	+48½	-	-	-1½	+47
Imports of goods and services	+40½	+¼	-	-¾	+40
Gross domestic product	+21½	-½	-½	+½	+20½

This article describes the results of a more detailed analysis of the expenditure-based constant price estimates for that period, examining the sensitivity of the estimates to the change in the base year and to alternative methods of construction. The results of an analysis of the output-based estimate will be published soon.

Before the results of this analysis are given, the nature of the constant price estimates deserves some attention. The purpose of constructing national accounts constant price estimates is to be able to distinguish that part of changes in the value of goods and services produced which reflects changes in quantities from that which reflects changes in prices. Thus the constant price estimates aim to represent quantities of goods and services revalued at the average prices of a given period (the base year). The changes shown by constant price estimates are the same as those which would be shown by a base-weighted (Laspeyres) volume index number, where changes in quantities are weighted together by the relative values of a fixed base period.* Constant price estimates in this form are convenient for the user to handle because they are additive (that is, any aggregate is still the sum of its components as at current prices)†; also volume indices in the Laspeyres form have the theoretical advantage that comparisons can be made between any

two periods (certain other forms of index strictly enable comparisons to be made only with the base period). Even though presented in terms of £ million, it should always be remembered that the constant price estimates are essentially volume index numbers in the Laspeyres form and are subject, therefore, to any limitations attaching to such statistical constructs. In particular, there is no unique estimate of 'real' changes in the national accounts aggregates. This article does, however, attempt to give some guidance on the range within which such estimates of 'real' changes may fall.

The analysis which follows should also be seen in the context of all the possible sources of error which arise when attempting to construct estimates at constant prices. In order to make a proper distinction between price changes and volume changes the unit of measurement for each good or service should be homogeneous but in practice only a rough approximation to the theoretical ideal may be achieved. Where data are available for homogeneous categories of goods or services it may be possible to construct direct estimates of changes in volume from physical quantities multiplied by base-year prices. Often, however, categories of goods or services for which data are available are by no means homogeneous and the approach adopted is to estimate volume changes from

*An index number in the form $\frac{\sum q_n p_o}{\sum q_o p_o}$ or $\frac{\sum p_o q_o q_n}{\sum p_o q_o}$ where o is the fixed base period and n is the period for which the index is constructed.

†The volume estimates published for periods far removed from the current base year do not have this characteristic because the volume changes shown by the calculations at the prices of a base year closer to the period in question have been retained. Thus, although each published series is expressed at the price level of 1970, the volume changes for years prior to 1963 reflect calculations at the prices of earlier base years, each series being simply scaled up to the 1970 price level (see *National Income and Expenditure 1973*, page 97).

changes in value divided by the changes shown by an appropriate price index. But unless data on prices can be collected for a sufficiently wide range of goods and services of constant specification, and these price changes can be combined by appropriate weights, the resulting estimates of changes in volume may be unsatisfactory. Changes in the quality of goods or services may make it difficult to ensure that the goods or services being priced are of constant specification and sometimes any allowance for quality change can be determined only arbitrarily. New and disappearing products also present problems of measurement to which there are often no very satisfactory solutions.

The analysis carried out is chiefly aimed at testing the sensitivity of the estimated volume changes to weighting by different sets of relative prices. It will be readily apparent, however, that the analysis can be carried out only within the actual system of estimation used. If the estimates had been made from less aggregated value data, or more detailed price data, then the conclusions to be drawn from the results of the analysis could be somewhat different.

The main components of the expenditure-based estimate of gross domestic product were each examined in turn with the following questions in mind:

- (a) Given the existing methodology underlying the constant price estimates, how wide a range of estimates for the volume changes between 1963 and 1970 is obtained by basing the calculations on different sets of relative prices? In particular, what are the implications for the measurement of gross domestic product?
- (b) What is the effect of using base-weighted price indices for the deflation of current values (current-weighted indices strictly being required when the aim is to construct base-weighted volume indices)?[‡] In particular, how important is this theoretical defect when

[‡]If $\sum q_n p_o$ is to be derived from $\sum p_n q_n$ (current values) a deflator is required in the form $\frac{\sum q_n p_n}{\sum q_n p_o}$ or $\frac{\sum q_n p_n}{\sum q_n p_n \cdot \frac{p_o}{p_n}}$

$$\frac{\sum q_n p_n}{\sum q_n p_o} \quad \frac{\sum q_n p_n}{\sum q_n p_n \cdot \frac{p_o}{p_n}}$$

the resulting volume estimates are used to measure changes between periods other than the base period?

- (c) What are the effects of using chain indices for deflation in contrast to base or current-weighted price indices?

Conclusions

A detailed description of the analysis is given in the annex below. The results suggest that the following conclusions might be drawn:

- (a) (i) On the basis of existing methodology and available data the range of possible estimates for the volume changes between 1963 and 1970, in real gross domestic product and its main expenditure components, is not unduly great, suggesting that during such a period a full rebasing of the constant price estimates is probably not necessary any more frequently than once every five years. (It had been intended to rebase on 1968 but the choice of 1970 was made for convenience in international reporting of national accounts estimates.)
- (ii) The same appears to be broadly true of most series within the main components, though some categories of consumers' expenditure show significantly different volume changes.
- (b) Given that most of the calculations are carried out at a considerable degree of disaggregation, the use of base-weighted deflators is probably not in practice a serious deficiency in the method of estimation, and it is unlikely to be any more serious than other deficiencies in the data on price movements.
- (c) The use of chain indices for deflation does not appear to lead to any serious deficiencies in the constant price estimates.

Central Statistical Office

ANNEX

General comments on the relative prices underlying the published estimates

Although estimates of expenditure expressed in terms of the level of prices existing in 1970 are published for a long run of years (a span of twenty-one years is given in Table 14 of the Blue Book), these estimates are not calculated by revaluing, at the maximum level of disaggregation, each item of expenditure at 1970 prices. This is because it is thought that the partitioning of changes in value between their volume and price components is best carried out in terms of the relative prices and quantities which existed during the periods under examination. Thus, the present published estimates for the period 1958 to 1963, for example, still show the same changes in volume as those previously published which were expressed in terms of the price level in 1963. Each of the published series for that period has simply been scaled up to the 1970 price level appropriate for that individual series, and it is therefore no longer a property of these constant price series that they are the sum of their components. The published constant price estimates for the long run of years reflect, therefore, volume estimates calculated at the relative prices of a number of different years and have in effect, the character of chained volume indices with linking in the years previously used as base years for the constant price estimates, namely 1948, 1954, 1958 and 1963.

However, the procedures followed for the expenditure-based estimate of gross domestic product at constant factor cost, and its main components, have not simply been to calculate the volume changes at one set of relative prices for any period and then link these movements together. If the volume changes for each published series calculated at the relative prices of 1963 had simply been retained for the period 1963 to 1970, for example, the 'adding-up' problem referred to above would now exist for all years prior to 1970. Since it is thought that most users regard it as an advantage to have constant price estimates with the property that each aggregate equals the sum of its components, the procedure adopted from 1963 onwards has been to link the volume series separately, at least for each of the published components (and sometimes in greater detail), before aggregating. The effect of this procedure is that the volume estimates for the period 1963 to 1970 generally reflect changes in quantities revalued at the relative prices of 1963 within each published component and revalued at the relative prices of 1970 between these components. The volume changes for earlier periods similarly reflect changes in quantities revalued at the relative prices of the two base years at the beginning and end of the period in question. One of the questions examined below is the extent to which the use of these 'mixed' systems of valuation may affect the results obtained, as compared with volume changes calculated at a single set of relative prices.

Consumers' expenditure

In Table A are given three estimates of the volume changes in consumers' expenditure and its main components between 1963 and 1970. The alternative sets of

Percentage increases in components of consumers' expenditure between 1963 and 1970

TABLE A

	Measured at 1963 prices (1)	As published (2)	Measured at 1970 prices (3)
Food	6.6	6.2	5.3
Alcoholic drink	32.0	31.9	31.0
Tobacco	-3.0	-3.0	-3.1
Housing	23.2	22.6	21.6
Fuel and light	12.0	8.5	8.6
Clothing	19.6	18.9	19.2
Cars	29.7	29.7	28.5
Other durables	12.7	11.4	11.1
Household goods	22.2	22.2	22.5
Books, etc.	-4.3	-5.3	-5.3
Chemists' goods	18.7	18.6	18.3
Miscellaneous recreational	33.7	33.1	33.4
Other miscellaneous	2.7	1.1	0.5
Running costs	84.9	83.2	82.2
Travel	10.9	4.0	4.7
Communications	53.8	50.9	48.9
Entertainment	16.6	8.5	8.1
Domestic service, catering, insurance and other services	7.9	7.1	5.0
Income in kind	-15.2	-25.4	-24.1
Expenditure by foreign tourists, etc. in the UK	47.5	47.6	48.0
Consumers' expenditure abroad	1.8	1.9	1.9
Total	15.7	14.5	13.9

estimates are the result of calculations intended to reflect (1) quantities revalued at the relative prices of 1963, (2) quantities revalued on the basis of the mixed weighting system described above (that is, the present published estimates) and (3) quantities revalued at the relative prices of 1970. For total consumers' expenditure the volume change of 14.5 per cent shown by the present published estimates is much closer to (3) than to (1), though for individual components this is not so. The volume change of 15.7 per cent shown by the estimates at the relative prices of 1963 differs from that previously published (16.4 per cent) partly because of revisions to current price estimates or changes in methodology. An additional reason, however, is that wherever practicable an attempt has been made in this analysis, where expenditure is revalued by deflating with a price index, to use a deflator in the theoretically appropriate form. Thus, for example, when expenditure on footwear in 1970 is revalued at 1963 prices the weights for the deflator should reflect the pattern of expenditure in 1970 on the different types of footwear for which separate price indicators are available (that is, the deflator should be current-weighted). This procedure may not always be practicable when estimates are first compiled, even though it may be possible in retrospect, and base-weighted deflators may be used purely on practical grounds. The effects of this theoretical defect are now examined for some of the main categories of consumers' expenditure where deflated values are used to measure volume changes.

Table B gives figures for twelve categories of retail sales calculated on a number of alternative bases. The categories covered represent about 20 per cent of total consumers' expenditure and perhaps one-half of the categories where volume is measured by deflated expenditure. For each of the categories shown, though not for the total, the volume change between 1963 and 1970 is identical in columns (1) and (4), where the deflators are weighted according to the pattern of expenditure within each category in 1963. The volume changes are also identical in columns (2) and (3) where the weighting system reflects the pattern of expenditure within each category in 1970. For each category the effect of using a base-weighted deflator is to lead to an estimated volume change equal to that which would be obtained if the volume change were measured in terms of the relative prices of the current year. Thus, when aggregated over all twelve categories, column (1) gives the volume change using 1970 relative prices within categories, but 1963 relative prices between categories, and *vice-versa* for column (3). The volume changes given in column (2) and (4) reflect the same set of relative prices within and between categories, 1963 and 1970 respectively.

Percentage change between 1963 and 1970 in the volume of consumers' expenditure on selected categories of retail sales

TABLE B

	Expenditure in 1970 revalued at 1963 prices		Expenditure in 1963 revalued at 1970 prices	
	Using base-weighted deflator ⁽¹⁾ (1)	Using current-weighted deflator ⁽¹⁾ (2)	Using base-weighted deflator ⁽¹⁾ (3)	Using current-weighted deflator ⁽¹⁾ (4)
Footwear ..	+13.3	+13.7	+13.7	+13.3
Men's wear ..	+18.0	+18.0	+18.0	+18.0
Women's wear ..	+21.7	+22.2	+22.2	+21.7
Furniture and floor coverings	+8.2	+8.9	+8.9	+8.2
Radio and electrical ..	+14.1	+16.4	+16.4	+14.1
Household textiles	+18.4	+18.1	+18.1	+18.4
Hardware ..	+40.2	+40.5	+40.5	+40.2
Chemist's goods..	+16.6	+16.8	+16.8	+16.6
Miscellaneous recreational goods ..	+40.8	+40.8	+40.8	+40.8
Other goods ..	+0.8	+2.7	+2.7	+0.8
Radio and TV rental ..	+60.8	+60.8	+60.8	+60.8
Radio and TV relay ..	+64.0	+64.0	+64.0	+64.0
Total ..	+19.5	+20.1	+19.7	+19.1

⁽¹⁾ 'Base year' means the year at the relative prices of which the calculations are made (that is, 1963 in columns (1) and (2), and 1970 in columns (3) and (4)); 'current year' means any year with which the base year is compared (1970 in columns (1) and (2), 1963 in columns (3) and (4)).

On the basis of the analysis of these particular categories we might tentatively conclude that, given the probable margins of error of the constant price estimates—which as already mentioned may stem, for example, from the failure to deal adequately with quality changes or obtain a sufficiently representative set of price indicators, the use of base-weighted deflators rather than current-weighted deflators appears to have very little effect on the

estimated volume change over this seven-year period. It should be noted that one important reason for this is, of course, that the calculations are carried out at a fair degree of disaggregation. If deflation were carried out at a higher level of aggregation the need for current-weighted deflators would assume greater importance.

The next question to be examined was how far the use of base-weighted deflators affected the estimation of volume changes between years other than the base year. Table C shows the estimated volume changes between 1969 and 1970 for the sum of the twelve categories given in Table B, using a variety of weighting systems for the deflators.

Percentage change between 1969 and 1970 in the volume of consumers' expenditure on twelve categories of retail sales⁽¹⁾

TABLE C

(1) Expenditure in 1969 and 1970 revalued at 1963 prices using base-weighted (1963) deflators	+2.8
(2) Expenditure in 1969 and 1970 revalued at 1963 prices using current-weighted (1969 and 1970) deflators..	+3.2
(3) Expenditure in 1969 revalued at 1970 prices using current-weighted (1969) deflators	+2.9
(4) Expenditure in 1970 revalued at 1969 prices using current-weighted (1970) deflators	+3.0

⁽¹⁾The formula for each of the deflators used to obtain the estimates compared are as follows:

$$\begin{aligned}
 (1) & \frac{\sum p_{63q63} p_{69}}{p_{63}} \text{ and } \frac{\sum p_{63q63} p_{70}}{p_{63}} \\
 (2) & \frac{\sum p_{69q69}}{p_{69}} \text{ and } \frac{\sum p_{70q70}}{p_{70}} \\
 (3) & \frac{\sum p_{69q69}}{\sum p_{69q69} p_{70}} \\
 (4) & \frac{\sum p_{70q70}}{\sum p_{70q70} p_{69}}
 \end{aligned}$$

Again, the differences are relatively small. One interesting point which emerges from the analysis, however, is that a result of using base-weighted deflators may be to lead to an estimated volume change which, though biased, is closer to that estimated at the relative prices of a more recent year than the volume change estimated at the relative prices of some distant year, in this case 1963 (that is, the change shown in line (1) is closer than that given in line (2) to those in lines (3) and (4)).

The final question examined in relation to the consumers' expenditure estimates was the extent to which the calculations might be affected by the use of chain indices for deflation. For this purpose it was decided to examine the effects of using different types of deflator for the revaluation of expenditure on transport and vehicles, the coverage of this category to be defined as for the general index of retail prices (RPI) in order that the chain-linked component of the RPI could be used as one of the deflators. The results of this analysis are given in Table D.

**Percentage increase in the volume of expenditure
on transport and vehicles**

TABLE D

	1963 to 1970	1969 to 1970
1970 revalued using a chain-linked deflator	+38.8	+4.9
1969 and 1970 revalued at 1963 prices using a base-weighted deflator ..	+36.3	+4.6
1969 and 1970 revalued at 1963 prices using a current-weighted deflator ..	+39.4	+4.8
1969 revalued at 1970 prices using a current-weighted (1969) deflator	+4.8
1970 revalued at 1969 prices using a current-weighted (1970) deflator	+5.1

Here the range of outcomes is again relatively small. The use of a base-weighted deflator appears to lead to some downward bias in the results. The use of a chain-linked deflator appears to lead to results closer to those using the theoretically preferable current-weighted deflator. There is certainly nothing here to suggest that the use of a chain-linked price index as a deflator may lead to perverse results.

Public authorities' current expenditure on goods and services

Table E shows the growth in volume, for the total of public authorities' current expenditure on goods and services, calculated on the same three alternative bases as for consumers' expenditure in Table A.

**Percentage increases between 1963 and 1970 in public
authorities' current expenditure on goods and services
at constant prices**

TABLE E

(1) Measured at 1963 prices ..	15.2
(2) As published	13.9
(3) Measured at 1970 prices ..	13.6

Again, the differences are fairly small. The closeness of the changes shown in lines (2) and (3) reflects the fact that the published figures were recalculated at 1970 prices at a considerable level of disaggregation.

The effects of using base-weighted deflators instead of current-weighted deflators were examined above for certain categories of consumers' expenditure. For public authorities' current expenditure on goods and services an attempt has been made to assess the effects over the total field of expenditure; this might appear to be a more comprehensive analysis than that given in Table B but a word or two of qualification is in order. It was mentioned in the introduction to this article that the analysis could be conducted only within the framework of the system of estimation followed in practice. The fact, therefore, that not a great deal is known about the commodity composition of local authorities' current expenditure on goods and services either in 1963 or 1970 means that the use of base-year or current-year weights when compiling deflators may be of little practical significance. Indeed, it is even possible that for some categories of expenditure apparent changes in their commodity composition between 1963 and 1970 might simply reflect an increase

in knowledge. However, if such 'changes' were extreme this would suggest that, in the absence of firm information, the assumptions which had been made in respect of 1963 were in error and these should be revised; thus sharp changes in commodity composition would be identified only in the rare case where reliable information exists for both years.

A second point to be noted is that the available price indicators for goods rarely relate to types of commodity purchased by public authorities. A wholesale price index for wooden furniture may be available, for example, but this is weighted in accordance with the importance of different items purchased by businesses rather than public authorities. A true reweighting of the volume estimates for public authorities would involve the use of data which we do not in fact possess. However, provided the changes in prices of individual items within a commodity group (such as wooden furniture) do not differ greatly the use of inappropriate weights will not generally lead to very different results.

Table F compares the effects of using base-weighted deflators and current-weighted deflators on the estimated volume changes between 1963 and 1970, and between 1969 and 1970.

**Percentage increases in the volume of public
authorities' current expenditure on goods and services**

TABLE F

1963 to 1970

Expenditure in 1970 revalued at 1963 prices using:

Base-weighted deflators	14.7
Current-weighted deflators ..	15.2

1969 to 1970

Expenditure in 1969 and 1970 revalued at 1963 prices using:

Base-weighted deflators	1.4
Current-weighted deflators ..	1.3

For the change between 1963 and 1970 the effect observed is the same as that identified for consumers' expenditure, a slower rate of growth resulting from the use of base-weighted deflators. The effect over the seven-year period is relatively small and the estimated change using base-weighted deflators lies within the range of volume changes as measured at 1963 or 1970 prices given in Table E. The effect on measurement of the change between 1969 and 1970 is perverse in that the use of base-weighted deflators results in a slightly higher volume increase than the use of current-weighted deflators. The difference seems sufficiently small to suggest that, subject to the qualifications mentioned above, the use of base-weighted deflators does not lead to a serious bias in the estimates.

Gross domestic fixed capital formation

With the exception of the transfer costs of land and buildings, all the estimates of gross domestic fixed capital formation at constant prices are derived by dividing current price values with base-weighted deflators. The calculations are carried out at a considerable degree of disaggregation with over 150 separate categories of expenditure revalued by 41 different deflators.

As already explained in the section on consumers' expenditure, the effect of using a base-weighted deflator is that the volume change for each category as measured by constant price estimates between the base year and any other year is equivalent to that expressed at the prices of the latter year. In fact the Blue Book constant price estimates for gross domestic fixed capital formation are only calculated with the use of rebased deflators for the years following the base year; for the years back to the previous base year the volume changes shown by the old estimates are merely scaled to the price level of the new base year. In normal circumstances, therefore, the change in the volume of gross domestic fixed capital formation between 1963 and 1970 shown by the published 1970 price figures would be equivalent to calculations at the relative prices of 1970, since within categories the use of 1963-weighted deflators would yield volume changes at the relative prices of 1970 and scaling up each category to the 1970 price level would result in 1970 relative prices between categories.

However, there was a departure from the principle normally followed when rebasing on 1970, a year which did not coincide with a full census of production (from the details of which the pattern of expenditure determining the weights for the deflators is estimated). The weights used for the 1970-based deflators were actually calculated from the 1968 census and had to be used as proxies for 1970 weights. Deflators using these weights but scaled to 1970=100 were used to produce constant 1970 price estimates from 1968 onwards and the 1963-based volume estimates were scaled up only for the period from 1963 to 1968. The result is that a comparison of gross domestic fixed capital formation between 1963 and 1970, using the constant price figures in the 1973 Blue Book, reflects the volume change between 1963 and 1968 calculated at 1968 prices together with the volume change between 1968 and 1970 calculated at 1970 prices.

The volume changes between 1963 and 1970 have been fully recalculated at 1963 and 1970 prices using true current-weighted deflators covering the whole period (1968 weights were used as proxies for 1970 weights in the calculations at 1963 prices). These changes are compared with those derived from the published figures with mixed weights in Table G.

Percentage increases between 1963 and 1970 in gross domestic fixed capital formation at constant prices, analysed by industry group

TABLE G

	Measured at 1963 prices (1)	As published (2)	Measured at 1970 prices (3)
Agriculture, forestry and fishing	8.2	8.9	7.7
Mining and quarrying	21.2	17.3	19.3
Manufacturing	51.5	53.0	52.6
Construction	29.4	32.0	31.9
Gas, electricity and water	-7.8	-9.3	-10.3
Transport and communication	89.7	83.1	85.6
Distributive trades and other private services	50.5	48.8	49.8
Dwellings	26.1	29.7	25.4
Social and public services	81.2	86.5	80.1
Transfer costs	15.5	15.5	15.5
Total	42.8	43.1	42.0

It is to be expected that where substitution takes place in the context of changing relative prices the increase in volume is less when measured at the prices of a later than when measured at those of an earlier period. This is borne out by the figures in columns (1) and (3) of Table G except for the manufacturing and construction industries. In these two cases the opposite is observed, suggesting that over the period concerned changes in the relative quantities of different capital goods were positively correlated with changes in relative prices. This may have been caused by a need to invest in certain goods for technological reasons which would admit no substitutes. The mixed-price volume changes in column (2) are influenced by the relative changes in prices between 1968 and 1970. In the cases of mining and quarrying, transport and communication, and distributive trades and other private services, the volume change measured in this way is lower than that at either 1963 or 1970 prices; in all other cases it is higher than at either of these prices.

An examination of the effects on the estimated volume change between 1969 and 1970 of the use of the base-weighted or current-weighted deflators showed virtually no differences between the two sets of results obtained. There was in fact no difference for gross domestic fixed capital formation as a whole, and very little difference for any of the main industry groups.

Value of physical increase in stocks and work in progress

The testing of the sensitivity of these estimates to different weighting systems has not been attempted. There are several reasons for this. First, in analysing the volume changes in gross domestic product at factor cost between 1963 and 1970 the contribution of changes in stocks is insignificant. Secondly, the complexity of the calculations of the physical change from figures of book values (see *National Accounts Statistics: Sources and Methods* (HMSO 1968)—Chapter XIII) is such that the resources cost of making the alternative calculations would have been large. And finally the estimates of physical stock changes at constant prices are subject to such wide margins of error for other reasons that the work seemed to be of little, if any, potential value.

Exports of goods and services; imports of goods and services

There were significant practical difficulties in undertaking for exports and imports the kind of analysis carried out by the categories of expenditure described above. One major difficulty was the change in trade classification introduced in 1970 which makes comparisons with earlier periods subject to additional sources of error. Also, as in the case of stock changes, it was thought that the resources which might be devoted to the analysis should be determined in the light of the usefulness of the results likely to be obtained. Work was concentrated, therefore, on the particular issue of the sensitivity of the estimates for changes in the volume of exports and imports of goods to the use of a current-weighted deflator in place of a base-weighted deflator.

The use of deflated values, as distinct from the use of direct volume indicators, to measure changes in the volume of exports and imports increased over the period 1963 to 1970. For exports about 43 per cent of the values were estimated at constant prices by deflation in 1963

rising to 54 per cent in 1970. The corresponding percentages for imports were 28 per cent and 38 per cent. In Table H are given estimates of the volume changes in exports and imports of goods (*Overseas Trade Statistics* basis) between 1963 and 1970 using (a) a base-weighted (that is, 1961 'unit value' index) for deflation, and (b) a current weighted (that is, 1970 'average value' index).

Percentage increase between 1963 and 1970 in volume of exports and import of goods (OTS basis) at 1961 prices

TABLE H

	Using base-weighted (i.e. 'unit value' index)	Using current-weighted (i.e. 'average value' index)
Exports	44.0	48.1
Imports	45.7	47.5

Given that a larger proportion of export volume is estimated by deflating values, the effects of using current-weighted deflators appear to be broadly similar for exports and imports.

Perhaps the most important difference between the data availability and methods of estimation used for external trade and elsewhere is the extensive range of detailed figures available for the former. This means that the changing commodity composition of exports and imports can more easily be taken into account than in areas such as gross domestic fixed capital formation. We might conclude, therefore, that had we been able to carry out our calculations for other areas of the accounts in greater detail we might well have found larger effects stemming from the use of base or current-weighted deflators. Once again, however, a word or two of caution would seem to be necessary. It should be understood that, for external trade, the base-weighted or current-weighted deflator used is not derived from price data but from unit values derived from data on values and quantities. Now, although the external trade statistics provide a wealth of detail on individual types of good, it is precisely those areas where the goods covered are relatively heterogeneous that the deflation of values (rather than use of a volume indicator) is adopted. The deflator generally used is that implied by the value and quantity data for goods of a similar kind. Thus, whether base-weighted or current-weighted, the components of this deflator will not necessarily be appropriate to the range of goods whose values are to be deflated.

Prior to the rebasing of the external trade unit value and volume index numbers on 1970, for those headings where deflation of values was used to measure volume the deflator for each grouping was base-weighted. The effect of this was to yield a current-weighted volume index for these headings in contrast to the base-weighted volume indices for headings where volume indicators are used. In the series based on 1970 current-weighted deflators have been used, thus ensuring that the volume indices are now effectively base-weighted throughout. The change in methodology was a factor contributing to the revisions to the estimated volume changes in exports from 1970 onwards noted on page xii of the October 1973 issue of *Economic Trends*.

Adjustment to factor cost

The adjustment to factor cost, not surprisingly, shows significant sensitivity to the set of prices, rates of tax or subsidy which underlie it. Table I sets out some of the relevant figures.

Percentage changes between 1963 and 1970

TABLE I

	1963 prices	1970 prices
Taxes	+22.0	+16.0
Subsidies	-11.2	+9.6
Taxes less subsidies ..	+27.4	+16.8

The differences observed reflect not only changes in rates of tax or subsidy but the introduction or withdrawal of a particular tax or subsidy. For example, a major contributory factor leading to the smaller volume increase in taxes when expressed at 1970 prices is the introduction of selective employment tax which did not exist in 1963. If selective employment tax were excluded from the calculations the estimated volume increase between 1963 and 1970 would be reduced only to 19.3 per cent when expressed at 1970 prices compared with the estimated increase of 16.0 per cent when all taxes existing in 1970 are included. The inclusion of employment premiums in the volume calculations for subsidies has had the effect of reducing the difference between the volume movements calculated at the two years' prices. If employment premiums were excluded from the calculations the volume increase would be 12.1 per cent when expressed at 1970 prices compared with the increase of 9.6 per cent when all subsidies existing in 1970 are included. Thus the inclusion of both selective employment tax and employment premiums has had the effect of reducing the estimated volume increases in taxes and subsidies between 1963 and 1970.

Gross domestic product

The significance of the differences between the factor cost adjustment at 1963 prices and 1970 prices is perhaps seen in better perspective when the volume changes in gross domestic product are compared at constant market prices and at constant factor cost. These figures are given in Table J.

Percentage increase in gross domestic product between 1963 and 1970

TABLE J

	1963 market prices and factor cost	As published	1970 market prices and factor cost
Gross domestic product at market prices ..	21.5	20.1	19.5
Gross domestic product at factor cost ..	20.7	20.7	19.9

Given the margins of error to which estimates of the increase in real gross domestic product over a seven-year period are likely to be subject, the effects of using 1963 market prices or factor cost compared with 1970 market prices or factor cost are not particularly large. The change in the structure and rates of taxes and subsidies has, however, been sufficiently great to reverse the differential effect of measuring gross domestic product at market prices or factor cost. At 1963 prices the growth at market prices is estimated to be slightly greater than at factor cost, whilst the reverse is true at 1970 prices.