



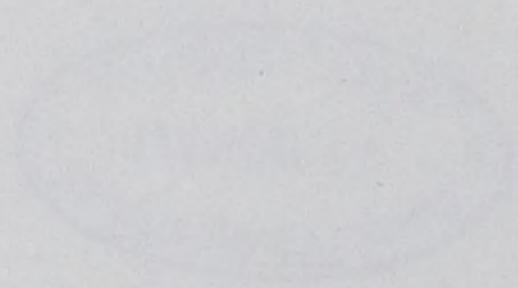
**CSO** **The index of industrial  
production and other  
output measures**



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## Foreword

This publication in the series of Studies in Official Statistics presents a revised edition of No. 7 dealing with the index of industrial production ; in addition, it includes a section on the measurement of the volume of total output (the real product). Hitherto these two parts of the subject of output have been treated separately in CSO publications but the desirability of treating the whole subject of output measurement in one publication has led to the arrangement in the following pages. After a general discussion of the concepts of output measurement in Chapter I, the index of industrial production is dealt with in Chapter II and the remaining industries in Chapter III. The index of industrial production can for national income purposes be regarded as a sub-index of the total index of the gross domestic product, but its special characteristics and its place in the series of monthly economic indicators require the special treatment accorded to it here.

Both index numbers are prepared in the Central Statistical Office with the collaboration of the statistics divisions of other government departments. Only with the help of firms and trade associations in industry and commerce is the construction and maintenance of these index numbers made possible and their co-operation in this work is gratefully acknowledged.

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# I. The measurement of output at constant factor cost

In the national income accounts for the United Kingdom the gross<sup>1</sup> domestic product at constant prices is measured in three ways: from income data, from expenditure data and from output data. This study is concerned with the last of these three, i.e. estimating the gross domestic product as a sum of the outputs of all industries.<sup>2</sup> In this introductory section the general concepts of the measurement of output are dealt with. The two following sections deal particularly with the treatment of the industries from which this output flows, one dealing with the industries included in the index of industrial production and the other with the remaining industries. The description of the sources and treatment of the data in these sections includes details of changes made in the rebasing on the year 1963. All the industries included in the 1968 Standard Industrial Classification fall thus into one or other of these two sections, which taken together cover all the industries that contribute to the gross domestic product.

In the output approach there is no distinction in principle between an industry that provides steel and one that provides medical services. All activities listed in the industrial classification—and these cover the whole spectrum of economic activity—are industries in this sense whether they provide goods, like the coal industry, or services, like the advertising industry. However, in accordance with general practice the term 'industrial' is taken to refer to those industries covered by the *index of industrial production*. These industries are mining and quarrying, manufacturing, construction, and gas, electricity and water, i.e. Orders II to XXI of the 1968 Standard Industrial Classification. Restricting the coverage of this index to these industries in no way implies that other industries such as agriculture, transport, distribution or public administration are in a class apart from 'industrial' production. The production boundary for the index of industrial production is determined primarily by the quinquennial censuses of production which provide the basic data of gross and net outputs and from which information on the indicators (which are described elsewhere) is obtained. It is determined partly by the availability of monthly and quarterly data on output and by the usefulness in many contexts of the concept of production limited to these industries. It is also that generally used internationally.<sup>3</sup>

Activity within industrial production was measured for a considerable time before the production method was extended to the whole economy. Thus the index of industrial production, which is produced monthly, has an importance beyond its role as a constituent part of the index of *gross domestic product at constant prices*, frequently referred to as the index of the real product. The

<sup>1</sup> The word 'gross' in this context means only that depreciation, i.e. capital consumption, has not been deducted. It must be distinguished from the use of 'gross' in referring to industrial output where it means total output before inputs are deducted to give net output.

<sup>2</sup> For a discussion of the other approaches to the estimation of gross domestic product see *National Accounts Statistics: Sources and Methods* (HMSO 1968), particularly Chapter III.

<sup>3</sup> However, nearly all other countries exclude the Construction industry.

original purpose of the index of industrial production remains—that of an indicator of short-term changes in industrial activity which are estimated monthly while the gross domestic product at constant prices is estimated only quarterly.

The extension of the methods used in the industrial index to industries outside this field<sup>4</sup> requires no modification of the principles involved but the difficulties encountered, particularly in respect of measures of output to be used and the treatment of quality changes, are so much greater that they may almost be regarded as of a different kind.

The measurement of the gross domestic product at constant prices starts from the estimated contribution of each industry to the gross domestic product in the base year. The year-to-year changes in output estimated by various measures of changes in the quantum of output are combined with weights proportional to the estimated contribution to the gross domestic product in the base year. Changes in the gross domestic product are estimated by a base-weighted quantity index and the result is expressed as an index with the base year as 100.

## The concept of net output at constant prices

An industry's contribution to the domestic product is its 'net output', that is the value of its gross (or total) output *less* any goods or services it has acquired from other industries or has imported. For example, the value of the gross output of the weaving industry includes the value of the yarn bought from the spinning industry and it may also include the value of services provided by banking, advertising and so on; the value of these goods and services has to be deducted in order to arrive at its net output. Net output in this sense is arrived at before making provision for depreciation but after deducting stock appreciation. It differs from the census of production concept of net output in the calculation of which inputs of services are not deducted. The net output of each industry consists of the services of the factors of production engaged in that industry and equals the sum of the factor incomes (income from employment and profit incomes) earned in the industry after deducting stock appreciation. The total of the net output of all industries is the gross domestic product of the country measured at factor cost; that is, it excludes taxes on expenditure and includes subsidies.

Conceptually, net output should be estimated at constant prices by revaluing at constant prices both the gross output and the inputs of materials, fuel, services and so on, and subtracting the latter from the former. This 'double deflation' method in practice is difficult to apply because it requires a great deal of information. Unless full information on all transactions is available at

<sup>4</sup> This was first done by the Department of Applied Economics of Cambridge University before official estimates were published. See W. B. Reddaway, 'Movements in the real product of the United Kingdom', *Journal of the Royal Statistical Society*, vol. CXIII, 1950; and C. F. Carter, 'Index numbers of the real product of the United Kingdom', *ibid.*, vol. CXV, 1952.

frequent intervals supplemented by adequate price data, the method can give unreliable results, as the output and input data must be consistent and relate to the same period. This applies especially if net output is small in relation to gross output. The double deflation method is in fact used in United Kingdom statistics only for estimating the net output of agriculture. It is used for this industry, not only because there is sufficient information available, but also because the relationship of net output to inputs and gross output can vary significantly from one year to another owing to weather conditions. Changes in gross output would therefore not give a satisfactory indication of changes in net output.

Net output at constant prices may be estimated by the use of changes in other series to indicate the changes in net output. This approach, of finding some indicator which will reflect changes in net output, is adopted in the United Kingdom statistics for all industries other than agriculture. This method of estimating changes in net output is simpler than that of double deflation and may in practice be more accurate because net output measured as the difference between two relatively large aggregates may be subject to random fluctuations. Furthermore, a considerable amount of quantity detail would be required to deflate outputs and inputs whose valuation may in turn be complicated by timing differences.

The most frequently used indicator is gross output. Provided that the ratio of gross output to net output remains unchanged at constant prices changes in net output at constant prices can be measured adequately by changes in gross output at constant prices. Changes in the ratio of net output to gross output in individual industries can be caused by many factors, such as changes in production methods, variations in the products made and materials used, and changes in services supplied by other industries while some inputs—those usually known as overheads such as rent and rates—may be independent, at least in the short term, of the level of production. It is likely that some of the errors introduced by the operation of these factors in individual industries will be somewhat reduced in the aggregate for all industries. For example, if an intermediate process is transferred from one industry to another this does not necessarily alter the combined amount of work done, and if the gross output indicator overstates the change in the net output of one industry for this reason, the error may be offset by an understatement of the change in the net output of the other industry.<sup>5</sup> Nevertheless, it should be realised that the use of gross output as an indicator is a substitute for what is really required. The resulting estimates may understate the true increase in net output where there is a change towards more processing per unit of output and economy in the use of materials.

Changes in net output may also be estimated by changes in inputs. The input chosen is generally materials used or purchased and this is subject to the same sort of limitations as gross output. Where production processes are improved and economies are made in the use of materials, changes in materials used may underestimate changes in net output. Employment is sometimes the input indicator but it is used as little as possible because it does not take account of any increases in productivity and therefore tends to underestimate increases in net output.

Technological change occurs only slowly, so that changes in gross output can be taken as a sufficiently

<sup>5</sup> Whether this compensating effect is present will depend on the types of indicator used in the industries between which the change has taken place.

good approximation to changes in net output so long as the basic estimate of net output is revised sufficiently frequently. This consideration applies also to the use of inputs or of manpower. Periodic revision of the basic estimates of net output takes account of changes in the relationship of net output to gross output and inputs and prevents continuing bias in the results.

In the case of industries whose outputs consist of physical products—as opposed to services—there is usually no great difficulty in determining appropriate measures of changes in output at constant prices. These can usually be estimated from the physical quantities of goods produced or from the value of output deflated by an index of price. Greater difficulties arise, however, with the measurement of the output of service industries for which there may be no obvious physical units. For some service industries, such as transport or distribution, measures of output suggest themselves fairly readily: the output of transport can be measured in terms of passenger-miles and ton-miles; the output of the distributive trades may be estimated by the volume of turnover. But the output of financial institutions (banks, building societies, etc.) is difficult to define since the commodity mainly dealt with is money itself. For example, banks, as well as keeping customers' accounts and providing other services, act as intermediaries in channelling funds between lender and borrower. The provision of these financial services requires the employment of people and other organisational arrangements, and it is necessary to allow for changes in their output if the gross domestic product is to be measured. In such cases the change in the services provided may have to be indicated by some series associated with these services, such as the deflated value of bank advances which is used as an indicator of the change in part of the services provided by banks.

Special problems arise in the case of services provided by public authorities for the community as a whole as these services are provided free or with only a nominal charge and there is no unit of output sold in the market which can be used as the indicator. The procedure generally adopted, to use changes in the numbers employed as an indicator of changes in output, is obviously not satisfactory although it seems the best approach with our present knowledge.

The relative importance of the various types of indicators used in the annual estimates of output from 1963 is summarised in the table below, compiled from the current (1963-based) index weights:

Type of indicator	Percentage of total weight
Net output at constant prices .. ..	3
Output indicators:	
Quantity of output of goods .. ..	19
Quantity indicators for services rendered	12
Value of output of goods revalued at constant prices .. ..	19
Value indicators for services rendered at constant prices .. ..	27
Input indicators:	
Quantity of material inputs .. ..	5
Employment .. ..	15
	100

#### The base year

The measure of the change in gross domestic product at constant prices necessarily depends upon the year

chosen as the base. Relative prices change over time and different relative prices result in a different measure of the change in gross domestic product. Changes in quantities are associated with the changes in relative prices; the pattern of prices in the base year ought not therefore to be greatly different from that of the current year. A compromise has to be made between the comparability obtained by measuring changes over a number of years in terms of the same base year and the need to measure changes in terms of up-to-date relative prices. In the United Kingdom statistics, the base year for both the production and expenditure estimates has been determined by the year of the detailed census of production and is changed about every five years. Estimates for a long run of years are published in terms of one base year, but the output estimates for years prior to the latest base year, originally estimated in relation to an earlier base, have merely been linked to the new base year without detailed recalculation.

#### *Quality changes*

The treatment of quality change presents formidable problems since quality itself is difficult to define and even more difficult to measure. The index seeks to measure changes in the quantity of work done; an improvement in quality should be treated as far as possible as equivalent to a fall in price and should be reflected in a rise in the output index and vice versa. The unit of measurement should thus be defined narrowly enough to preserve the proper distinction between price and quality changes.<sup>6</sup> Work done is measured in the index directly or indirectly by the quantities of goods or services produced and these quantities have therefore to be comparable for the index to be valid. Quality is thus an attribute of the products of industry to be taken account of, if possible, in the series used as indicators, just as they take account of variations in quantity.

There are a number of ways in which changes in quality can come about:

- (a) a shift in the commodity composition of output from one grade of product to another (e.g. changes in yarn counts in the textile industry);
- (b) variation of existing types of output (e.g. model and styling changes, modifications, new designs, etc.);
- (c) the introduction of new products, e.g. synthetic fibres.

There are no sharp lines between these categories. Shifts between grades can in part be taken account of by distinguishing grades. In the index of industrial production separate figures are used for two main types of

<sup>6</sup> A quality change in a product in any industry must, however, be a reflection of a greater amount of work done per unit of material used and not of the use of more materials per unit of output. This latter should be reflected in an increase in output of the industry supplying the material.

coal and one type is divided into five grades. In the indicators for spinning and doubling on the cotton and flax systems there are three separate series for different counts of yarn under each heading, and in addition six series for man-made fibres. Again, production of cars is measured by numbers produced classified into engine size ranges. Shifts from one type to another are thus taken care of; the elaboration of a product, such as cars, by the increasing number of accessories fitted, is taken into account by a series representing the output of car accessory manufacturers and by a further series for electrical fittings. The increasing use of plastics in substitution for metals will be reflected by the increased output of the chemical industry. Though not all such quality changes can be measured and allowed for (e.g. changes in styling or modification of carburettors may result in improved performance without either the use of more materials or any increase in price), nevertheless some quality changes are taken care of either by the totality of series used or by the series relating to the product in question. In these ways some account is taken of the sort of changes mentioned at (b) above.

The same problem is met in a rather different form when deflated value series are used as indicators; namely, to allow for quality changes in the price series used as deflators. The wholesale price indices make some allowance for changes in models and specifications when these can be identified in terms of changes in cost or in technical performance, where this can be narrowly defined. However, efficiency in use as a standard of measurement of quality (even where appropriate) would entail wide-ranging enquiries even in fairly simple cases. The measurement of changes in consumer 'satisfaction' may lead to even greater difficulties. For these reasons it is most difficult to allow for many quality changes. To take perhaps an extreme case, the measurement of the relative efficiency of a new drug can be regarded on the practical level as unattainable.

In the service industries the problems are considerably greater. For example, if the output of teachers is measured by the number of pupils taught, the quality of the service may decline as the size of classes increases. Similarly the number of patients treated by a medical practitioner may increase, but with less time for each one the quality of the service may decline. In the present state of knowledge there is no satisfactory treatment of quality changes in the service industries.

Thus quality changes cannot be fully allowed for but a considerable part of what is practicable is done. Where some improvement is theoretically possible it might require an elaboration of statistical collection the results of which are not thought to justify the expense and delay to the statistics. However, whatever the bias in the trend of the index introduced by the difficulties of taking account of quality changes, it is unlikely that the shorter term movements are significantly affected.

## II. The index of industrial production

### Introduction

The index of industrial production was rebased on the year 1963,<sup>7</sup> following the publication of the detailed results of the census of production taken for that year. Details of the weights and indicators used in the rebased index are given in the following pages together with some comment on the changes made from the former, 1958-based, index. The new index does not differ in concept and structure from the old index and, as in previous publications,<sup>8</sup> details of the methods of compilation are given.

One of the purposes of rebasing is to incorporate a more up-to-date set of weights. At the same time rebasing provides an opportunity to make use whenever possible of new indicator series, not already taken into the index, which the information provided by the Census shows to be necessary. In this way changes in industrial structure and in the composition of output are better reflected in the index. Thus a number of new indicator series some of which replace the substitute series which had to be used in the old index are introduced while there is now greater sub-division among output headings.

The industries included have been grouped according to the 1968 Standard Industrial Classification. To do this the 1963 Census detailed results (which were presented on the 1958 Standard Industrial Classification) have been adjusted so far as possible to conform with the 1968 Classification.<sup>9</sup>

### Objects and definitions

The purpose of the index is to show in one series the movements in the volume of output or activity in the industrial sector. Within this aggregate a similar series designed to show the movements in the volume of output of manufacturing industry as a whole is also compiled. There is a mass of information on the output of particular commodities but this does not make possible a comprehensive view of the movements in activity of a large section of the economy taken as a whole. In concept the index measures movements in the aggregate net output of the industries covered; that is the amount of 'work done', which for each industry is the difference between the gross output of products and the input of materials, products and services provided by other industries, adjusted for changes in stocks and work in progress.

In symbols the index for any period is:

$$\frac{\sum P_0 Q_0 (Q_n / Q_0)}{\sum P_0 Q_0}$$

where  $P_0 Q_0$  is the net output in the base year and

<sup>7</sup> See *Economic Trends*, August 1969.

<sup>8</sup> See *The Index of Industrial Production: Method of Compilation*, Studies in Official Statistics: No. 7, and *Economic Trends*, March 1962.

<sup>9</sup> With the publication of the provisional results of the 1968 Census (on the 1968 Classification), further work has been carried out in re-classifying the 1963 results (see *Board of Trade Journal*, 31 December 1969). It is not thought that the index of production would have shown any significant difference had these later estimates been used in constructing the weights.

$Q_n / Q_0$  is the ratio of gross output in any period to that of the base period.

The index aims at comparing the rate of production in different months and adjustments have to be made because calendar months vary in length. Some contain four and others five Sundays or Saturdays when production is likely to be lower than in the other days of the week. The effect of irregularities of the calendar have, so far as possible, to be eliminated so that the index compares the average weekly rate of production in different months. Account is taken also of the number of days per week usually worked by different industries so far as these are known.

Even when the effects of these calendar irregularities have been removed the index will still exhibit fluctuations not all of which are meaningful in the interpretation of production trends. These remaining fluctuations are of three kinds. Some may be purely random due to passing causes or other irregularities which cannot be determined in detail, while others may be due to a longer-term movement, i.e. a trend or a cyclical movement. The remainder may be no more than periodic fluctuations which occur at fairly well-defined intervals. This last kind of fluctuation, i.e. the regularly recurring changes due to seasonal causes, such as the effects on electricity production of lower temperatures in winter and higher temperatures in summer, can be removed by the process of seasonal adjustment. Additional index numbers are therefore prepared—the seasonally adjusted series—from which the seasonal effects have been removed. It is important to observe, however, that the series contain not only the trend—which is now more easily discernible—but also the random fluctuations. These latter chance fluctuations from whatever cause or extreme movements due to known causes such as floods, severe weather, strikes and so on are not removed by the process of seasonal adjustment.<sup>10</sup> Details of the method used for seasonal adjustment are given in the Annex.

As has been stated above the primary object of the index is to show the movements in the main aggregates—all industries and manufacturing industry. However, in addition to the index numbers covering all industries and manufacturing some further index numbers (e.g. engineering, chemicals) are prepared and it is important to observe that the purpose of the sub-index numbers is to give some indication of the main contributors to the overall movement. These are not intended to be a disaggregation of the total having equal validity with the two main aggregates because in the structure of the main index the nature of the production indicators used may determine how far disaggregation may be taken. For example the method used for measuring the output of cars by counting numbers produced divided into cubic capacity ranges is adequate for purposes of producing an aggregate index number because the output of the many

<sup>10</sup> See 'Seasonal adjustments of economic time-series', *Statistical News*, No. 6, August 1969.

other components incorporated is measured in other industries included in the index, e.g. the upholstery-material is measured in the leather or chemical industry.

### Production series

To compile the index of production, 892 individual series with separate weights are used. A list of the series classified by industry showing the weights attached to each is given in Appendix I. A few of these series relate to Great Britain but most of them cover production in the United Kingdom. These series will, according to the usual practice, be amended in scope, unit of reckoning and timing as better indicators become available so that, as in the past, the series actually used may depart progressively from those listed.<sup>11</sup>

It is impossible in practice to cover the whole of industrial output by means of these production series because many industries may each produce a variety of goods. To cover all of these over the whole field of industry would require a proliferation of series which would be difficult to collect and would add considerably to the work of compilation. Thus an industry is represented by one or more series covering the main products of that industry. Over the whole of the industrial field the series used cover 94 per cent of the total output. The table below shows the coverage achieved by the indicators for each of the industrial groupings of the index.

SIC Order		Percentages	
		1963 index	1958 index
II	Mining and quarrying	97	96
III	Food, drink and tobacco	86	90
IV	Coal and petroleum products	88	84
V	Chemicals and allied industries	80	77
VI	Metal manufacture	98	97
VII	Mechanical engineering	100	96
VIII	Instrument engineering	100	
IX	Electrical engineering	100	
X	Shipbuilding and marine engineering	100	99
XI	Vehicles	93	90
XII	Metal goods not elsewhere specified	96	91
XIII	Textiles	94	93
XIV	Leather, leather goods and fur	90	92
XV	Clothing and footwear	92	87
XVI	Bricks, pottery, glass, cement, etc.	81	76
XVII	Timber, furniture, etc.	91	96
XVIII	Paper, printing and publishing	98	94
XIX	Other manufacturing industries	95	93
XX	Construction	100	100
XXI	Gas, electricity and water	91	90

The percentages given above were arrived at by expressing the value of the gross output of the products represented by the indicators used as a percentage of the total gross output of the industry shown by the Census of Production for 1963. It should be noted, however, that where an industry is represented by an input series (materials or labour) it is included as representing 100 per cent of the work done. Similarly the value of total sales of all products would also represent 100 per cent of work done (except where the industry had done work on its own capital account). A series is treated as covering the whole of the output it represents even though based on the output of a sample of manufacturers.

The nature of the series used can be judged from the following table :

	Number of series	Percentage of weight carried
<b>Output indicators :</b>		
Quantities delivered or produced .. ..	690 (724)	43.2 (45.7)
Deflated value of deliveries or sales ..	146 (90)	43.3 (37.4)

<sup>11</sup> In a few cases, new indicators which have become available since 1963 have already been incorporated in the index. For example, a series for glass-fibre fabrics was introduced from the beginning of 1967. The indicators listed in Appendix I are those used for computing the index numbers in 1969. Further changes in the indicators used can be expected to follow from the introduction of the new system of industrial statistics (see *Statistical News*, No. 8, February 1970).

### Input indicators :

Quantities of major materials received ..	50 (54)	11.2 (14.5)
Numbers of persons employed .. ..	6 (8)	2.3 (2.4)

Figures in parenthesis relate to the 1958-based index

The nature of the four types of indicators used and their characteristics are examined briefly in the following paragraphs.

(i) *Quantities delivered or produced* Since the basic concept of what should be measured for each industry is the volume of work done in each period it is generally considered that indicators representing physical quantities as the nearest approximation to gross output should be used whenever possible. This type of indicator has the advantage that it does not have to be adjusted for price changes. A typical example of this type is that used for the coal industry where the output indicator is the number of tons produced.

There are, however, limitations to the usefulness of this type of indicator. An industry may produce a large number of products which in practice cannot all be covered by physical output series while products which have the same general description (e.g. metal castings) may vary considerably in quality or technical specification. Only by treating each type of product as a separate commodity with its own series and a net output weight could this difficulty be overcome. Physical quantities can only give a true measure of changes in output if the net output content per unit of product remains constant from period to period.

(ii) *Deflated values* i.e. the value of goods produced or delivered by the industry, adjusted for price changes. The assumption is that changes in selling value reflect changes in net output content.<sup>12</sup>

Deflated values have the advantage of covering in one figure the whole output of the industry however varied, and of being readily available from an industry's records. They will also automatically include new products. Whereas a series based on physical quantities will not reflect shifts in average quality of the goods produced a deflated value series will make some allowance at least for such changes. All this, however, is dependent on the accuracy of the adjustments made for price changes so that a series of price index numbers calculated at the appropriate stage in the production process and making the right adjustments for quality changes is essential in the use of deflated value series as for example in the engineering and clothing industries.

(iii) *Input of materials* Input indicators have to be used where output indicators are not available. The use of this type of indicator is based on the assumption that the change in the amount of work done in an industry is proportional to the change in the usage of one or more raw materials—the basic raw material is usually chosen. The most serious drawback is the difficulty of getting data on all the materials used : if there is a change in the proportions of the different types used, the index may be distorted. Even if the basic material is the only one used, it may be made into products involving varying amounts of work per unit of material used. If these change during the lifetime of an index and relatively more complex products are produced, the rise in the amount of

<sup>12</sup> Those changes in selling value ought strictly to reflect only changes in net output content. A change due to increased use of input materials or components ought not to be counted in that industry but in the industry producing the input material.

work done will be understated. For example the indicator for the tobacco industry in the 1958-based index was 'tobacco used' but the index became progressively less reliable with the growing consumption of tipped cigarettes, with the result that the amount of work done was understated. For the 1963 index it has been possible to use separate series for the different types of products of the tobacco industry.

Another obvious defect of this form of indicator is that it may not be the materials actually used but an even less satisfactory series—the amounts received by the industry.

The principal industries for which material inputs are used are Metal industries (n.e.s.) and Printing and publishing.

(iv) *Numbers of persons employed*<sup>13</sup> It is assumed in this case that the work done varies with the numbers employed. The objections to such an assumption are obvious. Productivity changes may affect output without affecting employment; adjustments have to be made for holidays and other events for the same reason. Employment series are therefore used only as a last resort for those industries for which no other indicator is available. Examples in the index are Shipbuilding, part of Other textile industries, Leather goods and fur and Water supply.

#### **Stocks and work in progress**

One of the limitations of the use of delivery series is that no account is taken of changes in the amounts of stocks and work in progress. Since changes in these have no effect on a pure delivery series the index will understate production when stocks of finished goods and work in progress are increasing and overstate it when they are declining. Data on stocks are only available quarterly and for broad industry groups; they cannot therefore be used to adjust the individual monthly delivery series used in the index. This defect of the indicator is more serious particularly in relation to work in progress when production extends over a lengthy period. Attempts to overcome this difficulty usually take the form of special index numbers such as that for the construction industry where the amount of work done is estimated quarterly and deflated by an index of changes in costs. In Shipbuilding a special index was used for some time but had to be replaced by an employment input indicator when technical changes in the industry made it unreliable. Problems of this kind sometimes arise in an acute form. For example a large part of the activity by the aircraft industry, where a special index number is employed, consists of work on research and development, the expenditure on which may be recovered a considerable time afterwards when the price of the finished aircraft includes a substantial element of research and development recoupment, i.e. for work done in earlier periods. In this instance the indicator is based on the value of deliveries, work done on repairs and on research and development deflated by an index of input costs.

#### **Weighting**

The weights given to each industry are based in principle on the values of net output (before deducting depreciation) in 1963. The net output of an industry is defined as the value of the gross output, less any costs incurred in producing this output which are payable to other industries. These costs consist of the value of materials, fuel and electricity used, amounts paid for work given out, and amounts paid for services.

<sup>13</sup> In general these figures relate to numbers on the payroll and take no account of absenteeism or of short time or overtime worked.

The estimates of net output are based on the data in the Census of Production for 1963 which have been assumed to relate to the calendar year 1963. The Census figures, however, have been adjusted in a number of ways:

(a) *Net output* Net output as defined in the census of production is reckoned before deducting payments for services rendered by other industries. However, information about certain expenses, such as payments for repairs to buildings and plant and machinery and vehicles, for rates and for hire of plant were collected in the detailed census of establishments and further information about business expenses such as on advertising and market research was collected in a supplementary head office inquiry into business expenses and receipts. In this inquiry information was collected only for broad groups of industries and expenses were assumed to be in proportion to the census net output of the individual industries comprising the groups covered by the survey.

The figures of net output used as weights for compiling the index are arrived at after deducting these payments for identified services. But some expenses cannot be identified and no adjustment has been made for these.

Conceptually, the net output or value added of an industry is identical with the sum of factor incomes generated in the industry, less stock appreciation. In practice, however, the estimated values of the net outputs of the census of production industries in 1963 given in Appendix I differ from the totals of factor incomes given for 1963,<sup>14</sup> for three main reasons. First, the total of factor incomes covers the whole economy and as there is no census from which the net outputs of industries outside the index of production can be estimated, the contributions of these industries and the production industries as a whole, to the gross domestic product must be estimated from incomes data, instead of from production data, in the manner described in the next chapter. Second, the index of production weights have been estimated on the 1968 industrial classification (see below), whereas the factor incomes are based on the 1958 classification. Third, as stated above, in compiling the index weights not all inputs of services can be estimated and deducted from the gross output of each industry.

(b) *Industrial classification* Some further adjustments to the Census figures were necessitated by the fact that the new Index of Industrial Production is based on the 1968 revised edition of the Standard Industrial Classification. The most important of these changes were:

- (i) The transfer of milk bottling and processing and tea blending from Distribution to Food Manufacturing.
- (ii) Coke ovens and mineral oil refining and lubricating oils and greases have been taken out of Chemicals and formed into a separate Order (Order IV).
- (iii) Vegetable and animal oils and fats have been transferred from Chemicals and Allied Industries to Food Manufacturing.
- (iv) Order VI (Mechanical and Electrical Engineering) of the 1958 SIC has been divided into three new Orders, i.e. Mechanical Engineering (Order VII); Instrument Engineering (Order VIII); and Electrical Engineering (Order IX).
- (v) Engineers' small tools have been transferred from Engineering to Metal Goods n.e.s. (Order XII).
- (vi) Turbines for electricity generation have been transferred from Mechanical engineering to Electrical engineering (Order IX).

<sup>14</sup> *National Income and Expenditure* (HMSO), 1969, Table 17.

(vii) Powered industrial trucks and industrial tractors formerly in the Vehicles industries have been transferred to Mechanical engineering (Order VII).

(viii) Domestic type refrigerators have been transferred from Mechanical engineering to Electrical engineering (Order IX).

(c) *Industries not covered by the Census* Estimates had to be made for mining and quarrying in Northern Ireland and these were based on the percentage of employment in Northern Ireland to that in the United Kingdom. In the case of Milk bottling and Tea blending, special departmental estimates of the output were used.

As with previous reweighting procedures it was often necessary to apportion the net output for a Census industry over several products. The net outputs of sub-divisions of industries were based on figures published in the Census reports for larger firms only. Where the sub-divisions of industry were not published the net output of the whole industry had to be apportioned among its several products in proportion to the values of their gross outputs. This was not always a satisfactory alternative and in a number of cases, allowances had to be made for factors which would clearly cause the products to have differing ratios of gross to net output, as for example, alloy and non-alloy steel. These allowances are based on special information received from the Departments.

Since the weights derived from the census of production are 'industry' weights it would be appropriate to have 'industry' indicators with the same coverage. But in practice we have in some cases physical production indicators covering only part of the production of the industry and in others indicators covering part of the production of one industry plus a minor part of the production of another industry. Thus some establishments in the bread and flour confectionery industry make biscuits together with their principal products, while some establishments in the biscuit industry make flour confectionery together with their principal products. Ideally, therefore, those industry weights which are used in combination with indicators of quantities produced or delivered would need a small addition to cover that part of the principal product made outside the industry and a small deduction for the subsidiary products and by-products which are the principal products of other industries to bring them on to a pure product basis. These possible adjustments are usually small and cannot be made sufficiently accurately to be worthwhile but in the case of iron castings it was felt worthwhile to make one. Iron castings are the principal product of the iron foundry trade but the production series include a substantial contribution from various branches of the engineering industry. The weight for iron castings is therefore derived from various Orders and the whole of it given to Order VI, metal manufacture:

	<i>Net output £ million</i>	<i>Weight per thousand</i>
Order VI Metal manufacture (MLH 313)	127.8	9.63
Order VII Mechanical engineering	17.3	1.30
Order X Shipbuilding and marine engineering	1.1	0.08
Order XI Vehicles (MLH 381)	4.8	0.36
	<hr/> 151.0	<hr/> 11.37

Another practical difficulty in the compilation of index numbers of industrial production is the treatment of industries or branches of industries for which weights but no current production series are available to measure changes in output. The difficulty is met for industries covered by a Minimum List Heading in the Standard Industrial Classification by using employment figures as indicators. There is a special difficulty, however, where certain parts or sub-divisions of a heading are covered by production series (other than employment series) while others are not. In these cases the alternatives followed have been:

(a) To attach the weight for an item to the weight for another item (whether in the same industry or in another industry) whose activity may be expected to be correlated with the output of the uncovered item. One of the very large number of instances where this is done is in coal mining where the output of deep-mined coal is used to reflect the output of the very small percentage of miscellaneous minerals and other products of the industry. Another example is jewellery, plate and the refining of precious metals (MLH 396) which is represented by the sales of jewellery and plate only. The few cases where the weight has been transferred to another Minimum List Heading include part of the textile industry where the making of canvas goods and sacks (MLH 422/2) has been transferred to the jute industry (MLH 415).

(b) To share an unattached weight among a group of industries which collectively might be expected to experience similar activity. The arrangement and groupings of industries in the Standard Industrial Classification are particularly useful for this purpose. This has been done with 'All other manufacturing industries' (MLH 499/2) which has been assumed to move with the rest of Order XIX excluding rubber.

### Computation and adjustments

Most of the series used in the compilation of the index are for calendar months or for periods of four and five weeks. The number and weights of series covering different periods are as follows:

#### Time interval

	<i>Number of series</i>	<i>Percentage of weight carried<sup>1</sup></i>
Weekly figures and weekly averages of periods of four and five weeks	92	19.3 (28.1)
Calendar months	520	36.8 (34.0)
Quarters (with alternative series for shorter intervals)	156	35.8 (33.5)
Quarters	124	8.1 (4.4)
	<hr/> 892	<hr/> 100.0

<sup>1</sup> Comparative figures for the 1958 index are shown in brackets.

#### Adjustments to eliminate variation in the length of calendar months

Since the purpose of the index is to show monthly changes in the rate of work done, the 'months' are made equal in length to facilitate comparison and the series for the different time intervals need adjustment before they can be incorporated in the index.

Calendar months do not all contain the same number of days, and the number of days on which it is the normal practice of firms in different industries to work each week also varies. Adjustments have been made to calendar monthly series to eliminate the effect of such variations as follows:

(a) Industries have been classified according to whether they work 5, 5½ or 7 days a week.

(b) For each industry, the total number of working days in the base year 1963 was determined, no allowance

being made for annual and public holidays. One-twelfth of this total was taken as a 'standard' month for each industry.

(c) In preparing the current index the monthly production figure for each commodity is multiplied by the ratio of the number of working days in the standard month in 1963 to the number in the current month, and then expressed as a percentage of the average monthly production in 1963.

An index for a standard month obtained in this way is equivalent to one representing the average weekly rate of production in the month, and can therefore be combined with indices based on weekly averages.

The only monthly figures not requiring adjustment in this way are those relating to numbers employed. Such figures relate to the number on the pay roll in a particular week of each month and are therefore influenced neither by the length of the month nor by the number of days normally worked per week. Employment figures, however, require adjustment in another way. Just as other types of production series are affected by public and annual holidays so employment figures have to be corrected to reflect the loss of production due to holidays. Weekly figures are usually received in the same form as the weekly averages which are for periods covering four, four and five weeks successively, this pattern being continued throughout the year so that each average approximately represents the weekly average for a particular calendar month. Given the weekly average, no further adjustment is made. The fact that the period averaged does not coincide exactly with the calendar month it represents is normally of little consequence, but there is always the possibility for example, that the average period of five weeks might cause a shift in the effect of the Easter holidays from one month to another whenever it occurs at the end or the beginning of a calendar month. No corrections are made to adjust the figures for such an occurrence in the index of production before seasonal adjustment but they are taken into account in the seasonal adjustment of the figures.

Quarterly figures require two adjustments. Firstly, they are adjusted so as to eliminate the effects of variations in the number of working days in each quarter in the same way as has been described for calendar months. Then secondly, they are made to yield three separate monthly figures by taking account of public and annual holidays in each of the three months of the quarter. Apart from the allowance made for holidays, therefore, each month is deemed to be one-third of the quarter containing it.

Annual indices are calculated by averaging the indices for the twelve months of the year. This produces a result which differs from indices based on annual production figures for two main reasons:

(a) Years do not all contain the same number of working days; a difference of one working day is equivalent to a difference of nearly half of one per cent which is not inconsiderable in relation to the changes which are being estimated.

(b) A simple average of 12 monthly indices in effect overweights the shorter working months and the weekly averages of four-week periods as against the longer working months and the weekly averages of five-week periods.

In general the differences are small in relation to other errors of estimation and it is considered preferable to obtain the annual indices of production by taking the simple average of the 12 monthly indices rather than to introduce a more complicated relationship between the

monthly and the annual indices which would not necessarily result in an appreciably better estimate.

#### *The provisional nature of indices for recent months*

All the series to be used in computing the index as listed in Appendix I will not have become available at the time the index for the latest month is being prepared. Much of the monthly data is not received until some weeks after the end of the month to which it relates. There is also the problem that some of the monthly figures are revised when fuller and more comprehensive quarterly figures are received for some series for which monthly estimates are used in the first instance (about a third of the index is so affected). In addition some eight per cent of the information is received only quarterly and these figures are not usually available until three months after the end of the quarter to which they apply.

The following table shows that in October 1969 when the index for August was first being calculated only 25 per cent of the information available could be considered firm. If the index were to be completed only when all the data for a month became available there would be a delay of three to six months before the index for a month could be issued.

Information received at mid-October 1969 for	Percentage of weight covered by data received		
	Total	Provisional <sup>1</sup>	Final
1969 March	100	4	96
April	100	7	93
May	100	7	93
June	100	8	92
July	91	55	36
August	90	65	25

<sup>1</sup> Including all series based on incomplete returns, some of which are subject to only slight alteration.

In computing index numbers for the latest months from incomplete data an estimate is made for each series missing from the index, based on recent trends and allowing for the normal seasonal variation (including an allowance for any expected irregularities arising from strikes, holidays, etc.). This procedure is considered better than assuming that the missing series will show the same changes as the other series in the same SIC Order for which information has been received.

It should be emphasised that the index of industrial production can only be firm when its component series have all been received in final form. Clearly, provisional figures must eventually be replaced by final figures. Moreover from time to time, individual series undergo improvement and revision so that figures assumed to be final may be occasionally revised back for several months and in some cases even years. These adjustments and revisions necessarily lead to corresponding revisions in the index, although only the larger ones will have any noticeable effect on the total index.

#### *Publication*

The current practice is to publish in a press notice provisional index numbers both adjusted and unadjusted about six weeks after the end of the month to which they relate together with revised figures for the preceding months. The provisional index numbers are given together with sub-indices for the main divisions of industry.<sup>15</sup> Also published in the press notice are the percentage changes for the latest three months compared with the preceding three months for these same groups based on the seasonally adjusted estimate. This gives a better estimation of the recent movement of production than the comparison of figures for individual months

<sup>15</sup> All industries; Manufacturing industries; Food, drink and tobacco; Chemicals and allied industries; Metal manufacture; Engineering and allied industries; Textiles, leather and clothing; All other manufacturing industries.

which may be affected by irregularities due to abnormal weather conditions, absenteeism or strikes. Charts are also drawn showing the trends for all industries and for manufacturing, produced by the Spencer weighted 15-term moving average including estimates for the missing terms at the end of the series.

### Comparison between the 1958-based and the 1963-based index numbers

Some idea of the changing relative importance at industrial Order level of the various groups is given by comparing the weights for the 1958- and 1963-based index numbers.<sup>16</sup> These are shown in the table below.

	1958 weights per cent	1963 weights per cent
Mining and quarrying .. .. .	7.17	5.58
Manufacturing: .. .. .	(74.83)	(74.94)
Food, drink and tobacco .. .. .	8.60	8.44
Coal and petroleum products .. .. .	0.90	0.74
Chemicals and allied industries .. .. .	5.88	6.36
Metal manufacture .. .. .	6.85	6.01
Mechanical engineering } .. .. .	16.69	9.04
Instrument engineering } .. .. .		0.97
Electrical engineering } .. .. .		6.81
Shipbuilding and marine engineering .. .. .	2.18	1.54
Vehicles .. .. .	7.91	8.05
Metal goods not elsewhere specified .. .. .	4.21	4.85
Textiles .. .. .	5.82	5.64
Leather, leather goods and fur .. .. .	0.41	0.43
Clothing and footwear .. .. .	2.95	2.71
Bricks, pottery, glass, cement, etc. .. .. .	2.81	2.90
Timber, furniture, etc. .. .. .	1.99	2.10
Paper, printing and publishing .. .. .	5.47	5.88
Other manufacturing industries .. .. .	2.16	2.47
Construction .. .. .	12.59	12.71
Gas, electricity and water .. .. .	5.41	6.77
All industries .. .. .	100.00	100.00

To give some idea of the effect of the change of base and the change in indicators, the 1958-based and the 1963-based index numbers for 1968 are shown side by side in the following table. In the first column the 1958-based figures for industrial Orders have been adjusted to make 1963 = 100 but have not been changed in any other way. The second column shows the effect of reweighting the 1958-based index numbers at Minimum List Heading level.

From the table below it will be seen that the combined result of reweighting and the introduction of new series is to produce for 'All industries' an index number which over the period 1963 to 1968 has risen by about two per cent more than the 1958-based index over the same period. The effect of reweighting alone at Minimum List

Heading level would have resulted in a slightly lower index number for the period.

The principal contributors to the faster rate of increase in the new index are Food, drink and tobacco (Order III), Chemicals and allied industries (Order V), Engineering (Orders VII, VIII and IX), Vehicles (Order XI) and Gas, electricity and water (Order XXI).

Some of the more significant changes in the indicators used in the new index are listed below.

(i) *Food, drink and tobacco* Changes in the SIC have resulted in the addition of series for the heat treatment of milk and tea blending. New series have also been included for the production of cream, potato crisps and instant coffee. A change has been made in the indicator for spirit distilling and compounding to take account of the work done in the blending of spirits. The former series only measured the production of potable spirits. The old series for tobacco manufacture was an input series of tobacco taken out of bond, which was becoming a much less appropriate indicator with the change to filter-tip cigarettes. The new series is manufacturers' sales of the various types of cigarettes, cigar and pipe tobacco.

(ii) *Chemicals* Figures for a much wider range of organic and inorganic chemicals are now used and series for the production of plastics materials have been introduced; movements in the latter were previously represented by those in synthetic resins. A series for the production of synthetic rubber has been introduced.

(iii) *Vehicles* The output of the aircraft industry is now measured by a deflated value series including the deflated value of work on research and development. This replaces a series which consisted of numbers of completed aircraft plus a value series for the export of parts and payments for research and development. Within this Order also a deflated value of deliveries series has replaced the input series—employment—used as a measure of output for locomotives and railway track equipment and railway carriages, wagons and trams.

(iv) *Textiles* Improved series for the manufacture of man-made fibres and household textiles have been used.

(v) *Other manufacturing industries* The index for rubber goods is now based on the production of tyres and tubes and for other rubber goods on the value of deliveries deflated.

	1968 (1963 = 100)		
	1958-based index 1958 MLH weights	1958-based index 1963 MLH weights	New index
All industries .. .. .	117.0	116.5	119.8
Mining and quarrying .. .. .	85.3	85.2	84.8
Manufacturing industries .. .. .	117.8	117.3	121.4
Food, drink and tobacco .. .. .	109.8	109.6	115.5
Coal and petroleum products .. .. .	128.0	129.8	126.4
Chemicals and allied industries .. .. .	131.9	130.4	140.0
Metal manufacture .. .. .	111.0	110.3	111.1
Mechanical engineering } .. .. .	124.9	124.8	130.9
Instrument engineering } .. .. .			
Electrical engineering } .. .. .			
Shipbuilding and marine engineering .. .. .	91.7	90.6	86.8
Vehicles .. .. .	109.2	109.8	117.2
Metal goods not elsewhere specified .. .. .	111.4	111.2	113.4
Textiles .. .. .	118.0	115.9	119.2
Leather, leather goods and fur .. .. .	94.3	93.4	93.3
Clothing and footwear .. .. .	104.0	103.7	103.7
Bricks, pottery, glass, cement, etc. .. .. .	126.2	125.4	127.3
Timber, furniture, etc. .. .. .	117.7	117.4	118.5
Paper, printing and publishing .. .. .	119.2	117.2	118.3
Other manufacturing industries .. .. .	136.0	139.2	135.2
Construction .. .. .	123.0	122.7	121.8
Gas, electricity and water .. .. .	123.1	122.1	128.2

<sup>16</sup> The 1963 weights, and index numbers given below, are not strictly comparable with the 1958 figures for some Orders owing to changes in the Standard Industrial Classification (see page 6).

(vi) *Gas, electricity and water* A new series for gas available at gas works together with a series for coke made at gas works now replaces the former series—gas and coke made at gas works. The latter took no account of the increasing quantities of gas obtained from other sources but distributed by the Gas Boards. The previous indicator became progressively inappropriate as these new sources of gas—North Sea and other—formed a rising proportion of total supplies. In the case of electricity the indicator now used is the quantity sent out instead of the quantity generated.

In nearly all cases the effect of these changes—more disaggregation of production measures, the substitution

of output for input series, and the efforts to keep the series in line with economic and technical changes—has been to raise the estimates of production. An input series for example, while theoretically giving full coverage of production is only an effective indicator when the technical co-efficients are constant. Increased efficiency in the use of an input material will result in an understatement of output. In much the same way disaggregation of output series frequently has the same effect of raising the estimate of output. The effect of replacing inadequate indicator series also tends in the same direction. It is normal to expect these changes to occur in the expanding industries where techniques are changing more rapidly than in other industries.

### III. The output measure of the gross domestic product

When the method used to construct the index of industrial production is extended to cover all industries within the Standard Industrial Classification the aggregate change so derived is a measure of the change in the aggregate net output. As already explained this aggregate is the gross domestic product at constant factor cost measured from output—often referred to as the 'real product'. This section describes the derivation of the base-year weights and the indicators used for the remaining industries.

#### Statistical sources: weights

The indicators of changes in net output in each industry are combined using weights based on the relative contribution made by each industry to the gross domestic product, as measured by its net output in the base year. In contrast to the index of production industries there is no census from which the net outputs of these remaining industries can be estimated. The starting point for the calculation of the weights is therefore the analysis of the gross domestic product by industry and type of income which is given in the annual *National Income and Expenditure* Blue Book (Table 17 of the 1969 Blue Book). This gives an analysis of factor incomes, differing from the required concept of net output only by the inclusion of stock appreciation.

The weights for the latest base year, 1963, are consistent with the figures given in the 1969 Blue Book, the latest estimates available at the time when the weights were compiled. For wages and salaries, there are two alternative analyses by broad industry group available. First, an industrial analysis of wages and salaries subject to PAYE for each financial year is made by the Inland Revenue; a similar analysis is made of profits. Second, for Table 17 of the Blue Book, independent estimates of wages and salaries are made for the main industrial groups; the data are derived from a number of sources, for example the wage and salary bill of the production industries is based on the results of the detailed Census of Production<sup>17</sup> (see Chapter VI of *National Accounts Statistics: Sources and Methods*). The Inland Revenue analyses are based on a classification of financial units as opposed to a classification by establishments which is used, as far as possible, in the national accounts tables. A classification by establishments is nearer to that required for an index of output in which the indicators relate to individual commodities rather than the total output of firms. For the 1963-based index it was decided, for consistency with other national accounts data and particularly with the input-output tables, to use the Blue Book analysis of factor incomes for the main industry groups (except within the index of industrial production) as given in Table 17. In the case of profits, the Table 17 figures are based on the Inland Revenue analysis. The use of the Blue Book, rather than the Inland Revenue analysis of wages and salaries in-

creases the weight for most service industries and reduces the weight for the index of production industries, but the effect on the index numbers of gross domestic product is small. Taking 1958 as 100·0, index numbers for the gross domestic product in 1967 were estimated using the two alternative sets of weights and it was found that they differed by only 0·1.

A number of adjustments were made to the Table 17 figures to produce the 1963 weights. The 1969 Blue Book analysis by industry was based on the 1958 Standard Industrial Classification; as with the index of industrial production, it was decided that the weights should as far as possible be in line with the revised Standard Industrial Classification issued in 1968. An adjustment was made in respect of Milk bottling and processing and Tea blending, which were formerly included with the distributive trades and are now included within the index of production industries. Business services, formerly part of Miscellaneous services, are now included with Insurance, banking and finance (Order XXIV).

Stock appreciation, amounting to £195 million in 1963, was deducted, industry by industry, in order to obtain net output weights on the desired concepts. In the 1958-based index no such adjustment was made as the estimated values of stock appreciation were very small in nearly every industry.

The weight for Transport and communication (Road goods transport) was increased to cover all 'C' licence transport by making appropriate transfers from the weights for other industries employing these vehicles (Manufacturing, Construction and the Distributive trades). This adjustment was made because the indicator used relates to road goods vehicles employed in all industries.

The analysis of factor incomes provided only the weight for the industrial production industries as a whole. Within these industries the detailed weights were compiled from the results of the detailed censuses of production as explained in Chapter II. Although the data are independent, every effort is made to produce weights which relate to the same definition of net output.

Within the broad industrial groups outside the index of production, use was generally made of the Inland Revenue analyses of wages, salaries and profits to estimate weights for individual Minimum List Headings. In many industries the weights were further apportioned between the various services or groups of services provided by the industries in order to provide appropriate weights for each of the output series used as indicators. Where it was not possible to measure the output of all the products of an industry it was assumed that the uncovered portion moves with one or more of the indicators which are available. Where a breakdown of the weights within Minimum List Headings was required and this was not provided by Inland Revenue data, the further sub-division necessary was generally made on the basis of gross receipts, for example within railways and postal

<sup>17</sup> The estimates are described in *National Accounts Statistics: Sources and Methods*, pages 133–140.

services and telecommunications. In the case of the distributive trades the weights within Minimum List Headings were estimated from the information on gross margins provided by the latest census of distribution. Gross margins on turnover are not an exact measure of net output since net output is obtained after deduction of payments to other industries for services such as rents, advertising and transport, but they are the best guide available.

One other aspect of the weights which needs to be mentioned concerns the Insurance, banking and finance industry where the treatment differs from that elsewhere in the national accounts. In order that changes in the financial services provided by this industry should be included in estimating the gross domestic product, the weight for Insurance, banking and finance included their net receipts of interest which are one of the means of paying for these financial services. In accordance with national accounting definitions, the net output weights of other industries were estimated before receipts and payments of interest and thus the industry weights contained a certain amount of duplication. There is no very satisfactory basis for allocating the amount of net interest included for Insurance, banking and finance against the weights of the other industries. The procedure adopted was to deduct from the weight for all industries the weight for net interest, by proportionately reducing the weight for each Order (including Ownership of dwellings).

The 1963 weights are shown in detail in Appendix II. The weights were first calculated in value terms as estimates of the factor incomes in the base year. The following list summarises the weights for 1963 scaled to add to 10,000. Column (1) shows the weights implied by the analysis of factor incomes shown in the 1969 Blue Book. Column (2) gives the weights after the adjustments have been made and summarises the weights

shown in the Appendix. These are the weights used in combining the Orders to produce the overall index number.

#### Net output in 1963

	Weights per 10,000	
	Blue Book analysis (1)	Calculated weights (2)
Agriculture, forestry and fishing .. ..	364	344
Mining and quarrying .. ..	272	244
Manufacturing industries .. ..	3,358	3,285
Construction .. ..	644	557
Gas, electricity and water .. ..	310	297
Transport and communication .. ..	847	910
Distributive trades .. ..	1,182	1,087
Insurance, banking, finance and business services .. ..	687	711
Professional and scientific services .. ..	1,679	811
Miscellaneous services .. ..		780
Public administration and defence .. ..	575	560
Ownership of dwellings .. ..	426	414
Net interest adjustment .. ..	-344	—
	10,000	10,000

Full lists of weights and indicators have been published for indices of output at constant factor cost relating to earlier years as follows:

1948-based index: *National Income and Expenditure: Sources and Methods*, 1956, Appendix IV

1954-based index: *Economic Trends*, August 1960<sup>18</sup>

1958-based index: *National Accounts Statistics: Sources and Methods*, 1968, Annex to Chapter V

The table below summarises the weights used for each index. It should be noted that changes in the relative weights of the industry groups between the years are due not only to changes in their net output but also to changes in the basis of the estimates. Changes in the relative contributions of the main industry groups to the gross domestic product on a consistent basis can readily be calculated from the 1970 *National Income and Expenditure* Blue Book, Table 17.

#### Comparison between the weights for the index of gross domestic product at constant factor cost

Orders of the Standard Industrial Classification <sup>1</sup>	Index weights per 10,000			
	1948	1954	1958	1963
Agriculture, forestry and fishing .. ..	614	483	429	344
Industrial production:				
Mining and quarrying .. ..	367	359	339	244
Manufacturing .. ..	3,556	3,567	3,534	3,285
Construction .. ..	625	567	595	557
Gas, electricity and water .. ..	203	235	255	297
Total .. ..	4,751	4,728	4,723	4,383
Transport and communication .. ..	957	804	853	910
Distributive trades .. ..	1,236	1,287	1,122	1,087
Insurance, banking, finance and business services .. ..	264	553	604	711
Professional and scientific services .. ..	555	724	680	811
Miscellaneous services .. ..	724	704	627	780
Public administration and defence .. ..	727	635	628	560
Ownership of dwellings .. ..	272	343	334	414
Adjustment for net interest <sup>2</sup> .. ..	-100	-261	—	—
	10,000	10,000	10,000	10,000

<sup>1</sup> 1948 SIC Orders for the 1948 index; 1958 SIC Orders for the 1954 and 1958 indices; 1968 SIC Orders for the 1963 index.

<sup>2</sup> Separate indicators bearing negative weights were used for this item in the 1948 and 1954 indices.

#### Indicators

A list of the series used from 1963 in both the annual and the quarterly estimates is set out in Appendix II. Where a series is available both annually and quarterly it is listed once only, under the annual heading. Where an annual series is not available quarterly, the substitute quarterly indicators are shown.

In each new index the opportunity is taken to replace some of the former indicators by series which are considered more satisfactory to indicate movements in output at constant prices in the period covered. With the introduction of a new index, a list of the main changes in indicators compared with the previous index is published; the main changes between the 1958-based and 1963-based index were as follows: (i) *Agriculture*—The

indicator, net output (before deducting depreciation) at constant prices, of agricultural and horticultural holdings and of agricultural contracts, is based on the revised index of agricultural net output introduced at the 1969 annual farm price review. The base period of the revised index is 1964/65–1966/67; a detailed description was published in the December 1969 issue of *Economic Trends*. (ii) *Transport and communication*—A series for travel by taxis and private-hire cars is now included. A series for rail passenger journeys at reduced fares replaces the former series for early morning ticket journeys. (iii) *Distributive trades*—Some indicators have been changed in the light of the results of the 1961 and 1966

<sup>18</sup> Reprinted in *New Contributions to Economic Statistics*, Second Series, 1962.

Censuses of Distribution and 1965 Wholesale Trades Inquiry. (iv) *Insurance, banking, finance and business services*—The indicators for insurance have been revised by the use of a three-year moving average of premiums less claims, appropriately deflated, for all forms of insurance other than life assurance. The output of business services and central offices not allocable elsewhere is at present represented by the output of the remainder of the Order. (v) *Professional and scientific services*—The output of the new Minimum List Heading, Research and development services, is represented in the annual index by the index of manufacturing production. (vi) *Miscellaneous services*—A revised series for catering has been constructed, turnover being revalued at constant prices by new price indices described on page 98 of the 1969 Blue Book. The indicator for motor repairers, garages, etc. has been improved by revising the weighting of the indices of the three categories of turnover to reflect their estimated contribution to net output in 1963. (vii) *Public administration and defence*—Within the Order, a change has been made in the indicator used for H.M. Forces. A simplified index of strength is now used both for the annual and quarterly index numbers.

The following notes relate specifically to the indicators used in the 1963-based index though most of the general remarks also apply to the earlier indices.

*Agriculture* The large amount of price and quantity data available for agriculture makes it possible to use the double deflation method for this industry. Some 250 items of output and 400 items of input are separately distinguished each carrying its own base-period price weight. A three-year price average (currently for the farm years 1964/65 to 1966/67) is used for the purposes of revaluation to reduce the effect of fluctuations arising from weather conditions and other factors. The resulting estimates of net output at constant prices for the June–May farm years are allocated to calendar years in the proportion 7 : 5 ; for example, the estimate for 1968 is 5/12 of that for the 1967/68 farm year plus 7/12 of that for the 1968/69 farm year. A full description of the method and indicators used was published in an article in *Economic Trends*, December 1969. In addition to covering the net output of agricultural and horticultural holdings (an index of which is published annually in the White Paper *Annual Review and Determination of Guarantees*) the index also includes estimates of the output of agricultural contractors in accordance with the Standard Industrial Classification. Also, estimates of depreciation are added back to make the estimates consistent with the definition of gross domestic product.

*Mining and quarrying, manufacturing, construction and gas, electricity and water* These industries are covered by the official index of industrial production. It is prepared and published monthly and provides an important economic indicator. A full description of the index is given in Chapter II.

*Transport and communication* This is an industry group for which suitable indicators of gross output are readily available. For most of the main forms of transport, figures of passenger-miles and of freight ton-miles constitute the basis of the system of indicators employed.

In the case of road goods transport, the indicator used is an estimate of the ton-mileage of all road goods vehicles. The weight for this indicator has therefore been increased by transfers from other industries employing 'C' licence vehicles, though strictly the work done by these vehicles should be included with the industries which own them (see page 11).

For sea transport it is necessary to allow for the work done on cross-voyages as well as on voyages between this country and abroad. The annual inquiry of the Chamber of Shipping provides estimates of gross receipts of British operated tankers and dry cargo vessels which are deflated by indices of freight rates.

The communication sector is quite well covered by volume indicators of various kinds.

*Distributive trades* The indicators for this industry are based on the volume of turnover (that is, turnover revalued at constant prices). Where wholesalers mainly supply retailers, as is the case for most consumer goods, wholesale as well as retail distribution of these categories is represented by the indices of the volume of retail trade. Other wholesale dealing in materials is represented where possible by indices of deliveries, and otherwise by indices of production or consumption of the various materials. The activities of export merchants are represented by a number of indices of the volume of groups of United Kingdom exports and re-exports.

*Insurance, banking, finance and business services* As far as possible in this industry specific indicators of activity are used. For life assurance business the indicator is derived by deflating the expenses of handling life assurance ; this is the same series as is included in consumers' expenditure at constant prices. For other forms of insurance the indicators are the excess of premiums over claims, deflated by an appropriate price index.

Banks are regarded as providing financial services to borrowers in addition to that of keeping customers' accounts, etc. The indicators of output for the latter are the number of cheques cleared and total deposits deflated. For financial services the indicator is bank advances deflated. Similar types of indicators are used for other financial institutions.

Property management is included in this Order, the indicator used is the stock of commercial and industrial buildings.

*Professional and scientific services* The greater part of the weight for this Order is accounted for by public education and health services. The output of these services is represented by employment indicators, with the exception of local authority health services for which the indicators are on an output basis, for example number of patients attending clinics. For a large part of the remaining services in this group there is little information on output and for some of these employment indicators are used.

Originally output indicators of various kinds were used to measure changes in the volume of output even in those areas where the problems of measurement are greatest as, for example, public education and health services. Such series as number of pupils in schools and number of bed-days in hospital were used, either by themselves or in conjunction with series for the numbers employed. Indicators of this type proved unsatisfactory and have been abandoned, partly because of the difficulty of finding indicators which bear a constant relationship to output and also because of the need to keep the output estimates consistent with the expenditure estimates. It was obviously necessary to revalue expenditure on wages and salaries by public authorities by methods consistent with those used to measure output. Revaluing expenditure on wages and salaries at constant prices by calculating the amount that would have had to be spent

if there had been no increases in rates of pay, gave different results from the indicators of output. The present practice, therefore, with a few minor exceptions, is to measure output in public education and health by reference to the numbers employed. Wherever possible, however, the figures used are not crude totals of staff but are weighted to take accounts of changes in the numbers in different grades or ranks. The assumption is thus made that the 'output' of a senior employee bears the same relation to that of a junior as their respective salaries bear to each other, and that within a particular grade or rank there is no change in output per head from year to year.

*Miscellaneous services* Most of the services in this group, which are largely final services provided by the private sector, are covered by gross output indicators. Many of these services are provided wholly to personal consumers, and the indicators for these are taken from the estimates of consumers' expenditure on these services at constant prices.

*Public administration and defence* The output of this Order consists of the direct services of the armed forces and women's services, civil servants, etc., and it is estimated from changes in employment. Originally, such output indicators as are available, for example the number of beneficiaries under social security schemes, were used but they were abandoned for the same reasons as for public education and health services (see above). Separate indicators representing the various grades of staff are used. Because of this treatment productivity is assumed to be unchanged within each grade of employment, any change in output per head being due to a change in the composition by grade of the total number employed.

It should be noted that this Order is defined as in the Standard Industrial Classification 1968 and does not include the activities of persons employed by public authorities but classified to other industries; for example, ordnance factories are included in manufacturing and the national health service is included in professional and scientific services.

*Ownership of dwellings* Ownership of dwellings is shown separately and is defined as the contribution to the gross domestic product made by the stock of dwellings. It is measured by consumers' expenditure at constant prices on rent, including imputed rent of owner-occupied houses.

#### **Quarterly indicators**

The quarterly indicators are selected so as to reflect the movements of the annual indicators as closely as possible. In many cases the same indicator is used. In some cases, it has been possible to select alternative series covering the same industry. For example, annual indicators for rail passenger transport are based on the number of passenger-miles; these statistics are not available quarterly, but an alternative indicator, the aggregate number of passenger journeys, is available quarterly. This is probably inferior to the annual series but is thought to be the best substitute available. In other cases quarterly indicators for closely related industries are used. For example, the quarterly indicator for telegrams handled by cable companies is the combined indicators for the other parts of the communications industry. Some industries, such as 'Other transport and storage', are represented in the quarterly index by the quarterly indicators for the other industries within the industrial Order.

The extent to which each industry group is covered by quarterly information comparable to the annual data varies considerably. For industrial production the quarterly index of production is completely consistent with the annual average. For agriculture, where a large part of output consists of crops grown and harvested once a year, there seems to be no satisfactory way of allocating the annual output to particular quarters within the year. In this case therefore the quarterly figures used are interpolations of the farming year figures. Transport and communication is fairly well covered by quarterly information, and for the distributive trades all the annual indicators are available quarterly. For Insurance, banking, finance and business services, although several of the annual indicators for banking and finance are available quarterly there are no corresponding quarterly series for types of insurance, other than life assurance, which are therefore covered quarterly by an employment indicator. For Professional and scientific services, and public administration and defence, the quarterly indicators are total employment in each industry; these series are similar to those used in the annual estimates except that the latter incorporate more detailed information about the numbers in each grade of staff. Miscellaneous services are well covered by quarterly data, although some of the quarterly estimates of consumers' expenditure which are used as indicators are only interpolations and projections of the annual figures.

Seasonally adjusted estimates are published for eight industry groups: agriculture, forestry and fishing; mining and quarrying; manufacturing; construction; gas, electricity and water; transport and communication; distributive trades; and other services. The quarterly series for the gross domestic product is a weighted average of these components. The ratio to moving average method of seasonal adjustment is used throughout; as with the index of industrial production, a computer programme based on the X-11 variant of the US Bureau of Census Method II is now employed.

As the quarterly figures for Agriculture are interpolations of the annual series, seasonal adjustment is not necessary. Quarterly unadjusted index numbers are estimated for forestry and fishing and these two series are seasonally adjusted separately. For the index of industrial production industries, the quarterly figures are simple averages of the monthly seasonally adjusted index numbers. Transport and communication is seasonally adjusted as a whole, as are the index numbers for the distributive trades. Within the series for Other services, Insurance, banking, finance and business services, Professional and scientific services, Miscellaneous services and Public administration and defence are seasonally adjusted separately. There is virtually no seasonal fluctuation in the series Ownership of dwellings and no adjustment is made. The method of seasonal adjustment is described in the Annex (page 16).

The quarterly indicators are used only to estimate changes within the year. For completed years each industry Order has been adjusted to bring the level of the quarterly indices to that of the annual index. For current quarters a provisional adjustment is made for each Order using the final adjustment to the preceding year's figures as a guide. Final adjustments are made when the annual indices for each Order are available, and the quarterly estimates are revised to agree with the annual figures. In the table below the quarterly series are shown as published in the October 1969 issue of *Economic Trends*, and as they would have been at that date if the quarterly rather than annual indicators had been used

where the two differ. It will be seen that the difference between the two series, that is, the overall final adjustment, is not large and does not change much from year to year. These adjustments are made at Order level and the overall index for each quarter is produced by combining the results for each Order, using the full weights as in the annual index.

### Index numbers of gross domestic product at constant factor cost

Seasonally adjusted (1963 = 100)

		After final adjustment (as published)	Before adjustment
1965	1st quarter	108.4	108.3
	2nd quarter	108.2	108.1
	3rd quarter	108.9	108.9
	4th quarter	110.0	109.9
	Year	108.8	108.8
1966	1st quarter	110.6	110.4
	2nd quarter	110.7	110.4
	3rd quarter	111.0	110.8
	4th quarter	110.1	109.9
	Year	110.6	110.4
1967	1st quarter	110.5	110.3
	2nd quarter	112.1	111.8
	3rd quarter	112.5	112.1
	4th quarter	114.1	113.7
	Year	112.4	112.0
1968	1st quarter	115.9	115.4
	2nd quarter	115.7	115.1
	3rd quarter	117.0	116.3
	4th quarter	118.2	117.5
	Year	116.7	116.1

#### Reliability

The reliability of the estimates should be considered in the light of what they are intended to achieve. The object of the calculation is not to measure the absolute level of output, but changes in the level of output. Even if full and complete information were available, the statistical and conceptual problems involved in the calculation of constant price estimates and index numbers would still remain. It must be realised that an estimate of this nature is to some extent an arbitrary measure, and its movement should only be interpreted in the light of the conventions and solutions adopted in its compilation, for example the use of base-year weights and the restricted definition of output for public services. However, if these limitations are realised then the measure of change in output over one period can reasonably be compared with that for another period.

A guide to the reliability of the estimates of output can thus only be given in the context of the principles adopted in its compilation, that is, whether the data available are adequate for this purpose. The reliability of the indices for agriculture, mining, manufacturing industries and gas, electricity and water over periods of up to say, five years, may be described as good. Those for construction, transport and communication and distributive trades are fair. The reliability of the indices within the

other four Orders varies a good deal and depends greatly on the underlying concepts. Accepting the conceptual approach, the indices for the Orders as a whole, allowing for compensation between errors in the estimates for constituent sections, can be regarded as fair. The reliability of the overall index of output as based on the concepts used in its compilation, can be described as good. However, it must be remembered that outside the field of the index of industrial production, many of the estimates for the latest year and some of the estimates for the previous year may subsequently be revised, as the full data gradually become available.

The quarterly index of output is necessarily less reliable than the annual index. The quarterly indices for the latest year are more liable to error since they are in part based on provisional information and are subject to adjustment when the full annual data become available. The estimates for the latest quarter are less reliable than those for earlier quarters because not all the information is available in time for the first published estimates.

#### The published tables

The estimates of output at constant prices are prepared and published on the basis of the 1968 Standard Industrial Classification. The table of the weights and indicators used for the estimates of output at constant prices given in Appendix II follows the Orders and Minimum List Headings of this Classification. As well as these 27 Orders, the Ownership of dwellings is also distinguished separately from real estate within the Insurance, banking, finance and business services Order, as elsewhere in the national accounts. This is because of its special interest and because much of the income, actual and imputed, is received by individuals, including owner-occupiers.

*National Income and Expenditure* includes one table (Table 15 of the 1969 Blue Book) on output at constant prices which gives index numbers of output from 1948 onwards at constant factor cost for 17 industrial groups, for total manufacturing, for total industrial production and for all industries combined. All of the industrial Orders outside of manufacturing are separately shown and so is the ownership of dwellings.

#### Quarterly estimates

Official quarterly estimates of output at constant prices were first published in 1966 and have been compiled back to 1958.<sup>19</sup> The estimates are compiled and presented in the same way as the annual figures, but the data available for the quarterly estimates are generally in less detail than for the annual estimates. Some of the industrial Orders are therefore combined before they are presented in the quarterly table, and the table gives estimates for only four groups outside of industrial production, compared with eight given annually.

<sup>19</sup> The estimates are published on a seasonally adjusted basis in *Economic Trends*, as part of the quarterly article on national income, and in the *Monthly Digest of Statistics*. Full runs of quarterly figures are given each year in the October *Economic Trends*.

## Seasonal adjustment

The several calculation stages employed to obtain the unadjusted index numbers from the original output and employment data have been described for all industries in the gross domestic product. These index numbers represent, for the index of production industries, the average weekly output during the period covered by the calendar month and for the remaining industries the total output in the quarter. They still reflect variation in output caused by special circumstances such as strikes and abnormal weather conditions, variations caused by public holidays and those caused by the annually recurring patterns of behaviour of the output series. In addition to these three sources of variation an economic time series of this type will always contain irregular short-period variations of unknown cause. The purpose of the seasonal adjustment procedure is to remove the more regular or predictable sources of variation in the series, which include the annual or seasonal pattern, so that the other variations may be more easily observed. The most important of these to the user is the trend of the series, and this is more apparent after seasonal adjustment though the index numbers still show irregular variations, including those due to strikes and abnormal weather conditions.

The adjustment method may be applied to the individual component series, or to arbitrary groupings of series. The current procedure is to group the series for similar industries and obtain composite indices which cover a complete or major part of a Standard Industrial Classification Order and to seasonally adjust these groups. The total index may be adjusted either by weighting together the adjusted component groups, or by adjusting the original total directly. The choice between the two methods is not too significant since both give similar results. The second method is used to obtain the adjusted total manufacturing figure, and the first method is used for the other aggregates, namely the total index of industrial production and the index of gross domestic product.

The seasonal adjustment is achieved in two stages although the first of these is applied only to the index of production industries. This removes the effects due to the public holidays, and the second stage applies a standard ratio to moving average method to remove the regular annual or seasonal pattern. The public holidays adjustments must be made separately since these are not in a strict sense seasonal adjustments. This is because the incidence of public holidays varies from year to year between calendar months. For example Easter can occur in either March or April, and the late summer Bank Holiday may fall in either August or September. There are also apparent movements of the public holidays caused by the nature of calendar periods employed in some of the production statistics, for example the new year holiday may be reflected in the December or January figures according to the incidence of the collection periods. The holiday adjustment is used also to allow for known or suspected changes in the summer holiday patterns within each industry. For many industries

summer holidays cause a drop in output which is spread over several months and this can be adjusted by the conventional seasonal adjustment. Some industries, however, close for a fixed period each year, and this period may move, for example from August to July from one year to another. The adjustment for this type of holiday effect must be made in the same manner as for the public holidays. It is clear that each industry requires a different treatment in respect to these adjustments, so this is an important reason for separate seasonal adjustment by industry group.

Adjustments to allow for loss of output due to holidays are clearly larger in a monthly than in a quarterly series. This is because most of the shifts in holiday patterns occur wholly within a calendar quarter. For example, the movements of summer holidays between July and August does not alter the overall third quarter output figure. Furthermore, the loss of one or two days' production due to a public holiday has a much smaller percentage effect on a quarterly total than on a monthly one. Also in the case of service industries covered by employment indicators (i.e. numbers on the payroll) there is no holiday variation in the series. For these reasons the adjustment process is omitted for all industries outside the index of production.

The method of holiday adjustment is as follows. A set of 12 monthly factors for each industry group is chosen to compensate for the loss of output due to the various holidays in the year, and these are scaled so that the average factor over the calendar year is equal to unity. The magnitudes of the chosen factors depend upon the duration of the holiday, and can be estimated sometimes from direct information on loss of output by the industry, but more usually from previous experience of the effect of corresponding holidays in previous years. A strict application *pro rata* of working days lost is not normally used in the factor, since this is found frequently to overstate the true loss of output.

An example of an industry which provides information on holidays is the deep-mined coal industry, which estimates for each four/five weekly period the loss of production due to recognised holidays. From this figure the percentage of output lost can be easily derived for the period, and this is used as the holiday adjustment factor.

The holiday adjusted monthly series or the original quarterly series is seasonally adjusted in a conventional manner as the second stage of the seasonal adjustment calculation. The method used is the X-11 variant of the Census Method II Seasonal Adjustment Program. This program is described in the Technical Paper No. 15 of the US Department of Commerce, Bureau of the Census. It is a development of earlier programs by the Bureau, which were written chiefly by Dr. J. Shiskin.

The program analyses the series into three components in a multiplicative model, namely

$$T = C \cdot S \cdot I$$

where  $T$  is the total unadjusted series,  $C$  the cyclical or trend component,  $S$  the monthly seasonal factor and  $I$  the residual irregular component.

The estimates of the trend and of the monthly or quarterly seasonal factors are made by the application of suitable moving averages to the series since both these components are assumed to have a smooth variation, in time, the trend varying smoothly in successive periods, and the seasonal moving over the corresponding periods in successive years. The seasonal factor for each month or quarter is permitted to change slowly to reflect changes in output over a number of years.

In order to separate the trend and seasonal components it is necessary to apply the moving averages by an iterative process. The first step is to approximate to the trend with a simple centred 12-month or four-quarter moving average. This procedure does not give a good estimate of the trend, but when this is divided into the original series, a first estimate is obtained of the seasonal-irregular ratios from which little of the seasonal element has been removed. A moving average over the 12 (or 4) sets of ratios—one for each month or quarter—is then applied to obtain a first estimate of the seasonal factors. A variety of moving average options is available to the user of the program, where the choice made for each period in the year depends upon the expected rate of variation over time in the seasonal factor for that period.

This seasonal factor is then removed from the original series by division to obtain a series containing the trend and the irregular component, and to this is applied a more sophisticated trend moving average (13 points for

the monthly or five points for the quarterly series) which is flexible enough to follow the peaks and troughs more closely than the yearly moving average used at the first stage. A better estimate of the seasonal-irregular ratios is obtained by removing this trend from the original series, and the complete set of calculation stages is repeated twice more to improve further the estimates of the trend and seasonal factors. The final adjusted series is then defined as the original series divided by the seasonal factors, so that it contains the trend and irregular components only.

A feature of the program is the method of detecting and eliminating extreme values in the original series. This is done by a progressive replacement of the extreme values in the seasonally adjusted series by the trend value as their departure from the trend value becomes greater. It is important to note that this replacement of extremes applies only at the intermediate calculation stages. Thus the trend and seasonal factors are not influenced by extreme values, but all the original extremes are present in full in the final seasonally adjusted series.

It is possible to run the seasonal adjustment program each time the latest monthly or quarterly member of the series becomes available, so that seasonal factors and trend are continually up-dated. This approach would result in frequent small revisions to the adjusted series and this disadvantage is overcome by running the program less frequently, and using forecast values of the seasonal factors for the most recent periods until the run which includes them is made. A forecast for this purpose is made by the X-11 program of the seasonal factors for 12 months or four quarters beyond the current end of the time series. This facility is used in the adjustment of all of the output series, in such a manner that at any point in time, the seasonal factors employed in the current calendar year are the forecast values.

# APPENDIX I

## Series and weights used in the index of industrial production

The series used in the index of production together with their corresponding weights have been arranged in accordance with the *Standard Industrial Classification 1968* and are given in the table below. Unless otherwise stated, the series cover the United Kingdom and relate to production. In those cases where the 'unit' column of the table shows that the series relate to money values, adjustments have been made for price changes.

Standard industrial classification							
Order	Minimum List heading	Industry	Series	Period of series	Unit	Weight per 1,000	Remarks
II		<b>Mining and quarrying</b>				55.76	Estimated net output in 1963, £740.2 million
101	Coal mining	Coal mined:	Bituminous	Weekly	Thousand tons	1.71	
			Unscreened	"	"	11.60	
			Large Graded	"	"	10.79	
			Treated smalls	"	"	10.78	
			Untreated smalls	"	"	11.53	
			Anthracite	"	"	1.32	
102	Stone and slate quarrying and mining	Cement		Four/five weekly	Thousand tons	2.92	
103	Chalk, clay, sand and gravel extraction	Aggregate (Great Britain)		Quarterly	Thousand cubic yards	3.16	
		China clay		"	Thousand tons		
104	Petroleum and natural gas	Natural gas		Monthly	Million therms	0.08	
		Indigenous crude oil		"	Thousand tons		
109	Other mining and quarrying	Iron ore		4/5 weekly	Thousand tons	0.61	
		Tin ore (metal content)		Monthly	Tons	0.07	
		Salt		"	"	0.96	
		Gypsum (excluding anhydrite) (Great Britain)		"	Thousand tons	0.23	
III		<b>Food, drink and tobacco</b>				84.39	Estimated net output in 1963, £1,120.2 million
211	Grain milling	Flour produced		Four/five weekly	Thousand tons	2.96	
		Oats milled		"	"	0.25	Input
		Breakfast cereals		"	"	1.46	
		Wheat milling offals		"	"	0.57	
212	Bread and flour confectionery	Flour for bread		Monthly	Index	6.03	Input
		Sales of cakes and flour confectionery		Quarterly	£ thousand	4.08	
213	Biscuits	Biscuits		Four/five weekly	Thousand tons	3.96	
214	Bacon curing, meat and fish products	Bacon and ham produced		Four/five weekly	Thousand tons	1.60	
		Sausages and meat pies		Quarterly	"	1.90	Sales
		Canned meat		"	"	1.23	
		Quick frozen meat and meat products		"	"	0.35	
		Quick frozen white fish products		"	"	0.57	
		Herrings for curing		"	"	0.12	Input
215	Milk and milk products	Heat treatment of milk		Monthly	Million gallons	0.94	Liquid milk sales
		Butter (excluding farm production)		"	Thousand tons	0.22	Input; based on milk usage
		Butter consumption		"	"	0.22	Representing butter blending
		Cheese		"	"	0.72	Input; based on milk usage
		Milk for cream		"	Million gallons	0.41	Input; based on milk usage
		Condensed milk		"	Thousand tons	0.49	
		Milk powder		"	"	0.08	
		Ice cream		Four/five weekly	Gallons	0.42	Index comprising three separately weighted series
216	Sugar	Raw sugar from home grown beet		Four/five weekly	Thousand tons	2.71	Refined equivalent
		Refined sugar from imported and home grown raws					
217	Cocoa, chocolate and sugar confectionery	Sugar confectionery		Four/five weekly	Thousand tons	2.19	
		Chocolate confectionery		Quarterly	"	5.23	Despatches
		Chocolate couverture, cocoa powder and drinking chocolate					
218	Fruit and vegetable products	Jam and marmalade		Four/five weekly	Thousand tons	0.82	
		Table jellies		Quarterly	"	0.18	
		Canned and bottled fruit (including pie fillings)		"	"	0.36	
		Canned vegetables		"	"	0.82	
		Frozen vegetables		"	"	0.82	
		Pickles, sauces, etc.		Four/five weekly	"	0.70	
		Canned soups		Quarterly	"	1.71	
		Potato crisps		"	"	0.60	Input; usage of potatoes

Appendix I (cont'd.)

Standard industrial classification

Order	Minimum list heading	Industry	Series	Period of series	Unit	Weight per 1,000	Remarks	
III (cont'd.)	219	Animal and poultry foods	Compound feeding stuffs by provender millers and compounders Cat and dog foods, canned Cat and dog foods, dry	Four/five weekly " "	Thousand tons Tons } "	4.18 0.96		
	221	Vegetable and animal oils and fats	Oilcake produced Refined deodorised oil; hardened Refined deodorised oil; unhardened	Four/five weekly " "	Thousand tons " "	5.46		
	229	Food industries not elsewhere specified	Margarine Compound cooking fat Glucose Maize starch Coffee; liquid essence Coffee; dry extracts Tea blending	Four/five weekly " " Quarterly " "	Thousand tons " " Thousand gallons Thousand tons "		Tea disposals	
	231	Brewing and malting	Beer	Monthly	Million bulk barrels		14.56	
	232	Soft drinks	Soft drinks; concentrated Soft drinks; unconcentrated	Monthly "	Thousand gallons "		1.03 1.68	
	239	Other drink industries	Potable spirits produced Home consumption of mature home produced spirits Exports of home produced spirits Cider British wines	Monthly " " " "	Million proof gallons " " Thousand gallons "		1.15 0.70 2.83 0.26 0.32	Represents blending
	240	Tobacco	Cigarettes; plain Cigarettes; tipped Cigars Tobacco	Quarterly " " "	Million lb. } " " "	6.54	Sales by weight. Monthly index numbers based on consumption of tobacco	
IV		<b>Coal and petroleum products</b>				7.38	Estimated net output in 1963, £98.0 million	
	261	Coke ovens and manufactured fuel	Coke from coke ovens Coal consumption by low temperature carbonisation plants Coal consumption by briquetting works	Four/five weekly Monthly "	Thousand tons " "	1.84	Input Input	
	262	Mineral oil refining	Aviation and motor spirits Industrial and white spirits Burning oil Vaporising oil Gas and diesel oils Marine diesel oil Fuel oil Lubricating oils Bitumen Paraffin wax Propane Butane Other petroleum gases Naphtha (light distillate feedstock) Other refinery products	Monthly " " " " " " " " " " " " " "	Thousand tons " " " " " " " " " " " " " "	3.78	Comprising 19 separately weighted series	
	263	Lubricating oils and greases	Lubricating oils (United Kingdom refineries)	Monthly	Thousand tons	1.76	Input	
V		<b>Chemicals and allied industries</b>				63.62	Estimated net output in 1963, £844.4 million	
	271	General chemicals	Inorganic chemicals (including inorganic gases) Coal tar products: Crude tar distilled Crude benzole refined Monomers Other organic chemicals Miscellaneous chemical products	Monthly Quarterly " " " Monthly	Tons (or thousand cubic ft.) Tons } Gallons } Tons Tons (or million cubic ft.) Tons	7.10 1.22 4.61 2.87 7.10	Comprising 28 separately weighted series Comprising 17 separately weighted series Comprising 25 separately weighted series Comprising 9 separately weighted series	
	272	Pharmaceutical chemicals and preparations	Prescriptions dispensed (England and Wales) Exports of pharmaceutical preparations Exports of pharmaceutical chemicals	Monthly " "	Pence } £ thousand } "	8.29	Cost of ingredients deflated Value deflated Value deflated	
	273	Toilet preparations	Toilet preparations and perfumery	Monthly	£ thousand	2.50	Sales by manufacturers deflated adjusted quarterly by 8 separately weighted series	
	274	Paint	Oil and synthetic based paints, emulsion paints, spirit based paints, cellulose based paints, other paints, enamels, varnishes and thinners Putty, mastics and fillers	Monthly "	Thousand gallons } Thousand cwt. }	4.64	Sales by manufacturers adjusted quarterly by 14 separately weighted series	

Appendix I (cont'd.)

Standard industrial classification

Order	Minimum list heading	Industry	Series	Period of series	Unit	Weight per 1,000	Remarks
V (cont'd.)	275	Soap and detergents	Detergents	Monthly	Tons	2.52	Sales by larger manufacturers adjusted quarterly by 2 separately weighted series Production adjusted quarterly by 4 separately weighted series of manufacturers' deliveries
			Soap	"	"		
			Scouring preparations	"	"		
276	Synthetic resins and plastics materials and synthetic rubber	Thermosetting synthetic resins	Quarterly	Tons	7.47	Comprising 8 separately weighted series Comprising 12 separately weighted series Comprising 7 separately weighted series Comprising 9 separately weighted series	
		Thermoplastic synthetic resins	"	"			
		Thermosetting plastics materials	"	"			
		Thermoplastic plastics materials	"	"			
		Transparent regenerated cellulose film	Monthly	"			
		Siloxanes Polyamides for fibres Synthetic rubber	"	"			
277	Dyestuffs and pigments	Synthetic dyestuffs	Monthly	Thousand lb.	3.80	Comprising 11 separately weighted series Comprising 3 separately weighted series Comprising 5 separately weighted series	
		Pigments other than colours	"	Tons			
		Colours	Quarterly	Thousand cwt.			
278	Fertilizers	Ammonium nitrate	Monthly	Tons	2.57	Sales by manufacturers	
		Ammonium sulphate	"	"			
		Ground rock phosphate	"	"			
		Single super phosphate	"	"			
		Triple super phosphate	"	"			
		Basic slag	"	"			
		Compounds	"	"			
279/1	Polishes	Floor and furniture polishes	Quarterly	Thousand cwt.	1.10	Sales by manufacturers	
		Leather polishes	"	"			
		Car polishes	"	"			
		Metal stove glass and other polishes and dressings	"	"			
		Sanitary cleaners	"	"			
279/2	Formulated adhesives, gelatine, etc.	Formulated adhesives, gelatine etc.	Quarterly	Index	0.98	Comprising 3 separately weighted series Glue and gelatine monthly	
279/3	Explosives and fireworks	Industrial explosives	Monthly	Short tons Index Number	3.03	Comprising 7 separately weighted series of quantities produced	
		Military explosives	Quarterly				
		Matches	Monthly				
279/4	Formulated pesticides, etc.	Insecticides	Quarterly	£ thousand	1.11	Sales by manufacturers deflated	
		Fungicides	"				
		Herbicides	"				
		Other pesticides	"				
279/5	Printing ink	Index for paper, printing and publishing	Quarterly	Index Tons	0.83	Input	
		Exports of printing ink	Monthly				
279/6	Surgical bandages, etc.	No series				Weight spread over remainder of MLH	
279/7	Photographic chemical materials	Cinematographic film, x-ray film, other film and sensitized paper	Quarterly	£ thousand	1.88	Comprising 4 separately weighted series of deliveries by manufacturers deflated	
VI	<b>Metal manufacture</b>					60.15	Estimated net output in 1963, £798.4 million
311	Iron and steel (general)	Steel ingots and castings	Weekly	Thousand tons	28.13	Adjusted quarterly by an index (Steel—crude, semi-finished, and finished excluding tubes) comprising 42 separately weighted items, prepared by the steel industry's joint Iron and Steel Statistics Bureau	
		Finished steel (deliveries)	Four/five weekly				
312	Steel tubes	Steel tubes : alloy	Four/five weekly	Thousand tons	1.41	33.76	
		non-alloy	"	"	4.22		
313	Iron castings, etc.	Pig iron	Four/five weekly	Thousand tons	0.63	Adjusted quarterly by 6 separately weighted groups of items	
		Iron castings including engineers' castings from Orders VII, X and XI	"	"	11.37		
321	Aluminium and aluminium alloys	Aluminium : virgin ingots	Monthly	Tons	0.16		
		secondary ingots	"				
		sheet and strip	"				
		extrusions	"				
		foil	"				
		castings forgings	"				
		Aluminium : virgin ingots	Monthly	Tons	5.31		
		secondary ingots	"				
		sheet and strip	"				
		extrusions	"				
		foil	"				
		castings forgings	"				



# Appendix I (cont'd.)

## Standard industrial classification

Order	Minimum list heading	Industry	Series	Period of series	Unit	Weight per 1,000	Remarks
IX (cont'd.)	363	Telegraph and telephone apparatus and equipment	Telegraph and telephone apparatus and equipment	Monthly <sup>1</sup>	£ thousand	6.62	Value of deliveries deflated
	364	Radio and electronic components	Radio and electronic components	Monthly <sup>1</sup>	£ thousand	7.10	Value of deliveries deflated comprising 3 series
	365	Broadcast receiving and sound reproducing equipment	Broadcast receiving and sound reproducing equipment	Monthly <sup>1</sup>	£ thousand	5.29	Value of deliveries deflated comprising 2 series
	366	Electronic computers	Electronic computers	Monthly <sup>1</sup>	£ thousand	1.96	Value deliveries deflated
	367	Radio, radar and electronic capital goods	Radio, radar and electronic capital goods	Monthly <sup>1</sup>	£ thousand	8.58	Value of deliveries deflated comprising 2 series
	368	Electric appliances primarily for domestic use	Electric appliances primarily for domestic use	Monthly <sup>1</sup>	£ thousand	6.40	Value of deliveries deflated
	369	Other electrical goods	Other electrical goods	Monthly <sup>1</sup>	£ thousand	9.45	Value of deliveries deflated comprising 6 series
X	<b>Shipbuilding and marine engineering</b>					15.38	Estimated net output in 1963, £204.2 million
	370	Shipbuilding and marine engineering	Shipbuilding and ship repairing (employment) Marine engineering (employment)	Monthly <sup>1</sup> "	} }	15.38	
XI	<b>Vehicles</b>					80.49	Estimated net output in 1963, £1,068.4 million
	380	Wheeled tractor manufacturing	Wheeled tractors of 10 belt h.p. and over Components and accessories	Monthly "	Number £ thousand	3.63 0.40	Value of deliveries deflated
381	Motor vehicle manufacturing	Passenger cars: 1,000 cc and under Over 1,000 cc but not over 1,600 cc Over 1,600 cc but not over 2,800 cc Over 2,800 cc Commercial vehicles: Under 1½ tons carrying capacity 1½ tons but not over 3 tons carrying capacity Over 3 tons but not over 5 tons carrying capacity Over 5 tons but not over 7 tons carrying capacity Over 7 tons but not over 10 tons carrying capacity Over 10 tons carrying capacity Motive units for articulated vehicles Omnibuses, coaches and trolley buses: 8-15 seating capacity Over 15 seating capacity single deck double deck Components and accessories for motor vehicles		Four/five weekly	Number	3.16	
				"	"	11.64	
				"	"	4.72	
				"	"	1.70	
				"	"	0.90	
				"	"	1.51	
				"	"	0.61	
				"	"	0.47	
				"	"	1.51	
				"	"	2.78	
				"	"	0.38	
				"	"	0.10	
				"	"	0.47	
				"	"	0.23	
		Monthly	£ thousand	16.97	Value of deliveries deflated		
382	Motor cycle, tricycle and pedal cycle manufacturing	Mopeds Scooters Conventional motor cycles Pedal cycles Components and accessories		Monthly	Number } " } " }	0.36	
				"		0.70	
				"		0.53	Value of deliveries deflated
				Monthly	£ thousand		
383	Aerospace equipment manufacturing and repairing	Aerospace equipment manufacturing and repairing	Quarterly	£ thousand	22.77	Value of deliveries and work done deflated by index of input costs	
384	Locomotives and railway track equipment	Output of railway workshops Output by private manufacturers	Weekly	£ thousand } " }	2.19	British Railways and London Transport expenditure on new construction and repair work deflated Value of deliveries and repair work deflated	
			Monthly				
385	Railway carriages and wagons and trams	Output of railway owned works Other manufacturers	Weekly	£ thousand } " }	2.76	British Railways and London Transport expenditure on new work deflated Value of deliveries and repairs deflated	
			Monthly				
XII	<b>Metal goods not elsewhere specified</b>					48.47	Estimated net output in 1963, £643.3 million
	390	Engineers' small tools and gauges	Engineers' small tools and gauges	Monthly	£ thousand	5.14	Value of deliveries deflated
	391	Hand tools and implements	Hand tools and implements	Monthly	£ thousand	1.59	Sales by manufacturers deflated
	392	Cutlery, spoons, forks and plated tableware, etc.	Cutlery, spoons and forks Razor blades: safety carbon steel safety stainless steel Razor sets: safety	Quarterly	£ thousand } Thousands }	1.63	Sales by manufacturers Sales by manufacturers Sales by manufacturers
				"			

<sup>1</sup> Supplemented by a more comprehensive quarterly enquiry.



**Appendix I (cont'd.)**
**Standard industrial classification**

Order	Minimum list heading	Industry	Series	Period of series	Unit	Weight per 1,000	Remarks
XIII (cont'd.)	416	Rope, twine and net	Agricultural twines Other ropes, twines, cords and lines of hard hemp Synthetic cordage	Monthly " "	Tons " "	0.23 0.52 0.06	Deliveries
	417	Hosiery and other knitted goods	Hosiery	Monthly	£ thousand	8.34	Sales by manufacturers deflated Adjusted quarterly by 5 separately weighted series of manufacturers' sales deflated and two series of quantities of fabric delivered  Men's hose <i>Weight</i> 0.44 Women's ankle socks, girls' hose, children's short and three-quarter length socks 0.21 Women's stockings, tights and pantihose of synthetic fibres 2.10 Underwear and nightwear 1.27 Outerwear including gloves 3.28 Warp knitted fabric 0.56 Weft knitted fabric 0.48
	418	Lace	Products of warp knitting and schliiffli machines Other laces	Quarterly "	£ thousand Index	0.32 0.34	Sales by manufacturers deflated Index of machine activity Separate series for products of: <i>Weight</i> Nottingham lace machines 0.11 Lavers machines 0.15 Plain net machines 0.08
	419	Carpets	Carpets	Monthly	£ thousand	3.43	Sales by manufacturers deflated Adjusted quarterly by 4 separately weighted series of quantities sold: <i>Weight</i> Wool carpets and rugs 2.34 Man-made fibre or hair carpets and rugs 0.44 Pile fabric and other rugs 0.17 Tufted carpets 0.48
	421	Narrow fabrics (not more than 30 cm. wide)	Woven, braided, knitted, netted, etc., narrow elastic goods Solid woven machinery belting woven on narrow looms Other non-elastic narrow fabrics	Quarterly " "	£ thousand " "	1.27	Sales by manufacturers deflated
	422/1	Household textiles and handkerchiefs	Converters deliveries of cloth for household textiles	Quarterly	Million sq. yds.	1.02	Input
	422/2	Canvas goods and sacks and other made-up textiles					Included with Heading 415
	423	Textile finishing	Yarn bleaching Yarn dyeing Piece bleaching  Piece dyeing Piece printing Finishing Woollen and worsted finishing Hosiery finishing Foam backing	Monthly " "  " " " " " "	Thousand lb. " Thousand linear yds. " " " Index " Thousand sq. yds.	0.07 0.27 0.38  1.19 0.74 0.19 0.66 1.06 0.08	Index based on Heading 414 Index based on Heading 417
	429/1	Asbestos	Asbestos	Monthly	£ thousand	2.43	Manufacturers' sales deflated
	429/2	Other textile industries	Employment (Great Britain)	Monthly	—		Adjusted for annual and public holidays
XIV		<b>Leather, leather goods and fur</b>				4.30	Estimated net output in 1963, £57.1 million
	431	Leather (tanning and dressing) and fellmongery	Leather tanning and dressing	Monthly	Index	4.30	Index based on 67 separately weighted series of quantities produced
	432	Leather goods	Employment (Great Britain)	Monthly	—		Adjusted for annual and public holidays
	433	Fur	Employment (Great Britain)	Monthly	—		Adjusted for annual and public holidays

Appendix I (cont'd.)

Standard industrial classification

Order	Minimum list heading	Industry	Series	Period of series	Unit	Weight per 1,000	Remarks
XV		<b>Clothing and footwear</b>				27.08	Estimated net output in 1963, £359.5 million
441		Weatherproof outerwear	Made-up clothing	Monthly	£ thousand	18.80	Sales by manufacturers deflated
442		Men's and boys' tailored outerwear		Monthly	£ thousand		
443		Women's and girls' tailored outerwear		Monthly	£ thousand		
444		Overalls and men's shirts, underwear, etc.		Monthly	£ thousand		
445		Dresses, lingerie, infants' wear		Monthly	£ thousand		
449/1		Corsets and swimwear		Monthly	£ thousand		
449/3		Umbrellas and walking sticks		Monthly	£ thousand		
449/4		Other dress industries not elsewhere specified		Monthly	£ thousand		
446		Hats, caps and millinery	Men's felt hats and caps: wool fur Ladies' felt hats: wool fur	Monthly " " "	Dozens of hats " " "	0.27 0.21	Sales by manufacturers
449/2		Gloves	Dress gloves: leather fabric and vinyl Industrial gloves: leather fabric and vinyl	Quarterly " " "	Thousand dozen pairs " " "	0.31 0.16	
450		Footwear	Boots and shoes	Monthly	Thousand pairs	7.33	Adjusted quarterly by 9 separately weighted series of quantities produced:  <i>Weight</i> Men's and youths' shoes with leather uppers 1.91 Women's and maids' shoes with leather uppers 2.99 Boys' shoes with leather uppers 0.33 Girls' shoes with leather uppers 0.43 Infants' shoes with leather uppers 0.23 Footwear with uppers wholly or mainly of other materials 0.56 Slippers, house shoes and ballet shoes 0.57 Rubber protective footwear 0.29 Plastic protective footwear 0.02
XVI		<b>Bricks, pottery, glass, cement, etc.</b>				28.95	Estimated net output in 1963, £384.3 million
461		Bricks, fireclay and refractory goods	Refractories (bricks, etc.) Building bricks (Great Britain) Clay roofing tiles (Great Britain) Stoneware pipes (Great Britain) Other unglazed tiles including quarry tiles (Great Britain)	Monthly " " " "	Thousand tons Millions Thousand squares Thousand tons Thousand sq. yds.	1.43 3.96 0.09 0.24 0.20	Comprising 14 separately weighted series Comprising 5 separately weighted series
462		Pottery	Electrical ware Glazed tiles (Great Britain) China Earthenware, stoneware, jet and Rockingham	Monthly " " "	£ thousand Thousand sq. yds. £ thousand "	0.52 1.20 1.87	Sales by manufacturers deflated Sales by manufacturers deflated
463		Glass	Domestic and fancy glassware Illuminating glass Scientific and industrial glassware Glass containers Flat glass Vacuum flasks Ampoules and vials Safety glass	Four/five weekly " " " Monthly Four/five weekly " "	£ thousand " " Thousand gross Square feet Number Gross Square feet	6.75	Sales by manufacturers deflated Sales by manufacturers
464		Cement	Cement Concrete roofing tiles (Great Britain)	Four/five weekly Monthly	Thousand tons Thousand squares	4.90 0.93	Partly input
469/2		Building materials, etc., not elsewhere specified	Plasterboard (Great Britain) Plaster (Great Britain) Asbestos cement goods (Great Britain) Concrete building blocks Ready mixed concrete	Monthly " Four/five weekly Monthly Quarterly	Thousand sq. yds. Thousand tons " Thousand yards super Thousand cubic yards	1.13 0.60 0.95 1.81 1.27	

**Appendix I (cont'd.)**
**Standard industrial classification**

Order	Minimum list heading	Industry	Series	Period of series	Unit	Weight per 1,000	Remarks
XVI (cont'd.)	469/1	Abrasives	Bonded abrasives including diamond abrasives Coated abrasives	Quarterly "	£ thousand "	0.81 0.29	Sales by manufacturers deflated
XVII		<b>Timber, furniture, etc.</b>				21.03	Estimated net output in 1963, £259.2 million
	471/1	Sawmilling, etc.	Sawmill output from home grown softwood Sawmill output from home grown hardwood Home produced plywood Home produced chipboard Apparent consumption of imported softwood Apparent consumption of imported hardwood	Monthly " " " "	Cubic feet " Cubic metres Tons Standards Cubic feet	3.83	Input; standards of 165 cu. ft. Input
	472	Furniture and upholstery	Domestic furniture	Monthly	£ thousand	7.28	Deliveries by manufacturers deflated
	473	Bedding, etc.	Divans and bases Spring interior mattresses Foam mattresses Other bedding	Quarterly " " "	£ thousand " " "	1.48	Sales by manufacturers deflated
	471/2	Other woodwork for buildings	Sawmill output from home grown softwood Sawmill output from home grown hardwood	Monthly "	Cubic feet "		Input Input
	474	Shop and office fitting	Home produced plywood Apparent consumption of imported softwood	" "	Cubic metres Standards	8.44	Input Input; standards of 165 cu. ft.
	475	Wooden containers and baskets	Apparent consumption of imported hardwood	"	Cubic feet		Input
	479	Miscellaneous wood and cork manufactures	Apparent consumption of imported plywood	"	Cubic metres		Input
XVIII		<b>Paper, printing and publishing</b>				58.81	Estimated net output in 1963, £780.6 million
	481	Paper and board	Newsprint Other uncoated printing and writing paper Wrappings Tissue Industrial and special purpose papers Packaging board Other board	Four/five weekly " " " " " "	Tons " " " " " "	1.00 3.01 1.71 1.03 0.79 1.48 0.86	
	482	Packaging product of paper, board and associated materials	Cartons Rigid boxes Solid fibreboard packing cases Corrugated fibreboard packing cases Paper bags and carrier bags Multiwall paper sacks Film bags	Four/five weekly " " " " " "	Tons " " " " " "	1.92 0.84 0.35 1.70 0.44 0.53 0.24	
	483	Manufactured stationery	Manufactured stationery	Monthly	£ thousand	2.72	Sales by manufacturers deflated
	484	Manufactures of paper and board not elsewhere specified	Gummed and self-adhesive tapes, papers and boards, serviettes, doyleys, jam pot covers, etc. Wallpaper base Household toilet papers and tissues	Quarterly Four/five weekly	£ thousand Tons "	3.40	Sales by manufacturers deflated Input
	485	Printing, publishing of newspapers	Consumption of newsprint	Four/five weekly	Tons	16.87	Input
	486	Printing, publishing of periodicals					
	489	Other printing, publishing, bookbinding, engraving, etc.	Sales by book publishers Consumption of printing and writing paper	Quarterly "	£ thousand Tons	19.92	Sales by manufacturers deflated Input
XIX		<b>Other manufacturing industries</b>				24.71	Estimated net output in 1963, £328.0 million
	491	Rubber	Tyres and tubes Sheets and sheeting Hose and tubing Belting Soles and heels and soling sheet Cellular products Mats, matting, flooring, tiling, etc. Medical, surgical and dental goods Other rubber goods	Monthly " " " " " " " "	Number £ thousand " " " " " " "	4.90 6.25	Sales by manufacturers deflated
	492	Linoleum, plastics floor covering, leathercloth, etc.	Linoleum, thermoplastic flooring and tiling, etc. Leathercloth, decorative polyvinyl-chloride sheets, etc.	Quarterly "	Thousand sq. yds. "	2.50	
	493	Brushes and brooms	Brushes and brooms	Quarterly	£ thousand	0.82	Sales by larger manufacturers deflated

Appendix I (cont'd.)

Standard industrial classification

Order	Minimum list heading	Industry	Series	Period of series	Unit	Weight per 1,000	Remarks
XIX (cont'd.)	494	Toys, games, children's carriages and sports equipment	Toys and games Sports equipment Perambulators Bedfolders Pushchairs	Quarterly	£ thousand	2.41	Sales by manufacturers deflated
				Monthly	Thousands		
				"	"	0.34	
				"	"		
	495	Miscellaneous stationers' goods	Pens and pencils, etc. Tissue for carbonising	Quarterly Four/five weekly	£ thousand Tons	0.58 0.53	Sales by manufacturers deflated Input
496	Plastics products not elsewhere specified	Plastics materials consumption (including imports)	Monthly	£ thousand	6.08	The value of imports are deflated	
499/1	Musical instruments	Musical instruments	Monthly	£ thousand	0.30	Sales by manufacturers deflated	
499/2	All other manufacturing industries	No series				Weight for this item has been allocated between MLH Nos. 492-499/1	
XX		<b>Construction</b>				127.09	Estimated net output in 1963, £1,686.9 million
500	Construction	Construction (Great Britain)	Quarterly	Index	125.02	Index comprising 2 separately weighted series of the value of work done deflated. Monthly estimate based on operatives employed also used	
		Construction (Northern Ireland)	Quarterly	Index	2.07		
XXI		<b>Gas, electricity and water</b>				67.75	Estimated net output in 1963, £899.3 million
601	Gas	Gas available at gas works	Four/five weekly	Million therms	11.31		
		Coke produced at gas works (Great Britain)	"	Thousand tons	2.90		
602	Electricity	Electricity sent out (Electricity Boards only)	Monthly	Million Kwh	43.40		
603	Water supply	Employment (Great Britain)	Monthly	—	5.02		
601-603	Construction by gas, electricity and water undertakings	Construction by gas, electricity and water undertakings (Great Britain)	Quarterly	Index	5.12	Index comprising 2 separately weighted series of the value of work done	

## APPENDIX II

### Series and weights used from 1963 in estimating the gross domestic product at constant factor cost

Standard industrial classification					
Order	Minimum list heading	Industry	Weight per 1,000	Annual series	Quarterly series (if different from annual series)
I		<b>Agriculture, forestry, fishing</b>	34.4		
	001	Agriculture and horticulture	32.3	Net output (before deducting depreciation) of agricultural and horticultural holdings, and of agricultural contractors, at constant prices	Interpolation and projection of the annual figures
	002	Forestry	0.2 0.2 0.2 0.2	Forest area Area planted Production of hardwood Production of pitwood and softwood	} Represented by the two following indicators
	003	Fishing	1.3	Landings of British taking: weighted total of different types of fish	
II		<b>Mining and quarrying</b>	} 438.3	Index of industrial production <sup>1</sup>	
III-XIX		<b>Manufacturing</b>			
XX		<b>Construction</b>			
XXI		<b>Gas, electricity and water</b>			
XXII		<b>Transport and communication</b>	91.0		
	701	Railways		British Railways	} Number of passenger journeys
			2.7	Number of passenger miles: Full fare	
			1.8	Reduced fare	
			0.9	Season tickets	
			3.7	Number of freight net ton-miles: Coal and coke	
			1.2	Iron and steel	
			3.1	Other traffic	
			1.2	Parcels receipts, deflated	
			0.7	Mail: numbers of letters posted and parcels carried	
			1.1	London Transport railways: number of passenger-miles	
	702	Road passenger transport	1.6	London Transport road services: number of passenger-miles	} All operators: total number of passenger journeys
			1.8	Transport Holding Company <sup>2</sup> road services: number of passenger journeys	
			5.6	Other operators: number of passenger journeys	
			2.1	Taxis and private hire cars: consumers' expenditure at constant prices	
	703/704	Road haulage	20.3	Number of ton-miles for all road goods transport	Index of ton-miles for all road goods transport
	705	Sea transport		Freight receipts of vessels in foreign trade deflated by indices of freight rates:	
			4.0	Tankers	
			4.7	Dry cargo: Liners	
			0.9	Tramps	
				Passenger movement by Commonwealth ships (assumed that proportion of passengers carried by British ships is constant):	
			0.1	Between UK and Continent	
			0.9	Between UK and other countries	
			0.5	Vessels in coastal trade: arrivals and departures of Commonwealth ships with cargo (net tonnage)	
	706	Port and inland water transport	5.7	Total arrivals and departures of shipping at UK ports (net tonnage), representing port services	
			0.4	Inland waterways: net ton-miles	
	707	Air transport		All scheduled services:	
				Number of passenger-miles:	
			1.8	International	
			0.3	Domestic	
				Number of ton-miles:	
			0.2	Mail	
			0.3	Freight	
			0.6	Charter operations: Capacity ton-miles flown	
			0.3	Air transport landings at UK airports, representing airport services	

<sup>1</sup> See Appendix I

<sup>2</sup> National Bus Company and Scottish Bus group from 1969.

## Appendix II (cont'd.)

### Standard industrial classification

Order	Minimum list heading	Industry	Weight per 1,000	Annual series	Quarterly series (if different from annual series)	
XVII (cont'd.)	708	Postal services and telecommunications	5.1	Post Office: Number of letters and parcels posted	Number of machine-counted letters and number of parcels	
			0.1	Number of money orders issued		
			0.2	Number of postal orders cashed		
			0.3	Number of pensions and allowances paid <sup>3</sup>		
			0.1	Number of savings bank and Giro transactions <sup>3</sup>		
			0.1	Number of broadcast receiving licences issued <sup>3</sup>		
			0.1	Number of inland telegrams		
			0.4	Number of overseas telegrams		
				Number of telephone exchange connections:		
			2.4	Business		
			1.8	Residence		
				Number of telephone calls:		
			3.6	Trunk		
			2.1	Local		
0.4	International					
0.1	Number of telex calls					
	Number of private wire rentals:					
0.6	Telephone					
0.2	Telegraph					
1.3	Number of telegrams handled by cable companies	Represented by the remainder of the MLH				
	709	Miscellaneous transport services and storage	3.6	Number in employment	Represented by the remainder of the Order	
XXIII	<b>Distributive trades</b>		108.7			
	810	Wholesale distribution of food and drink	5.9	Volume of sales of food shops other than multiple retailers		
			1.0	Volume of sales of restaurants, cafés, etc.		
			0.3	Volume of sales of canteens		
				1.7	Volume of turnover of public houses	
	811	Wholesale distribution of petroleum products	3.4	Deliveries of petroleum products for inland consumption		
	812	Other wholesale distribution	0.2	Volume of consumers' expenditure on tobacco		
			0.5	Deliveries by merchant converters		
			0.1	Home consumption of newsprint		
			0.3	Home deliveries of other paper and board		
			9.4	Volume of sales of non-food shops other than multiple retailers		
				3.1	Volume of UK exports, representing export trade of merchants	
	820	Retail distribution of food and drink	7.1	Volume of sales of multiple food shops		
			15.9	Volume of sales of food shops other than multiple retailers		
821	Other retail distribution	17.6	Volume of sales of multiple non-food shops			
		26.1	Volume of sales of non-food shops other than multiples			
		0.8	Deflated cost of national health service prescriptions			
831	Dealing in coal, oil, builders' materials, grain and agricultural supplies	2.7	Separate indicators for domestic merchants' disposals of coal, boiler fuel and oil, for overseas shipments of coal, for coast-wise bunkers, and for some industrial consumption of coal			
		3.1	Index of industrial production for construction (Order XX)	Interpolation and projection of the annual figures		
		2.0	Separate indicators for deflated value of farmers' purchases of fertilisers and feedingstuffs, for wheat and oats milled and for total arable acreage under seed			
		0.1	Livestock (cattle two years old and over and sheep) on agricultural holdings			
832	Dealing in other industrial materials and machinery	1.1	Separate indicators for iron and steel scrap consumption at steel works and foundries, for home industrial consumption of scrap copper, zinc and lead, and for waste paper consumed by paper and board mills			
		4.9	Index of industrial production for manufacturing (Orders III-XIX)			
		0.8	Index of industrial production for construction (Order XX)			
		0.6	Volume of UK exports			
XXIV	<b>Insurance, banking, finance and business services</b>		71.1			
	860	Insurance	8.7	Consumers' expenditure on life assurance at constant prices	Number in employment in Order XXIV	
			0.4	Accident insurance: premiums paid less claims deflated by consumer price index (3-year average)		
			3.1	Fire insurance: premiums paid less claims deflated by price index for gross domestic capital formation (3-year average)		
			2.4	Marine, aviation and transit insurance: premiums paid less claims deflated by average of unit value indices for imports and exports (3-year average)		
			4.0	Motor vehicle insurance: premiums paid less claims deflated by price index of vehicles (3-year average)		
			4.3	Miscellaneous insurance: premiums paid less claims deflated by consumer price index (3-year average)		
	861	Banking and bill discounting	8.7	Number of cheques cleared		
			2.2	Total bank deposits deflated by consumer price index		
			1.7	Amount remaining invested in national savings deflated by consumer price index		
5.3			Bank advances deflated by consumer price index			

<sup>3</sup> Representing agency services.

<sup>4</sup> Quarterly figures are estimates.

Appendix II (cont'd.)

Standard industrial classification

Order	Minimum list heading	Industry	Weight per 1,000	Annual series	Quarterly series (if different from annual series)		
XXIV (cont'd.)	862	Other financial institutions	0.4	Building societies: Number of mortgage advances	From 1965: Number of mortgage advances Up to 1964: Value of mortgage advances deflated by price index of houses with vacant possession		
			0.4	Value of mortgages outstanding (deflated by price index of new houses)			
			0.4	Total liabilities (deflated by price index of new houses)			
			1.3	Stockbroking: From 1965: number of transactions on London Stock Exchange Up to 1964: number of bargains marked on London Stock Exchange			
			1.2	Stamp duty on share transfers deflated by index of share prices			
			1.2	New capital issues deflated by capital goods price index			
			0.4	Hire purchase and other instalment credit: New credit extended (deflated by durable goods price index)			
			0.4	Balance of credit outstanding (deflated by durable goods price index)			
			3.8	Parts of MLH 862 not covered above: represented by the remainder of the Order			
			863	Property owning and managing, etc.		2.7 13.8	Transfer costs of land and buildings at constant prices, representing estate agents, etc. Stock of commercial and industrial buildings, representing real estate industry
864	Advertising and market research	3.4	Represented by the remainder of the Order				
865	Other business services						
866	Central offices not allocable elsewhere			0.9			
XXV		<b>Professional and scientific services</b>		81.1			
871	Accountancy services	1.6	Number of Schedule D tax assessments: Individuals Partnerships Number of tax assessments on companies: From 1966/67, corporation tax Up to 1965/66, income tax	Number in employment in Order XXV (one indicator for the Order)			
		0.5					
		2.2					
		18.8			Weighted index of teachers in maintained schools Number of other local authority employees in education departments Number of full-time teaching staff at universities Others employed in education		
		5.4					
		2.4					
		8.2					
		873			Legal services	5.4	Weighted average of various kinds of cases tried in Courts of Justice Number of grants of probate
						0.5	
		874			Medical and dental services	15.4	Index of hospital staff, based on staff costs Ante-natal, post-natal and child welfare clinics: number of patients Home-nursing: number of patients Health visits: number of patients Midwives: number of home confinements and early discharges Ambulance service: patients carried Mental health services: number of cases School medical service: number of children inspected Number of doctors on the Executive Council services list, representing general practice Weighted average of number of dental treatments Number employed in other medical services
0.5							
0.4							
0.2							
0.3							
0.8							
0.4							
0.5							
2.8							
1.1							
2.2							
875	Religious organisations	2.0	Number in employment				
876	Research and development services	3.3	Index of industrial production for manufacturing (Orders III-XIX)				
879	Other professional and scientific services	6.2	Number in employment				
XXVI		<b>Miscellaneous services</b>	78.0				
881	Cinemas, theatres, radio, etc.	2.5	Number of admissions to cinemas Weighted average of radio and television licences current Consumers' expenditure on other entertainment and sport at constant prices				
		1.7					
		4.0					
882	Sport and other recreations	1.8					
883	Betting and gambling	2.3	Consumers' expenditure at constant prices				
884	Hotels and other residential establishments	7.2	Deflated index of value of turnover				
885	Restaurants, cafés, snack bars	7.8	Deflated index of value of turnover				

Appendix II (cont'd.)

Standard industrial classification

Order	Minimum list heading	Industry	Weight per 1,000	Annual series	Quarterly series (if different from annual series)	
XXVI (cont'd.)	886	Public houses	4.0	Deflated index of value of turnover		
	887	Clubs	2.0	Deflated value of turnover interpolated and projected from periodic figures		
	888	Catering contractors	2.6	Deflated index of value of turnover		
	889	Hairdressing and manicure	3.7	Consumers' expenditure at constant prices		
	891	Private domestic service	4.3	Number in employment	Interpolation and projection of the annual figures	
	892	Laundries	5.0	Index of turnover deflated		
	893	Dry cleaning, etc.				
	894	Motor repairers, garages, etc.	15.9	Index of motor trades' total turnover deflated (3 series)		
	895	Repair of boots and shoes	0.9	Consumers' expenditure at constant prices		
	899	Other services	12.3	Number in employment		
XXVII		<b>Public administration and defence</b>	56.0			
	901	National government service	18.0	Armed services and women's services : weighted index of strength		
			16.0	Non-industrial civil servants : weighted index of staff	Number in employment	
			3.9	Industrial civil servants : number in employment		
	906	Local government service	4.3	Police : weighted index of strength	Number in employment	
			1.1	Fire service : weighted index of strength		
			12.7	Other local government service : number in employment		
			<b>Ownership of dwellings</b>	41.4	Consumers' expenditure on rent at constant prices, representing house ownership and occupation	

# APPENDIX III

## Index of industrial production and index of output at constant factor cost 1963=100

	Index of industrial production				Index of output at constant factor cost					
	Total		All manufacturing industries		Gross domestic product	Total of industrial production	Other industries and services			
	Unadjusted	Seasonally adjusted	Unadjusted	Seasonally adjusted	Seasonally adjusted		Agriculture, forestry and fishing	Transport and communication	Distributive trades	Other
1963 weights	100.0		74.9		100	44	3	9	11	33
1964	108.3		108.7		105.8	108.3	104	106	103	103
1965	111.7		112.4		108.6	111.7	107	108	106	106
1966	113.2		114.2		110.5	113.2	107	110	107	108
1967	113.9		114.2		112.2	113.9	111	112	108	112
1968	119.8		121.4		116.6	119.8	111	115	111	115
1963 1st quarter	96.9	93.9	96.6	94.5	95.9	93.9	99	96	97	98
2nd quarter	99.7	99.6	99.8	99.2	99.7	99.6	100	100	100	100
3rd quarter	95.8	102.3	96.0	102.1	101.5	102.3	100	101	102	101
4th quarter	107.6	104.2	107.6	104.3	102.8	104.2	100	102	101	102
1964 1st quarter	108.0	106.3	107.2	106.6	104.1	106.3	101	104	102	102
2nd quarter	109.3	108.0	110.5	108.1	105.5	108.0	103	106	103	103
3rd quarter	101.4	108.2	102.0	108.5	106.0	108.2	105	106	104	104
4th quarter	114.4	110.8	115.1	111.6	107.5	110.8	107	106	105	104
1965 1st quarter	114.3	111.1	113.8	111.3	108.0	111.1	108	107	105	105
2nd quarter	111.6	111.4	113.3	112.4	108.1	111.4	108	107	105	105
3rd quarter	104.3	111.4	105.3	112.0	108.7	111.4	107	109	106	106
4th quarter	116.7	112.9	117.3	113.9	109.8	112.9	107	109	107	107
1966 1st quarter	116.5	113.3	117.4	115.0	110.4	113.3	107	109	107	108
2nd quarter	113.9	113.7	115.8	114.9	110.6	113.7	107	107	108	109
3rd quarter	106.8	113.9	108.3	114.9	110.9	113.9	107	111	107	109
4th quarter	115.5	111.7	115.3	111.9	109.9	111.7	108	111	107	109
1967 1st quarter	113.6	112.4	112.7	112.7	110.7	112.4	108	111	107	110
2nd quarter	115.4	113.6	116.6	113.7	111.9	113.6	110	112	108	111
3rd quarter	106.7	113.7	107.3	113.8	112.4	113.7	112	111	108	112
4th quarter	119.9	116.2	120.0	116.7	114.0	116.2	113	111	110	113
1968 1st quarter	120.7	117.8	120.6	118.7	115.6	117.8	113	114	113	114
2nd quarter	119.3	118.8	121.3	120.1	115.6	118.8	112	114	109	114
3rd quarter	113.1	120.7	115.3	122.6	117.2	120.7	110	115	111	116
4th quarter	126.2	122.3	128.2	124.3	118.2	122.3	108	117	112	116



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