Indices of Distributive Trade: Handbook on Good Practices

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Preface

1. Over recent years the United Nations Statistical Commission has been concerned with conceptual and practical difficulties in measuring dynamics of the value and volume of the retail and wholesale trade, commonly referred to as distributive trade, as well as the output of service activities.[1] The changes in the retail sales, for instance, are one of the few short-term indicators which provide advanced information on the economic situation in a country. However, for many countries information on these kind of statistics is still relatively inadequate and often problematic in terms of quality and comparability. Due to the distinct way of organization and particular user interest, distributive trade indices have been traditionally compiled separately for retail sales and wholesale trade sales. A number of countries produce them both, while others calculate only the retail sales (retail turnover) index, or its modifications.

2. The United Nations Statistics Division (UNSD) has undertaken a range of activities to improve the current status. Significant among these was the preparation and adoption by the thirty-ninth session of the United Nations Statistical Commission of the *International Recommendations for Distributive Trade Statistics 2008* (IRDTS 2008).[2] International guidelines and recommendations in other statistical areas such as the *System of National Accounts 2008* (2008 SNA),[3] the *International Standard Industrial Classification of All Economic Activities, Revision 4* (ISIC, Rev.4),[4] have also been revised and updated and are now available to help countries develop internationally comparable distributive trade statistics. While adopting the IRDTS 2008, the Statistical Commission also agreed to its implementation programme and requested UNSD to develop practical guidance on the compilation of distributive trade statistics, including a description of good practices in compilation of distributive trade indices.

3. This Handbook has been prepared by Vladimir Markhonko and Youlia Antonova in response to the Commission's request and as part of the Statistics Division efforts to strengthen countries' methodological and operational foundations for basic economic statistics in an integrated manner, including enhancement of their coherence across different sectors of an economy and conceptual consistency with respect to macroeconomic statistics, as well as to ensure production of the official distributive trade statistics in the most cost-efficient way. Its general objective is to support compilers of distributive trade statistics by collecting experiences in compilation of distributive trade indices in one document. The Handbook contains explanations of the challenges and good practices in compilation practices of several countries with different statistical background. What is appropriate for one country is not necessarily applicable for other countries. The decision for a good practice in a country should always be based on

[1] Report of the *Organization for Economic Cooperation and Development* on service statistics , presented at the thirty-sixth session of the United Nations Statistical Commission, document E/CN.3/2005/5.
[2] United Nations publication, Sales No. E.08.XVII.26.
[3] United Nations publication, Sales No. E.08.XVII.29.
[4] United Nations publication, Sales No. E.08.XVII.25.

national circumstances. By providing readers with a description of various country experiences, the handbook could be a useful tool in this decision process.

4. The distributive trade has long been of great interest for analysts and forecasters as the changes in value and volume of trade turnover, in particular the retail turnover, is regarded as an important short-term indicator of consumer confidence and economic activity in general. Chapters 2 to 6 of the Handbook describe both general issues relevant to the compilation of value and volume indices of retail trade turnover and experiences of several countries in this area. The output of distributive trade is a significant component in the compilation of the GDP and, in this context, deflation of its value is of a special interest for national accounts. Chapter 7 is devoted to a discussion of conceptual issues and practices of the European countries relevant in this regard.

Chapter I
Measuring distributive trade: an overview of international recommendations

A. What is distributive trade?

1. Distributive trade is an economic activity comprising wholesaling and retailing, that is to say, sale without transformation, of any types of goods together with performing services incidental to sales such as repair, installation and delivery.

2. Increasingly, distributive trade provides a link not only between producers and buyers of goods who are residents of a given economy, but also between producers and buyers operating as exporters and importers on the global markets. In this context, availability of high-quality distributive trade statistics becomes a precondition for an in-depth analysis of globalization. While, in developed countries, distributive trade is well organized and can normally be captured by standard statistical means, the fact that, in developing countries, much distributive trade is still carried out in the informal sector of the economy complicates statistical observation.

3. What makes distributive trade different from other types of economic activity lie mostly in the specificity of its production process which is hereinafter referred to as "resale". Resale includes a number of actions that might be undertaken to make goods available for buying including negotiating transactions between buyers and sellers or buying goods from the manufacturer on own account, transporting, storing, sorting, assembling, grading, packaging, and displaying a selection of goods in convenient locations. These actions can be organized or combined in different ways. Each combination of such actions resulting in the reselling of goods represents an activity falling within the scope of distributive trade.

4. By convention, resale of goods represents sale without transformation. In general, goods are transformed if they undergo a substantial change in form, appearance or nature so that the goods existing after the change are new and different from those existing before the change (e.g., sorting, grading and assembling of goods, mixing (blending) of goods (for example, sand), bottling (with or without preceding bottle cleaning), packaging, breaking bulk and repackaging for distribution in smaller lots, storage of goods (whether or not they are frozen or chilled), cleaning and drying of agricultural products, and cutting out of wood fiberboards or metal sheets as secondary activities.

5. Distributive trade as an activity consists of: (i) provision of a service to various types of customers (retailers and other commercial users or the general public) by storing and displaying a selection of goods and making them available for buying; and (ii) provision of other services incidental to the sale of those goods or subordinated to the selling such as delivery, after-sale repair and installation services.

6. A more precise definition of the scope of distributive trade as well as description of its structure can be given in terms of an activity classification. Following the decision of the United Nations Statistical Commission to adopt the *International Standard Industrial Classification of All Economic Activities, Revision 4* (ISIC, Rev.4), as an international standard for activity classification, the scope of distributive trade is defined as the scope of section G, *Wholesale and retail trade; repair of motor vehicles and motorcycles*, of ISIC, Rev.4. Many countries that do not use ISIC, Rev.4, have developed their national activity classifications in such a manner as to ensure that the overall scope of distributive trade is the same as in ISIC, and have implemented this in all national compilations for the purposes of international comparability. However, countries using activity classifications not compatible with ISIC should, at the minimum, develop clear and precise concordances between distributive trade classes in their national classification and those in ISIC, Rev.4.

7. According to the classification scheme of ISIC, Rev.4, distributive trade is structured within three divisions. Division 45 includes all activities related to the sale and repair of motor vehicles and motorcycles, while divisions 46 and 47 include all other sale activities. The distinction between divisions 46 (wholesale) and 47 (retail sale) is based on the predominant type of customer. Within divisions 46 and 47, the classification scheme considers two additional levels of distinction based on the type of operation of the units involved in such trade and the kind of products sold.

8. *Retail trade* is defined as the resale (sale without transformation) of new and used goods mainly to the general public for personal or household consumption or utilization, by shops, department stores, stalls, e-commerce retailers, mail-order houses, hawkers and peddlers, consumer cooperatives, etc. The goods sold in this division are limited to those usually referred to as consumer goods or retail goods. Therefore, goods not usually entering the retail trade, such as cereal grains, ores, industrial machinery, etc., are excluded.

9. Retail trade also includes units engaged primarily in selling to the general public, from displayed merchandise, products such as personal computers and software, stationery, paint or timber, although these sales may not be for personal or household use. Some processing of goods may be involved, but only as incidental to selling, for example, sorting or repackaging of goods, installation of a domestic appliance, etc. Retail trade also includes the retail sale by commission agents and activities of retail auctioning houses. Activities which are not incidental to retail trade are not covered. Examples of such activities are renting and leasing of goods, packaging of solid goods and bottling of liquid or gaseous goods (including blending and filtering, for third parties), sale of food and drinks for consumption on the premises and sale of takeaway food.

10. *Wholesale trade* is defined as the resale of new and used goods to retailers, business-to-business trade (for example, to industrial, commercial, institutional or professional users) or resale to other wholesalers, or it involves acting as an agent or broker in buying merchandise for, or selling merchandise to, such persons or companies. The principal types of wholesale trade businesses are merchant wholesalers, that is,

wholesalers who take title to the goods they sell, such as wholesale merchants or jobbers, industrial distributors, exporters, importers, and cooperative buying associations, sales branches and sales offices (but not retail stores) that are maintained by manufacturing or mining units apart from their plants or mines for the purpose of marketing their products and that do not merely take orders to be filled by direct shipments from the plants or mines.

11. In addition, wholesale trade includes merchandise and commodity brokers, commission merchants and agents and assemblers, buyers and cooperative associations engaged in the marketing of farm products. While by definition, wholesalers do not transform goods, they frequently physically assemble, sort and grade goods in large lots, break bulk, repack and redistribute in smaller lots (for example, pharmaceuticals), store, refrigerate, deliver and install goods, and engage in sales promotion for their customers and label design.

12. Wholesale trade covers activities that are not considered as entailing transformation of goods, for example, physical assembly, packaging, sorting and grading of goods in large lots, mixing (blending) of goods (for example, sand), bottling (with or without preceding bottle cleaning), storage (whether or not goods are frozen or chilled) and delivering. On the other hand activities which are considered as transformation or as providing other types of services are excluded. Examples are: renting and leasing of goods, sale of farmers' products by farmers and manufacture and sale of goods, which are generally classified as manufacturing.

13. The structure of distributive trade can also be given in terms of a product classification. The *Central Product Classification, Version 2* (CPC, Ver.2) is the international reference classification for products, adopted by the United Nations Statistical Commission. There are various national product classifications in use, tailored to specific country needs, either derived from or related to CPC. The comparability among them however is less than that among national classifications of activities.

14. To satisfy the needs of a wide range of users, countries draw up their own lists for the reporting of distributive trade by type of products in accordance with the product classifications used in their trade surveys and the need to comply with international standards. In general, countries prepare more detailed lists for retail trade than for wholesale trade, since the former are useful in describing the flow of goods to households. Whatever list or classification of products is used by countries, it should be linked to the classification of household goods and services for national accounts purposes. For the purpose of achieving broad international and national comparability of compiled distributive trade statistics, including indices, retail product classes of division 45 could be grouped into the following 7 product categories:

Food, beverages and tobacco
Clothing and footwear
Household appliances, articles and equipment
    Of which: Furniture

Machinery, equipment and supplies
Of which: Information-processing equipment
Of which: Motor vehicles and associated goods
Personal and other goods
Construction materials
Other

15. Compilers of distributive trade indices should be aware that there are a number of boundary issues which require specific treatment and should be taken into account while organizing collection of value data and selecting price indices to deflate them. The two most typical boundary issues belonging to this group are briefly described below.

(a) The boundary between wholesaling (or retailing) and manufacturing should be considered when a principal production unit outsources[5] a complete production process (any manufacturing activity) to another unit - the contractor. In a case when the principal unit does not physically transform the goods at the location of its unit and does not own the material inputs, this unit should be classified to *section G, Wholesale and retail trade; repair of motor vehicles and motorcycles* of ISIC, Rev.4, specifically to the classification category that corresponds to the activity represented by the type of sale (for example, wholesale or retail sale) and type of goods sold. The contractor in such a case is classified to section C, Manufacturing of ISIC, Rev.4, specifically to the classification category that corresponds to the manufacturing activity performed by the contractor;

(b) Distinction between retail trade and financial services should be considered when a retail store or another economic entity involved in distributive trade issues its customers membership cards that allow them to make purchases within a prearranged credit limit. Consumer credit is a form of a short-term loan extended to individuals for personal or household use, rather than to businesses and it is important that distributive trade is not confused with provision of financial services. Compilers of distributive trade statistics must pay attention to cases where the originator and holder of consumer credits is a retail trade unit that has a separate establishment dealing with, or ancillary activities involving granting of consumer credits. Because 2008 SNA distinguishes non-financial and financial sectors separately,[6] whenever possible, two separate units should be defined in this case, one for the entity engaged in non-financial (trade) activity and the other for the entity engaged in financial activity (provision of consumer credits), as long as the necessary financial accounts are available for each of them, even if the two together have all the other attributes of an economic entity and consolidated accounts are compiled for them as a single unit. However, if the unit providing consumer credits is not statistically observable separately (that is to say, if

[5] The term "outsourcing" of production is used to refer to a situation where the principal productive unit (the principal) contracts another productive unit (the contractor) to carry out specific functions constituting the whole or a part of the principal's activity in producing a good or service.
[6] See *System of National Accounts, 2008,* chap. 4, for institutional sectors and institutional sector classification.

separate accounts of its activity are not available), it will be treated as a part of the relevant statistical unit involved in an ancillary activity.

16. *General definition of the scope of distributive trade statistics.* To summarize the above discussion, distributive trade statistics reflect characteristics and activities of the units belonging to the distributive trade sector of an economy consisting of all resident entities recognized as statistical units and classifiable in section G of ISIC, Rev.4, irrespective of their size, form of economic and legal organization and ownership. The residency of economic entities should be determined in accordance with the rules laid out in 2008 SNA. Distributive trade activities carried out by entities not classified in section G of ISIC, Rev.4, are not covered by distributive trade statistics.

17. By convention, the data items falling within the scope of distributive trade statistics are those reflecting: (i) the characteristics of entities belonging to the distributive trade sector; (ii) receipts and other revenues and purchases of those entities that are recorded in their profit and loss statements and used for calculation of trade output, intermediate consumption and value added; (iii) investment of entities in non-financial assets and changes in inventories; and (iv) employment information which is closely related to most of the previous groups of items. Other data items, such as those on the financial position of the entities, are explicitly excluded and compiled instead as a part of financial or other relevant statistics. Distributive trade indices could be compiled for each of these data items; however, the most widely used indices are those of the turnover (sales) and the distributive trade output and value added, compiled for both - retail and wholesale trade.

18. Statistical units play an important role in collection of distributive trade data and compilation of indices. In recognition of the fact that the 2008 SNA recommends the establishment as the most appropriate statistical unit for production and employment data and that compilation of homogeneous and geographically distributed data is to be ensured, it is considered desirable that the establishment is also used as a statistical unit for production of distributive trade indices. In the majority of cases, the establishment and the enterprise are the same; hence all types of data can be obtained from the same source. In such cases, an establishment/enterprise can be not only a statistical but also a reporting and collection unit. However, if an establishment is a part of a multi-establishment enterprise, it may not have access to all the necessary (for example, financial) information. Under these circumstances, the enterprise to which a given establishment belongs may serve as a collection unit which provides data about activities of that establishment to the statistical authorities.

B. Two key concepts - turnover and output

19. For the compilers of distributive trade indices two concepts have a special importance – turnover and output. They are discussed below. For the detailed list of distributive trade data items and their definitions the readers should refer to Chapter IV of the IRTDS 2008.

1. Turnover

20. The terms "turnover", "sales", "receipts", "shipments"[7], etc., are used interchangeably in economic statistics and business accounting to denote the revenues of statistical units. The term "turnover" has been determined to be suitable for the purpose of index compilation in accordance with the international recommendations for distributive trade statistics (IRDTS 2008), however, it is recognized that there exist wide variations between countries in respect of the scope of different types of revenues included in it.

21. In general the term *turnover* will be understood as covering sales, shipments, receipts for services and other revenues and comprising the totals invoiced by the establishment during the reference period. The turnover corresponds to market sales of goods or services of a trade unit supplied to other enterprises or transferred to other establishments of the same enterprise.

22. Turnover should exclude value added tax and other similar deductible taxes directly linked to the sales as well as all duties and taxes on products invoiced by the unit, which turnover after valuation is equivalent to the valuation at basic prices. Included are all other invoiced charges for transport (whether carried out by the establishment with its own transport facilities or by outside organizations), packaging, etc., passed on to the customer, even if these charges are listed separately in the invoice. Price rebates, discounts and similar allowances granted on returned goods and the value of returned packaging should be deducted. This includes cash discounts where netted off sales in sales records. Included are all items made by or for the establishment from materials owned by it, whether sold, transferred to other establishments of the same enterprise, or shipped on consignment. The net selling value of products made in one establishment on a contract basis from materials owned by another should be reported by the establishment providing the material.

23. Transfers from the producing establishment to another establishment of the same enterprise for further processing should also be included. In principle, these should be valued as if sold to an independent enterprise. In practice, however, it may be necessary to accept the book value of such transfers. Book value or production cost is equal to the sum of material and service costs, compensation of employees, other taxes on production, depreciation of the fixed assets used in production, and, if possible, an imputed margin for overhead costs and profits. Where both establishments are included in the collection programme, the receiving establishment should report the same items as purchases at the same value as the sales of the shipping establishment. Also included are the sales or shipments of goods produced by the establishment that have been exported to customers and also transfers to affiliated overseas branches.

[7] Value of shipments replaces sales when the establishment delivers the good to other establishments of the same enterprise.

24. Turnover also includes sales of goods and services purchased for resale and commissions and fees from selling goods on account of others and all receipts for industrial services rendered, such as receipts for contract work performed for others, installation and repair work, and research and development work of an industrial nature.

25. Revenues from activities other than the sale of goods or rendering of industrial services, such as revenues from rental or lease of buildings and machinery and equipment, and all other miscellaneous revenues, as well as the value of fixed assets manufactured or built by the establishment for its own use, are also included.

26. The sales of all goods and services purchased for resale in the same condition as received includes also the goods withdrawn by the owners of a trade unit for their own use. Those goods should be valued at the appropriate market price (in other words, as if sold to a customer). If this is not possible, the owners' withdrawals should be valued at acquisition costs. The goods and services purchased for resale may be sold either to final consumers or to other enterprises or transferred to other establishments of the same enterprise.

2. Output

27. *Gross output* at basic prices refers to the overall production activity of trade establishments. Output (production) cannot be directly observed from their accounting records. It is calculated using such data items as turnover, purchases of goods and services and inventories[8]. The value of output corresponds to the sum of the value of all goods or services that are actually produced within a trade establishment and become available for use outside that establishment, plus any goods and services produced for own final use. The value of output at basic prices is calculated as follows:

Gross output =

+ Value of sale/turnover/shipments of goods produced by the establishment
+ Value of sale/turnover/shipments of all goods and services purchased for resale in the same condition as received
- Purchases of goods and services for resale in the same condition as received
+ Commissions and fees from selling goods and services on account of others
+ Receipts for industrial work done or industrial services rendered to others
+ Other revenues
+ Value of own-account fixed assets
+ Change in work-in-progress
+ Change in inventories of finished goods
+ Change in inventories of goods purchased for resale in the same condition as received

[8] For detailed definitions of gross output components see Chapter IV: Data items and their definitions of the IRDTS 2008.

28. In order to maintain consistency with valuation concepts for output (production) across all international recommendations on business statistics and national accounts, it is highly desirable that trade output is valued at basic prices. However, for countries where it may be difficult both for respondents and for survey statisticians to distinguish between "taxes and subsidies on products" and "other taxes on production," valuation of output at factor cost can serve as second best alternative. Depending upon the treatment applied to other taxes and subsidies on production, any of the following three valuations of output - at factor costs, basic prices or producers' prices -- can be derived.

29. The relationship between these concepts is as follows:

Value of gross output at factor costs

\+ Other taxes on production
\- Other subsidies on production

= Value of gross output at basic prices

\+ Taxes on products (excluding imports and any value added tax or similar deductible taxes, invoiced to the purchaser)
\- Subsidies on products

= Value of gross output at producers' prices

30. *Gross margin* is defined as the difference between the actual or imputed price realized on a good purchased for resale (either wholesale or retail) and the price that would have to be paid by the distributor to replace the good at the time it is sold or otherwise disposed of. The valuation of gross margin, in principle, should be at basic prices, although, alternative valuation principles, similar to those for the valuation of gross output at basic prices may also apply. The value of gross margin is derived through the following identity:

Gross margin =

\+ Value of sale/turnover/shipments of all goods and services purchased for resale in the same condition as received
\- Purchases of goods and services for resale in the same condition as received
\+ Change in inventories of goods purchased for resale in the same condition as received
\- Value of recurrent losses due to normal rates of wastage

31. As a general recommendation, change in inventories of goods for resale should be valued exclusive of holding gains and losses. Holding gains and losses are excluded from gross margin/output by valuing all entries to, or withdrawals from, inventories at the prices prevailing at the times the entries or withdrawals take place.

C. Indices of distributive trade and their role in economic analysis

1. Importance of short term distributive trade statistics

32. Compilation of indices of distributive trade is at the core of short-term distributive trade statistics which is an important source of information for developing and monitoring the effectiveness of economic policy and carrying out business cycle analysis. The priority of short-term statistics is to produce monthly and quarterly indicators of the dynamics of distributive trade sector in the most timely manner, even if this will likely result in lower accuracy, less detailedness and reduced scope. These statistics are usually produced according to a strict timetable, and are required shortly after the end of the reference period by policymakers. Sometimes, this means that initial figures are subsequently revised or adjusted as more data are collected and analysed.

33. Most commonly, short-term statistics in general and short-term distributive trade statistics in particular are presented in the form of indices (relative to a base period) or as growth rates, although it is a widespread practice for absolute figures to be compiled and disseminated as well. Although there are many users of short-term distributive trade statistics with many different motivations for using the data, the analyses performed with them generally fall into one of following two types:

(a) Comparison of activities of distributive trade units at two different points in time;

(b) Comparison within one reference period of two or more different subpopulations of units, such as units in different geographical locations; or between trade units and other units classified in service activities, or between wholesalers and retailers, etc.

34. The existence of different objectives and priorities in respect of structural and short-term distributive trade statistics requires that countries develop and implement appropriate statistical techniques in order to combine these two sets of data. The main aim of such techniques is to reconcile the statistical data derived from different data sources with different frequencies in order to obtain short-term data series which, while respecting the constraints imposed by the more reliable and accurate long-term information sources, preserve as much as possible the dynamic time-profile of the high frequency time series.

35. To facilitate the achievement of this aim, both sets of statistics should be based on identical concepts and measurement principles, statistical units, classifications and definitions of data items. Short-term statistics should be built on a foundation of timely and accurate infra-annual data sources which cover an adequate proportion of units (size of samples). They also should be made consistent with their annual equivalents, partly for the convenience of users and partly -- and more fundamentally -- because the

benchmarking process incorporates the information content of the annual data into the monthly/quarterly estimates.

36. In principle, the econometric methods and indirect estimation procedures should not be a substitute for the collection of short-term statistics by countries. However, the use of such methods is unavoidable in the production of flash estimates (for example, production of quarterly data within 30 days after the end of the quarter), when the availability of data are generally scarce. In those cases, it is advisable that countries make available to users both the methods used and an assessment of the reliability of the estimates, and revise the estimates as soon as new and more accurate information becomes available.

2. Types of distributive trade indices

37. To analyze various aspects of distributive trade dynamics, a number of indices can be constructed ranging from a rather simple index of turnover changes in nominal terms (value index) to a more detailed and complex index of turnover volume and output of the distributive trade sector (reflecting volume of production of retail and wholesale trade services). To obtain volume indices, the indices of retail and wholesale prices, their proxies or appropriate volume indicators should be available.

38. One of the main purposes of compilation of distributive trade indices is to describe the short-term changes in value and volume of turnover of wholesale and retail trade as well as in the output of the distributive trade sector as a whole and of its components. If available on a monthly/quarterly basis, indices of volume of turnover complement indices of other economic activities in the short-term analysis of the entire economy, including the identification of the turning points in economic cycles. Indices of output of the distributive trade sector, in addition to their importance for short-term analysis, provide a key input into the compilation of quarterly national accounts.

39. The IRDTS 2008 recommends that indices of turnover volume and output be compiled on a monthly basis, as this better reveals short-term fluctuations. Monthly indices are even more meaningful if produced without a significant time lag, that is to say, within the month (or within the two months) immediately following the reference period. In recognition of the fact that national statistical offices may not have the capacity to produce reliable monthly indices, countries are advised, in such cases, to compile quarterly indices, as this gives sufficient flexibility in terms of time and resources. It should be noted, however, that the use of quarterly indices entails a dilution of the effects of current market conditions, seasonal changes and other factors related to short term production.

40. Indices of wholesale and retail trade turnover comprise the value and volume index. The turnover value index is a direct index that compares the value of turnover in the current period (at current prices) with the value of turnover in the base year (at base year prices). This index can be calculated for both retail trade and wholesale trade and their components. The turnover volume index, especially the volume of retail trade

turnover, is one of the most closely monitored series. In order to eliminate the price effect on turnover, it has to be deflated. In principle, the deflator of turnover should be a price index representative of the particular distributive trade activity class and reflecting price changes in the goods sold rather than in the trade services provided (see Chapter 2 for details).

41. The objective of the turnover volume index is to show the evolution of the market for goods and services. It should be noted in this connection, that there are significant conceptual differences between this index and the index of output of wholesale and retail trade services (also called the index of production of wholesale and retail services). The main differences are as follows:

(a) Turnover includes sales of goods bought for resale in the same condition as received which are not considered in the indices of output of wholesale and retail trade services;

(b) Goods produced (or purchased) and stocked before sale are included in both output and turnover, but are considered at different moments in time;

(c) The index of output of wholesale and retail trade services takes account of changes in the quality of the trade service supplied.

42. Both indices are important in their own right. While the volume of turnover is recommended for compilation within the framework of short-term statistics, the indices of output of wholesale and retail trade services are meaningfully compiled only within the framework of national accounts, preferably within the framework of supply and use tables.

43. The indices of output measure changes in production of services by various distributive trade activities. One of the major incentives for compilation of these indices is their use as inputs in the compilation of quarterly national accounts as an appropriate estimate of short-term changes in gross value added for wholesale and retail trade services. Therefore, in principle, they should be calculated as weighted averages of the outputs of these activities using value added weights, with the assumption that the ratio of value added to output is constant in the short run. In practice, however, the required value added data might not be available at such a detailed level for the required periods. Therefore, in the absence of value added, alternative measures for producing these indices, such as volume of turnover, should be used.

3. Seasonal adjustment and indices of distributive trade

44. Monthly and quarterly data on distributive trade statistics are an important tool for economic policymaking, business cycle analysis, modelling and forecasting. However, they are often characterized by seasonal fluctuations and other calendar/trading-day effects, which are obstacles to the clear identification of important features of time series

such as their short and long-term movements, turning points and consistency with other economic indicators.

45. Seasonal adjustment is a process by which changes that are due to seasonal or calendar influences are removed from a time series in order that a better knowledge of the underlying behaviour may be achieved. Seasonal adjustment issues of particular interest for distributive trade statistics are trading day and moving holiday effects. Countries should consider producing seasonally adjusted series as an integral part of their long term programme of quality enhancement of their distributive trade statistics. They are encouraged to begin production of seasonally adjusted series of distributive trade data items as a matter of priority. The seasonal adjustment method, once chosen, should not be changed often. If changes are necessary, they should be thoroughly justified.

46. When statistical data are collected at regular intervals, they form a time series. Turnover of retail trade for each sub-period (week, month, quarter) of the year, in a given country, is a good example of a time series. In contrast, data collected irregularly or only once do not represent a time series. There are two types of time series: stock and flow. Stock series are measures of activity at a point in time, while flow series measure the level of activity over a time interval.

47. A time series is generally considered to be made up of the following four components: the trend component, the cyclical component, seasonal component and irregular component. The trend component reflects long term movements lasting many years. It is generally associated with structural phenomena, for example, institutional events, demographic and technological changes, new methods of organization, general economic development, etc. The cycle component indicates the fluctuation around the trend, characterized by alternating periods of expansion and contraction, usually referred to as a business cycle. The seasonal component is a movement within the year, with a characteristic shape for each time series, representing the effect of climatic and institutional events that are repeated more or less regularly each year.

48. The seasonal component includes seasonal effects narrowly defined and calendar related systematic effects that are not stable in annual timing, such as trading day and moving holiday effects. The seasonal effect narrowly defined is one that is reasonably stable in terms of magnitude. Possible causes for this effect are natural factors, administrative or legal measures, social/cultural traditions, and calendar-related effects that are stable in respect of annual timing (for example, public holidays such as Christmas);

49. The irregular component represents unforeseeable movements related to events of all kinds. It comprises residual variations due to developments or to momentous occurrences, such as wars or national catastrophes, which affect a number of series simultaneously. In general, the irregular component has a stable random appearance and captures effects that are unpredictable, unless additional information is available, in terms of timing, impact and duration. The irregular component includes the following: (i) irregular effects narrowly defined; (ii) outlier effects; (iii) other regular effects such as

those of unseasonable weather, natural disasters, strikes, irregular sales campaigns, etc. However, it should be noted that these effects can be estimated separately from the irregular component and that it is important to carry out such estimates in order to ensure that the best quality seasonal adjustment is achieved.

Chapter II
Value and volume indices of retail sales: basic concepts and approaches to compilation

A. Value and volume indices

1. A *value index of retail sales* is a measure of change in value of goods sold by the statistical units classified as retailers, from one period to another. This index is calculated as a ratio of sales in a given period (*t*) to sales in the reference period (*0*) where values are expressed in current prices of the respective periods. For a monthly series, the reference period value is the average monthly retail sales during the reference year and for a quarterly series, the reference period value is the average of quarterly retail sales during the reference year. By convention, the index value of 100 is assigned to the reference value. The index can be written as follows:

$$I_{t_{value}} = \frac{\sum p_{it} * q_{it}}{\sum p_{i0} * q_{i0}}$$

where p_{it} and p_{i0} stand for prices, while q_{it} and q_{i0} denote quantities of goods sold in current and base periods respectively.

2. Calculation of such an index is rather a simple matter only if required values are available. This, however, is not the case in practice. Therefore, the first task in measuring the value change is to obtain a reasonable estimate of the values of sales in the compared periods. Country experiences in this respect are described in chapters IV and V of the publication.

3. The issue how to split this value change into components attributable to changes in quantities of goods sold and to changes in prices is more complicated from both theoretical and practical points of view.

4. A *volume index of retails sales* is a weighted average of the proportionate changes in the quantities of goods sold between two periods of time. The quantity changes must be weighted by the economic importance of goods, as measured by their relative values in one or both periods. Three most known formulae used for the volume index calculation are Laspeyres, Paasche and Fisher.

5. The Laspeyres volume index (L_{volume}) is obtained by weighing the quantity relatives of all goods, $qr_i = q_{it} / q_{i0}$, by the shares of sales of particular goods in the base period, w_{i0}, where:

$$w_i = \frac{p_{i0} * q_{i0}}{\sum p_{t0} * q_{i0}}, \text{ note that } \sum w_{i0} = 1$$

as

$$L_{volume} = \sum w_{i0} * qr_i = \sum \frac{p_{i0} * q_{i0}}{\sum p_{t0} * q_{i0}} qr_i = \frac{\sum p_{i0} * q_{i0} * qr_i}{\sum p_{t0} * q_{i0}} = \frac{\sum p_{i0} * q_{it}}{\sum p_{t0} * q_{i0}}$$

6. Paasche volume index (P_{volume})) is different from the Laspeyres in that it is a harmonic average of quantity relatives with weights being the shares of sales of particular goods in the current period w_{it} where:

$$w_{it} = \frac{p_{it} * q_{it}}{\sum p_{it} * q_{it}}, \text{ note that } \sum w_{it} = 1, \text{ as}$$

$$P_{volume}^{t} = \sum \frac{1}{\sum \frac{w_{it}}{qr_i}} = \sum \frac{p_{it} * q_{it}}{\sum \frac{p_{it} * q_{it}}{qr_i}} = \frac{\sum p_{it} * q_{it}}{\sum p_{it} * q_{i0}}$$

B. Series of volume indices

7. Discussion in section A above was limited to comparison of values and volumes in two periods. However, for analytical purposes countries compile index numbers for many periods. Sequence of index numbers attributed to several, normally adjacent, periods (or *index numbers series*) can be calculated in different ways. Main types of such series are described below.

8. In description of the volume index series the two reference periods are used - the weight reference period (base period) and the index reference period. *The base period* is generally understood as the period whose values provide the weights for an index. The index reference period is the period for which the index is set equal to 100. The base period and the reference period may coincide, but frequently do not. If series have one base period they are called *fixed base series.* Series where base period changes may be of various types and usually involve linking and chaining (see below).

1. Series of fixed based Laspeyres volume indices

9. Even though the fixed based Laspeyres series use as the base one and the same period they can be presented with any index reference period which might be more convenient, for example, for better comparability with series of other index numbers. In table 1 the first row contains series of annual volume indices from 2005 to 2008 which are calculated with the weights of year 2005 (base period) and 2005 is used also as the index reference period. Row two presents the same series with the new index reference period 2007 obtained by dividing the original indices by the value of index in 2007.

	2005	**2006**	**2007**	**2008**
Original series	100.0	102.0	103.5	105.0
Series with the new reference period	96.6	98.6	100.0	101.4

2. Series of Paasche type volume indices

10. Series of Paasche type volume indices are produced when for every period its own weights are calculated and applied to quantity relatives. While theoretically possible, compilation of such series is more difficult in practice since obtaining quantity relatives is more difficult than price relatives or their approximations. If compiled, such series can be made available on any selected index reference period and compared with the Laspeyres series.

3. Comparison of Laspeyres and Paasche series of index numbers

11. The big advantage of the fixed based Laspeyres series of volume index is its relatively low cost of compilation and ease of interpretation, especially if product structure of sales does not change significantly. This condition, however, does not hold well as the base period becomes more and more distant from the current periods. With time these indices are loosing their intended meaning. In the most simple case, when in period *0* only one good *x* is sold for price $p_{x,0}$ and in period *t* another good *y* is sold for price $p_{y,t}$ the value index $(p_{y,t} * y)/(p_{x,0} * x)$ has a clear meaning, while the volume index can not be calculated at all.

12. In general, it is assumed that Laspeyres volume index tends to overestimate period-to-period increase in volume of sales while Paasche index somewhat underestimates it. This relationship holds whenever the price and quantity relatives (weighted by values) are negatively correlated, that is, as prices go up the quantities purchased go down or vice versa. Such negative correlation is to be expected for

consumers who react to changes in relative prices by substituting goods that have become relatively less expensive for those that have become relatively more expensive. Because different formula gives different results, a consideration of alternative approaches to choosing among them is needed and this in turn gives rise to a consideration of further index number formula.

13. As neither formula can be judged superior to the other, a compromise solution for the volume index is to use a formula that makes symmetric use of the reference period and current period information. This approach is known as the Fisher formula. Fisher volume index is defined as geometric mean of the respective Laspeyres and Paasche indices, namely:

$$F_{t_{volume}} = \left[L_t * P_t\right]^{1/2}$$

4. Series of linked and chained indices

14. The base period in the Laspeyres volume indices may be periodically changed, say every five or ten years, to update the weights. When this is done indices are compiled with the new weights and are recompiled for several periods prior to the new base period. This approach produces sets of series with separate fixed bases. The issue is then how to link them so to obtain a one continuous series for all periods. One way of doing it is to recalculate back all indices in the given series using new weights. However, this improves relevance of the index only for several preceding periods, immediately before the new base period, but may damage relevance of historic series. It is worth noting also that recalculation of historical series, in most cases, is simply impossible due to lack of input data. To solve the issue with multi-base series of Laspeyres volume indices various splicing techniques could be used with deferent degrees of justification.

15. Series of *chained Laspeyres volume indices* are obtained by using, for each period, weights of the immediately preceding period. For example, an annual volume index is chained if weights are updated annually and the two indices being linked together. Such series better reflect period-to-period changes in the volume but they have a significant drawback – they lack *additivity* that is the volume of sales calculated for components do not add up to total sales of the activity. Non-additivity is most evident to users when chain volume measures are published in monetary (value) terms rather than index numbers. It should be noted that the annually chained Laspeyres indices are additive in the year after the weight period but additivity breaks down in periods significantly before or after the reference period.

16. The impact of non-additivity can be reduced by choosing a reference period that is close to the current period. It is for this reason that some statistical agencies update both the *weight reference period* and *index reference period* on an annual basis. It is important that the issue of non-additivity as a result of chaining is carefully explained and

presented to users. The presentation of percentage point contributions to the percent change of an index is a way to decompose the growth rate of a chain index into additive components.

5. Selection of index formulae

17. Determining which index type should be used to compile the volume of retail sales is not necessarily simple, though the selection of an appropriate index formula should be made on both theoretical and practical grounds. In short, all index types possess characteristics that make each of them more or less desirable in certain circumstances.

18. For example, the Paasche type index benefits from an up-to-date weighting structure but also suffers from an inability to produce results in a cost effective and timely manner. The Fisher index possesses several theoretically desirable characteristics[9] but is considered difficult to produce in a timely and cost effective manner due to its use of the Paasche index. The Laspeyres type can be produced in a timely and cost effective manner and benefits from taking practical compilation constraints into consideration. The main theoretical concern is that the Laspeyres type index can suffer from not having an up-to-date weighting structure. This can be overcome by frequently updating the weights.

19. An overall assessment of both theoretical and practical issues has resulted in the Laspeyres-type volume index being widely used by national statistical agencies. This publication also endorses the Laspeyres-type volume index for compilation of the volume of retail trade.

C. Practical approaches to calculation of the value and volume indices

20. The complete information on quantity and prices of goods sold in a country during a particular period of time by all retail trade units is not normally available. Therefore, calculation of a value index is not a simple matter as sample based estimates of the value of goods sold have to be generated for every current period. Since sampling is a costly operation taking large samples, which allow obtaining rather detailed information about activity and product classes, can not be performed monthly (or even quarterly). Typically larger samples are taken on the annual basis. Differences in sample sizes and the information obtained during annual and infra annual surveys leads to a number of issues how to ensure consistency and comparability of short term and annual index numbers series (e.g., benchmarking etc.).

1. Estimation a value change

[9] Such as factor reversal and time reversal tests. See the Compilation Manual for an Index of Service Production, Paris: Organization for Economic Cooperation and Development (OECD), 2007, for more on this issue.

21. Theoretically, to measure the change in value of goods sold in different periods several steps have to be made form the collection of sample values of sales for each activity class to producing the estimates of sales at higher levels of classification using appropriate weights. These steps involve a number of activities related to managing input data, non-response and missing data.

(a) *Managing input data:* Input data are collected on a regular basis (by a survey from respondents, or from administrative sources) by survey statisticians who edit, impute, aggregate and/or use the data in the compilation and production of statistics. However, the raw input data are rarely available in a form that is ready for compilation, i.e. some of the data may be missing or require quality adjustment.

(b) *Managing non-response / missing data:* Missing data are encountered in most statistical surveys, creating problems when attempting to compile estimates. The index of value of retail sales is no different in this respect. Missing data may be the result of partial completion of the questionnaire (item non-response) or a selected unit may not have returned a questionnaire at all (unit non-response). There are two general strategies to deal with item non-response: (i) ignoring all forms with missing values and confine analysis to the fully completed forms; or (ii) estimating and imputing missing data.

22. *Imputation* is a good practice for dealing with missing data because adopting the first strategy leads to discarding the valid data contained in the partially completed forms. There are a variety of imputation methods, ranging from simple and intuitive to rather complicated statistical procedures. Some of the more common methods are: (i) subjective treatment where imputations are made on the basis of values which appear reasonable; (ii) mean/modal value imputation where the mean value of a variable for missing data is imputed; (iii) post stratification where the sample is divided into strata and then stratum mean, mode or median is imputed; (iv) carry forward the value for the reporting unit from the same survey occasion in the previous period, adjusted to reflect the average increase (decrease) of the data item in the stratum; and (v) regression imputation which uses regression techniques to impute the missing data. The choice of method for imputation depends on the local statistical environment of the country concerned and is best handled on a case-by-case basis.

23. The case of *unit non-response* can also be dealt with by using the imputation approaches listed above. This is particularly relevant when the missing unit might have a significant impact on the index. Another way to manage non-response / missing data is to use administrative data as a replacement strategy. When available, administrative data can be modelled or substituted directly to fill data gaps. There are also non-statistical ways to minimize both forms of non-response. These include (i) impressing upon respondents the importance of providing the requested data; (ii) sending reminders to non-respondents; and (iii) resorting to the enforcement measures laid down in national legislation.

2. Calculation of the Laspeyres type volume index

24. In principle the Laspeyres type volume index can be obtained by:

(a) Deflating the estimated values of current sales $p_{it} * q_{it}$ by their respective price relatives p_{it} / p_{i0};

(b) Calculation of the volume relative for each good; and then

(c) Calculation of a weighed average of those volume relatives using the value shares of each good in the base period as weights.

25. These steps are represented by the formula below:

$$L_{vol} = \sum \frac{(p_{it} * q_{it}) / (p_{it} / p_{i0})}{p_{t0} * q_{i0}} * \frac{p_{i0} * q_{i0}}{\sum p_{t0} * q_{i0}} = \frac{\sum p_{i0} * q_{it}}{\sum p_{t0} * q_{i0}}$$

26. In practice, however, the index numbers compiler deals not with data on all individual goods but with estimates of current sales by particular groups of retailers, such as retail sale of food, beverages and tobacco in specialized stores. Deflation of those values is undertaken by dividing the current period value by an appropriate price index.

Deflators

27. The recommendation of the Laspeyres-type index for the calculation of the volume of retail sales implies that the deflator should be of the Paasche-type. This is because the variation of an aggregate at current prices is equal to the product of the Laspeyres volume index and the Paasche price index. The application of a Paasche price index as the deflator will lead to quantities sold in the period of interest being valued in the prices of the base period.

28. In practice, however, it is virtually impossible to obtain Paasche price indices for all detailed activity classes of retail sales. The compromise solution used by most countries is to deflate current values using Laspeyres-type price indices. These indices are, in most cases, obtained from the consumer price indices surveys. Some times specially designed retail price indices are compiled. The outcome is an approximation of the volume which would be achieved by using Paasche deflators. The approximation is acceptable because where the current and reference periods are close, the difference between the Paasche and Laspeyres price indices, and hence the resulting deflated values are, normally, quite small.

Weighting

29. The upper classification levels of volume of sales are compiled following the calculation of volumes at the lower levels. Volume relatives of the lower levels are aggregated using appropriate weights to produce volumes for all upper levels. Weights allow the lower level indices to be 'put together' or combined to produce aggregate measures once all the necessary input variables have been collected, imputed, and adjusted as required.

30. Weights are a key element in the construction of any index as they provide a measure of the relative importance of each index component. In the case of the volume index of retail sales, weights reflect the relative importance of a product or a retail trade activity class within total retail trade. To arrive at the aggregate index figure, those classes are multiplied by these weights to derive a weighted average aggregate index. The activity classes' weights are generally obtained via the conduct of economic censuses and annual surveys.

31. The weights of an index need to be periodically updated in order to reflect the changing structure of the retail trade. The two key issues to consider when updating index weights are: (i) the frequency of weights update; and (ii) the method used to incorporate new weights into the index structure. The frequency at which weights are updated depend on:

(a) The need to accurately reflect the current relative importance of product groups and industries;

(b) Data availability; and

(c) The index type used to compile the index.

32. The need to accurately reflect the current relative importance of sales by activity classes is an important consideration when determining the frequency at updates. As the current period gets further and further away from the base period the weights become more and more irrelevant because of various factors including the substitution of less expensive products for more expensive products over time which is not taken into account. Therefore the credibility of the index is gradually undermined.

33. The best practice of weights updating would be when the activity level weights are updated as frequently as possible, preferably less than every 5 years, aiming at the annual updates whenever possible. The more frequent updates will ensure that the volume index is an accurate indicator of changes in the volume of the measured indicator, i.e. the retail sales. The latest weights available are likely to be from year t-2 or t-3. The frequent updating of weights negates the substitution bias/changing weights problem. Reliable and timely annual weighting data for the activity levels of the index need to be available for inclusion into the compilation process. Delays in the availability of annual

weighting data will cause revisions to the index when the weights do become available and recalculations are made.

34. In index compilation practices the following operations are usually performed: (i) *re-weighting* process, that is implementing new weights into the index structure; (ii) *linking*, that is adjusting the preceding series by a factor derived from the index numbers calculated for the same period but using old and new weights; and (iii) *re-referencing* (updating the reference period to equal 100.0).

35. *Linking several fixed based series* is desirable in order to maintain a continuous index series whenever new weights are incorporated into an index. Therefore it is a good practice that when weights are updated the new series should be linked to the old series producing the continuous series and, unlike the fixed weight approach, the entire historical series should not be re-estimated each time the weights are updated.

36. To achieve this, each time the weights and base year for the index are updated, data are only compiled with the new weights for periods close to the reference period and the series is then linked to the historical portion. This is called a *chain-linked index* as it is compiled for a succession of different segments while keeping the original weights for each past segment fixed. Three linking methods are generally applied: (i) the *one quarter overlap* - a link factor is derived by dividing the index of the first quarter of year t by the index for the same quarter using the weights of year t-1; (ii) the *annual overlap* technique - a link factor is derived by dividing the index for year t by the index for year t using the weights of year t-1; and (iii) the *over-the-year* technique - a link factor is determined based on the same period in the previous year.

37. It is advisable to take into account that while, in many cases, all three linking techniques give similar results, in situations with strong changes in relative quantities and relative prices, the over-the-year technique can result in distorted seasonal patterns in the linked series. While standard price statistics compilation exclusively uses the one-quarter overlap technique, the annual overlap technique may be more practical for Laspeyres type volume measures because it results in data that aggregate exactly to the corresponding direct annual index. In contrast, the one-quarter overlap technique and the over-the-year technique do not result in data that aggregate exactly to the corresponding direct annual index. The one-quarter overlap provides the smoothest transition between each link, while the annual overlap technique may introduce a step between each link[10].

3. Introducing new products

38. The emergence of new products and the disappearance of old products is a usual phenomenon in economies. The inclusion of these new products where their sales are significant and the removal of old products are important for the compilation of an accurate retail sales volume index. The annual updating of weights, as advised in this publication, provides the opportunity to incorporate new products more often. This is

[10] The IMF Quarterly National Accounts manual (2001), chapter IX, paragraph 9.39.

because the new product can be added to the list of products in the base period and quantity comparisons between the current period and the base period for this new product can now occur. It is important that appropriate weighting data are available for these products before they can be incorporated into the index.

E. Data confrontation and benchmarking

39. National statistical organizations may conduct a number of surveys aimed at producing estimates of retail sales. It is, therefore, a good practice to compare data obtained from the various sources to determine if they present a consistent message about the dynamics of the retail sales to users. The process of comparing data that has generally been derived from different surveys or other sources, especially those of different frequencies, in order to assess their coherence and the reasons for any differences is referred to as *data confrontation*. It is a good practice that the sub-annual volume indices are compared to other data sources essentially in an attempt to identify any significant quality issues with the indices. These comparisons could then result in improvements to the production of the index in future periods, for example, improving or changing data sources.

40. Some countries take this data confrontation process a step further and implement *benchmarking* of the monthly indices to the annual ones. Benchmarking is concerned with formally correcting inconsistencies between different estimates of the same target variable when data are collected from different sources and at different frequencies, e.g. quarterly/monthly and annual estimates of volume from different sources. The levels or movements of the two independent series are forced to be equal. Benchmarking is generally done retrospectively leading to revisions of the data as annual benchmark data are available some time after quarterly/monthly data. The pros of benchmarking (e.g. ensuring consistency between two data series) and the cons (e.g. frequent revisions to the sub-annual series) need to be considered by individual countries to determine if they should implement benchmarking for their series of retail trade indices.

F. Transition from a fixed weight index to a chain index

41. It was indicated above that the best approach for compiling retail trade indices is an annually chained volume index of the Laspeyres type. Countries that currently compile a fixed weight Laspeyres index but would like to switch to its annual chaining should carefully plan the transition process and consider the following five stages in a project management context.

Stage 1: Scope and plan the programme of work involved

42. In this stage it is important to develop a sound project management framework that ensures the project is carried out in a way that is efficient, meets the desired objectives, assigns responsibilities and reporting arrangements, identifies risks and lists

the set of tasks to be undertaken. There are various project management frameworks available that can assist statistical agencies to undertake this work. Also, it is suggested that planning for the change in methodology begin one to two years prior to the desired change and that it occur in conjunction with the next re-weight.

Stage 2: Develop detailed methodologies

43. This stage of the transition process is aimed at developing detailed methodologies required to calculate the annually chained Laspeyres retail trade volume indices. The topics should center on methodologies to rebase and link the indices every year including the source of annual weighting data as well as to produce seasonally adjusted estimates. This publication provides an overview of the relevant good practices.

Stage 3: Specify and develop necessary computer systems

44. The computer systems used to produce the monthly retail trade volume indices would need to be changed to reflect the new methodology. This will require the specification of necessary methodological changes by the subject matter staff and implementation by computer programmers. An essential part of this process is the testing of the system changes in a 'test' environment to ensure the production of estimates are in line with the specified methodology.

Stage 4: Publish experimental estimates and consult key users

45. It is important that key users of the retail trade volume indices understand the changes that are being made when moving to a new methodology for the index. Communication of these changes to key users could include: (i) release of a special information paper including the presentation of the new methodology to users, reasons for the changes as well as results of research; (ii) conduct of seminars and workshops for key users as these provide an opportunity for users to gain an understanding of the new methodology, ask questions and provide feedback; and (iii) release of experimental estimates to provide an opportunity for users to become accustomed to the changes before the changes are implemented into the official release of the index.

Stage 5: Officially release the annually chained Laspeyres retail trade volume indices

46. A date for official release of the retail trade volume indices as per the new methodology should be set following (i) extensive consultation with users detailing the new methodology; (ii) verification that the computer systems are producing estimates as per the required methodology; and (iii) a sufficiently long period of producing experimental estimates.

Chapter III
Practices of the European Union member states in the compilation of turnover indices

A. Legal basis for the compilation of distributive trade indices

1. Council Regulation (EC) No. 1165/98 of 19 May 1998 establishes the legal basis and common framework for the production of short-term business statistics, including indices compilation, by European Union countries. This Regulation covers distributive trade as well. The Regulation lays down the norms, standards and definitions necessary for producing comparable Community statistics, without detailing the actual collection methods to be used. As such, the national statistical authority in each Member State may conduct the data collection exercises in the manner most appropriate to its own situation, for example, to conduct statistical surveys or make use of administrative data sources such as those for value added tax and for social security.

2. The Regulation continues the reinforcement of the statistical system of the European Union, incorporating into the production of short-term statistics the EU tools such as the statistical classification of economic activities in the European Union,[11] the definition of statistical units, the drawing up of business registers for statistical purposes, etc. Article 2 determines the scope the Regulation in terms of economic activities as applicable to all market activities in sections C to K and M to O of NACE, Rev.1 as well as in terms of statistical units as those listed in Regulation (EEC) No. 696/93 and classified under one of the activities referred to above. The use of particular units for the compilation of statistics is specified in an annex to the Regulation.

3. The Regulation has four annexes, each one laying down information on the specific activities for which short-term statistics are to be compiled; types of statistical units to be used for the compilation, list of variables, periodicity and reference period, level of detail etc. Distributive trade activities are covered in two annexes of the Regulation. Annex C, Retail Trade and Repair is applicable to the activities listed in Division 52, Retail Trade, except of motor vehicles and motorcycles; repair of personal and households goods of NACE, Rev.1 only, while Annex D, Other Services applies to sections H, I, J, K, L, M, N and O and Divisions 50, Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel, and 51, Wholesale trade and commission trade, except of motor vehicles and motorcycles.

4. The table below shows the observation unit, variables and their periodicity as adopted in the Regulation and applicable to distributive trade activities:

[11] NACE, Rev.1 at the moment of adoption of the Regulation by the Council of the European Union, amended to NACE, Rev.2 at a later stage.

Activity	*Observation unit*	*Variable*	*Reference period*
Division 50. Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	Enterprise	120 Turnover	Quarter
		210 Number of persons employed	
Division 51. Wholesale trade and commission trade, except of motor vehicles and motorcycles	Enterprise	120 Turnover	Quarter
		210 Number of persons employed	
Division 52. Retail Trade, except of motor vehicles and motorcycles; repair of personal and households goods	Enterprise	120 Turnover	Month
		210 Number of persons employed	Quarter
		330 Deflator of sales (or 123 Volume of sales)	Month

5. Commission Regulation (EC) No. 588/2001 of 26 March 2001 sets forth the implementation of the Council Regulation (EC) No. 1165/98 as regards definitions of the variables, objectives, characteristics and calculation of the relevant indices.

1. Statistical units

6. The Council Regulation (EC) No. 1165/98 applicable for the purposes of short-term distributive trade statistics requires that an enterprise was used as the observation unit. Countries may use other observation units, such as local unit and KAU, in accordance with the procedure laid down in the Regulation.

7. *Enterprise*. The enterprise is the smallest combination of legal units that is an organizational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources. An enterprise carries out one or more activities at one or more locations. An enterprise may be a sole legal unit. The enterprise thus defined is an economic entity that can therefore, under certain circumstances, correspond to a grouping of several legal units. Some legal units, in fact, perform activities exclusively for other legal units and their existence can only be explained by administrative factors (e.g. tax reasons), without them being of any economic significance. A large proportion of the legal units with no persons employed also belong to this category. In many cases, the activities of these legal units should be seen as ancillary activities of the parent legal unit they serve, to which they belong and to which they must be attached to form an enterprise used for economic analysis.

8. *Local unit*. The local unit is an enterprise or part thereof (e.g. a workshop, factory, warehouse, office, mine or depot) situated in a geographically identified place. At or from

this place economic activity is carried out for which - save for certain exceptions - one or more persons work (even if only part-time) for one and the same enterprise. It should be noted that, unlike the enterprise, there must be some employment within a local unit for it to exist. The local unit is a unit and not just a geographical breakdown of an enterprise. As such it is possible for more than one local unit belonging to the same enterprise to exist in the same region. This has important consequences for the collection of regional data.

9. *Kind of Activity Unit*. The kind-of-activity unit (KAU) groups all the parts of an enterprise contributing to the performance of an activity at class level (four digits) of NACE and corresponds to one or more operational sub- divisions of the enterprise. The enterprise's information system must be capable of indicating or calculating for each KAU at least the value of production, intermediate consumption, manpower costs, the operating surplus and employment and gross fixed capital formation. The KAU was devised as an observation unit in order to improve the homogeneity of the results of statistical surveys by activity and hence the international comparability of these results, since at the level of the enterprise different types of horizontal and vertical integration can be observed at both national and international level. An entity that only carries out ancillary activities for the enterprise to which it belongs can be considered as a separate KAU only if it is statistically observable, in the sense that separate accounts for the production it undertakes are readily available, or if it is in a geographically different location from the establishments of the enterprise it serves, it may be desirable and useful to consider it as a separate unit and allocate it to the industrial classification corresponding to its principal activity. However, it is recommended that statisticians not make extraordinary efforts to create separate establishments for these activities artificially in the absence of suitable basic data being available.

10. In fact, the KAU corresponds to the operational definition given in paragraph 96 of the introduction to ISIC Rev.3. The KAUs falling within a particular heading in the NACE classification system can produce products outside the homogeneous group, on account of secondary activities connected with them which cannot be separately identified from available accounting documents. Conversely, the KAUs classified under a particular heading in the classification system on the basis of a principal activity do not produce the entire output of homogeneous groups of specific products because the same products can be produced in secondary activities of KAUs falling under some other classification heading. The internal accounts of enterprises (e.g. profit or cost centres) have often been developed according to criteria that are close: the activity concept. They enable the supply of data at KAU level, so that these can be observed.

2. Classifications

11. *Activity classification.* All European Union member countries use NACE, Rev. 2[12] as the statistical classification of economic activities. All short-term statistics, including distributive trade indices, which compilation is governed by the Regulation (EC) No. 1165/98 shall be produced using NACE, Rev. 2, or a national classification derived therefrom, from 1 January 2009. NACE was revised in parallel with ISIC, Rev. 4 as the Statistical Office of European Union - Eurostat, together with other European countries, had cooperated actively with the United Nations in the whole revision process. The two classifications are fully compatible, as NACE provides in some cases a subdivision of ISIC that is suited better to the structures of the European economies. Moreover, both classifications apply identical criteria, the so called "type-of-operation" criteria, for determining the proper classification of wholesale and retail trade units.

12. *Product classification.* Product classifications are designed to categorize products (goods and services) that have common characteristics. They are a basic statistical tool for establishing distributive trade statistics by product. Distributive trade services are classified on the basis of two criteria: (i) type of provided service (i.e. retail sales in stores or not in stores, specialized and non-specialized trade, on own account or on a commission basis etc.) and (ii) type of traded goods. As a result, the list of commodities that can be sold is set against different groups of type of operation of trade services. The Statistical Classification of Products by Activity (CPA)[13] is the European equivalent of the Central Product Classification, Version 2 (CPC, Ver.2). Its revised version has been in use by European countries since 1 January 2008.

3. Variables relevant to distributive trade indices

Turnover (variable 120)

13. The Turnover Index is a business cycle indicator showing the monthly (or quarterly) evolution of the market of goods and services in distributive trade industry. It also records the evolution of turnover over longer periods of time.

(a) In the case of retail trade, the volume measure of the retail trade turnover index is more commonly referred to as the index of the volume of retail sales. Retail trade turnover indices are short-term indicators for final domestic demand.

(b) Wholesale and motor trade Turnover Indices are business cycle indicators which show the quarterly activity of these services in value.

[12] Regulation (EC) No. 1893/2006 of the European Parliament and of the Council of 20 December 2006 establishing the statistical classification of economic activities NACE Revision 2 and amending Council Regulation (EEC) No. 3037/90 as well as certain EC regulations on specific statistical domains.

[13] Regulation (EC) No. 451/2008 of the European Parliament and of the Council of 23 April 2008 establishing a new statistical classification of products by activity (CPA) and repealing Council Regulation (EEC) No. 3696/93.

14. Turnover comprises the totals invoiced by the observation unit during the reference period, and this corresponds to market sales of goods or services supplied to third parties. Turnover also includes all other charges (transport, packaging, etc.) passed on to the customer, even if these charges are listed separately in the invoice. Turnover excludes VAT and other similar deductible taxes directly linked to turnover as well as all duties and taxes on the goods or services invoiced by the unit. Reduction in prices, rebates and discounts as well as the value of returned packing must be deducted. Price reductions, rebates and bonuses conceded later to clients, for example at the end of the year, are not taken into account. Income classified as other operating income, financial income and extraordinary income in company accounts is excluded from turnover. According to this definition, the items generally included are:

- sales of manufactured products
- sales of products manufactured by subcontractors
- sales of goods purchased for resale in the same condition as received
- invoiced services provided
- sales of by-products
- invoiced charges for packaging and transport
- invoiced hours worked to third parties for labour only subcontracting
- invoiced mounting, installations and repairs
- invoiced installments (stage payments)
- invoiced development of software and software licences
- sales of supplied electric power, gas, heat, steam and water
- sales of waste and scrap materials
- subsidies on products

15. Subject to the treatment of income classified as "other operating income, financial income and extraordinary income" in company accounts, the items generally excluded from the turnover are listed below. They may be included if they generate turnover in the principle field of operation of the observation unit:

- VAT and other similar deductible taxes directly linked to turnover all duties and taxes on the goods or services invoiced by the unit
- commissions
- leases and rentals
- leases for own production units and machines if used by third parties
- leases of company-owned dwellings
- receipts for license-fees
- receipts from staff facilities (for example from a factory canteen)
- the supply of products and services within the observation unit
- sales of own land and fixed assets
- sales or leases of own properties
- sales of shares
- interest receipts and dividends
- other extraordinary income

16. In order to eliminate the price effect on turnover in retail trade, the short-term statistics regulation also requires a deflator of sales (variable 330). The volume of retail sales is in fact the most closely followed series.

Volume of sales (variable 123)

17. The volume of sales represents the value of turnover in constant prices and as such is a quantity index. It can be calculated as turnover at current prices, deflated by the deflator of sales, or as a quantity index derived directly from the quantity of goods sold. The information on the volume of sales (variable 123) can be used instead of the deflator of sales (variable 330) in Annex C (retail trade and repair) of Regulation (EC) No 1165/98.

Deflator of sales (Variable 330)

18. It is the objective of the deflator of sales to adjust turnover for the impact of price changes. The deflator of sales in retail trade is a deflator not of the service provided but of the goods sold. The prices used to calculate the deflator for an activity are calculated as a weighted average of the relevant goods price indices for that activity.

19. It is essential that all price-determining characteristics of the products are taken into account, including quantity of units sold, transport provided, rebates, guarantee conditions and destination. The specification must be such that in subsequent reference periods, the observation unit is able uniquely to identify the good and to provide the appropriate price per unit. In order to show the true evolution of price movements, it should be an actual transaction price, and not a list price. The collected price information refers preferably to a specific date during the reference period. In practice the information actually collected may refer to a particular day in the middle of the reference period that should be determined as a representative figure for the reference period.

4. Scope and coverage of data

20. *The Retail Trade Indices* cover the division 52 of NACE Rev. 1.1. In addition to the standard levels of NACE, up to 4-digit level of detail, the following aggregates are also compiled and disseminated by European Union countries:

Level of detail	*Variable*

- Class 52.11 - Class 52.12 - Group 52.2 - Group 52.3 - sum of Classes 52.41, 52.42 and 52.43 - sum of Classes 52.44, 52.45 and 52.46 - sum of Classes 52.47 and 52.48 - Class 52.61	120. Turnover 123. Volume of sales 330. Deflator of sales
- sum of Class 52.11 and Group 52.2 - sum of Class 52.12 and Groups 52.3 to 52.6 - sum of Groups 52.1 to 52.6	120. Turnover 123. Volume of sales 330. Deflator of sales 210. Number of persons employed
- Division 52 Member States whose value added for Group 52.7 represents less than 5 % of their value added for Division 52 in a given base year may approximate Division 52 by the sum of Groups 52.1 to 52.6	120. Turnover 123. Volume of sales 330. Deflator of sales 210. Number of persons employed

23. Indices are compiled and disseminated for the following activities of *Divisions 50 Motor trade* and *51 Wholesale trade*:

Level of detail	*Variable*
- sum of Groups 50.1, 50.3, 50.4 - Group 50.2 - Group 50.5 - Division 51 at three-digit level of NACE, Rev.1 - Division 50 at two-digit level of NACE, Rev.1	120. Turnover
- Division 50 at two-digit level of NACE, Rev.1 - Division 51 at two-digit level of NACE, Rev.1	210. Number of persons employed

5. Accounting conventions

21. *Base period*. Indices in the short-term statistics are expressed with reference to a base value and this base value is representative for a base year. For a monthly series the base value is the monthly average during the base year and for a quarterly series the base value is the quarterly average during the base year. By convention the index value of 100 is assigned to the base value.

22. General criteria for suitable base years are that they should be a "normal" or "average" year, which has not shown very strong special influences. However, so that international data comparison and aggregation of national indices are not made more difficult through different nationally specified base years, the Short-term statistics (STS) Regulation ((EC) No. 1165/98) has specified that base years should be updated every 5 years and that the base years should be those ending in a "0" or a "5". The Regulation requires that rebasing should take place within three years from the end of the base year. The current base year is 2005.

23. *Recording of transactions.* The Regulation requires Member States to transmit data to Eurostat either as an index or as absolute figures.

B. A summary of country practices on the compilation of the retail trade turnover and volume of sales indices

24. The summary below describes the European country practices with respect to compilation of retail trade turnover and volume of sales indices for 2006. The methodology used by them may well have changed since then, in particular due to rebasing to 2005 and the introduction of NACE, Rev.2 on 1 January 2009.

1. Target population, statistical unit and size class and threshold

25. Traditionally the main method of collecting information on turnover by European Union countries is through the use of statistical surveys, although data from administrative sources may also be used alone or in a combination with survey data. In the case of statistical surveys either a sample survey or a census can be used. Every country derives the retail trade turnover index from statistical survey except Luxembourg, and a few countries use a combination of administrative and survey data.

26. The total population that each country targets for the statistical surveys on distributive trade is defined in terms of the activities covered, the type of statistical unit, and the size of units covered (including any exclusions or deviations). The surveyed population is defined by the STS Regulation which requires an activity coverage of NACE Division 52, however, it permits the exclusion of NACE, Rev.1.1 Group 52.7 for those Member States whose value added in this Group is less than 5 % of the value added of the whole of Division 52. In fact, 15 of the countries do not collect data for any units in Group 52.7. Coverage rate calculated as percentage of nationally defined target population to the STS Regulation requirement is 90-100% for most counties.

27. The use of size thresholds is not specifically mentioned in the Regulation; however the conduct of stratified sample surveys by Member States requires implementing such thresholds. The total turnover or/and the number of persons employed/employees above certain cut-off point are the most commonly used thresholds.

Some countries indicated that they use a very low threshold, as this may in fact be the threshold for their business register rather then a threshold used to exclude part of the population from their surveys.

28. Most countries use the enterprise as an observation and reporting unit. For some activities or specific type of enterprises (such as large multi-establishment enterprises), the enterprise is used in a combination with local unit or kind-of-activity unit (KAU).

2. Selection of units to be surveyed and stratification

29. Units can be selected in a number of ways, essentially by taking all units, or a sample. If all units are taken it may be a case that only those above a certain size are in fact taken. If a sample is taken it may be a random sample, or a purposive/judicious sample. The random sampling is almost exclusively used, with Luxembourg taking all units (from an administrative source).

30. In the case of the retail trade turnover index it is normal to use activities (NACE headings) as one of the criteria for drawing a sample, and size is commonly also used: nine countries use turnover as the size measure, eleven use employment, two use both employment and turnover, one uses sales area, and one uses no size measure. A further criterion that is used is region.

3. Sample size, coverage and frequency of updating of the sample

31. The sample size for Division 52 (number of retail trade units in the sample) varies markedly among countries – from almost 20000 units in the sample of Germany to 193 units in the sample of Malta. The proportion of turnover of the nationally defined population also varies as for most countries it is above 60 percent, however, for some it is below 25 percent. Nearly all of the countries update their sample at least every year. Greece, Cyprus, Malta and Austria do this every 5 years or irregularly.

4. Definition of turnover

32. The definition of turnover for short-term statistics (para. 14-17 above) follows the definition of turnover for structural business statistics[14] and in this respect follows largely the European System of National and Regional Accounts 1995[15]. The definition is relatively straightforward. In case of doubts concerning the eventual inclusion or not of any item in the turnover the definition specifies that "items may be included if they generate turnover in the principle field of operation of the observation unit."

33. National statistical authorities should implement this definition, but accounting rules in force in each country should be used as guiding principles of what to include and to exclude from the turnover. One of the controversial issues in the turnover definition is

[14] Council Regulation (EC) No. 58/97 of 20 December 1996 concerning structural business statistics.
[15] Council Regulation (EC) No 2223/96 of 25 June 1996 on the European system of national and regional accounts in the Community

the treatment of VAT. Some countries consider that VAT should be included in the definition of turnover, while other should not. The definition adopted for short-term statistics excludes VAT that is consistent with its treatment adopted for structural business statistics. Some of the arguments for not including VAT in the turnover definition are presented below:

(a) The aim of the short-term statistics is to follow developments over time and VAT does not have any impact on the tendency unless the rate of the tax has been changed. In fact, if there is a change in the tax of different products this could introduce an artificial element into the development of the turnover indicator;

(b) If VAT is included in the weights, it can distort the share of each activity; bearing in mind that the tax differs from product to product, the impact of VAT on these weights can have a negative impact on the quality of the index;

(c) The tax for domestic or non-domestic markets may differ; and

(d) The tax differs between Member States.

5. Estimates of non-response

34. Data as they have been received from respondents through the statistical surveys and administrative data sources are the starting point for the calculation of short-term distributive trade statistics. The process of compiling the indices comprises more than just aggregating the questionnaire items. Statistical Offices of the member states perform a number of checks, validation and statistical procedures on collected data with the aim of making them compliant with the requirements of the short-term statistics Regulation.

35. The issue of non-response can be evaluated from a number of perspectives, however, three are normally used for this purpose - a simple snapshot of the non-response rate for a particular monthly survey, the second shows how this evolves over the course of one monthly round of data collection, and the third looks at differences in response rates for the 12 calendar months. An overall non-response rate varies quite widely among member states - from 53-33 percent in Italy, Portugal, and Czech Republic to 2-3 percent in Cyprus, Norway, and Estonia. The non-response rate develops over the course of a period of data collection, and so to be able to compare non-response rates it is important to take a snapshot at the same point in time, either after a fixed period of time such as 35 days from the end of the reference period, or at a benchmark moment such as the first date for publishing the index. Unfortunately, the benchmark point in time was not specified: a number of countries spontaneously indicated the reference time at which the non-response rate was measured. This would be assessed by Eurostat in future.

36. An analysis of response rates for the 12 calendar months could show if there are seasonal factors influencing enterprises speed/willingness to respond, or statistical offices ability to follow-up non-respondents. The non-response rate is quite stable with the highest average non-response rate of 9.5 percent in December while the lowest rate of 7.0

percent was observed in April. For reducing the non-response, all member states take actions to follow-up non-respondents and encourage faster and more responses. The direct telephone contacts and postal or fax /e-mail reminders are the most common forms of non-response follow-up. Availability of electronic (or web-based) questionnaires for data collection is also considered a factor improving the response rates. Sanctions, although envisaged in statistical legislation, play a very limited role. The actions taken by European countries to follow-up non-respondents and encourage faster and more responses are listed below in descending order of usage:.

(a) Telephone contacts;
(b) Postal (or fax or e-mail) reminders;
(c) Electronic questionnaires; web-based questionnaires;
(d) Sanctions;
(e) Field visits (personal interview);
(f) Extend deadlines;
(g) Acceptance of estimations by enterprises;
(h) Improved cooperation with regional offices;
(i) Inform data suppliers of the use of the information;
(j) Increase the frequency of the survey;
(k) Improved questionnaires;
(l) Use of administrative data;
(m) Contacts with trade associations/research institutes.

37. Measurement of non-response errors/bias is not compiled however, some assessment is being done based on the difference between early estimates of the index and revised indices after late responses have been received.

38. Member States apply different methods for treating the issues of non-response or missing values, depending on the availability of data at the level of a single enterprise or the degree of importance of this enterprise. The following practices exist:

(a) Turnover data for a non-respondent for a particular month are imputed on the basis of the available data from previous month (period) of the unit concerned adjusted by the rate of change from the corresponding month (period) of the previous year. Imputed turnover data might be obtained from a statistical survey or administrative data source, such as the value added tax records;

(b) If no previous response for a non-respondent enterprise is available (due to for example to a partial rotation of the sample), the imputation is carried out on the basis of the average rate of change calculated for respondent enterprises in the same stratum. In this case all imputations are made under the assumption that there is no significant difference between the respondents behavior and the non-respondents behavior;

(c) Adjustment of the weights for non-respondents. The base weights are calculated separately for strata as ratios: the number of the enterprises in the frame

population to the number of enterprises in the sample. The base weights are corrected for units non-response by multiplying the base weight by an adjustment factor;

(d) No imputations are made if the non-response is due to the closure or temporal inactivity of the enterprise.

6. Data processing

39. Data processing includes data editing which is done by countries at a micro (individual respondents) and at a macro (activity (aggregated)) level. Countries indicate that they do automated error logical checking for validity and consistency. Consistency checks include cross-checking with other data provided by the respondent in the same survey, for example, turnover is compared with the turnover of the same month of the previous year, with the turnover of the previous month and with administrative data. Respondents are contacted when data are not plausible or are doubted as in some cases the data is additionally compared with the latest data from the VAT declaration of this unit. Respondents are in most cases confronted with the results of the checks immediately. A further round of data editing is done on the database as a whole.

40. Macro editing is then carried out, firstly by checking that the data are not accumulated figures. Then the growth rate is verified for each activity to find values and confidence intervals that seem to be unnatural or divergent. In activities where the growth rate appears to be divergent in some way the micro data for that activity are studied. Micro data that deviate a lot compared to earlier months and/or the VAT declarations for the same period of the previous year are studied on a micro level and if necessary enterprises are re-contacted.

7. Estimates for grossing up and confrontation with other data sets

41. Once data have been collected and treated for non-response and other data validation and editing procedures they are grossed-up to estimate the level of the indicators for the total population on the basis of which value indices are calculated. Grossing-up consist of raising the sample value by a factor based on the sampling fraction for each cell in the stratified sample in order to obtain the levels of data for the frame population. As a general rule, member states use the grossed-up values only to compile indices; they are not disseminated in their own right. The grossing-up is made on the basis of the following approaches:

(a) Inverse sampling rate (N/n). The grossing up factor for each stratum is defined as the ratio of the total number of enterprises (N) within a given stratum to the corresponding number of enterprises (n) of the sample;

(b) Ratios between the values in returned questionnaires and the total turnover submitted to VAT authorities calculated for each sector of trade and each stratum;

(c) The sample means are multiplied by the sample size of the population in the various strata;

(d) Extrapolation of the results to the population is made by using extrapolation coefficients based on the turnover of selected units and the total turnover in particular strata;

(e) Horvitz-Thompson estimator.

42. Most of the Members States routinely confront the results of the short-term distributive trade surveys with those obtained from the annual structural business statistics surveys, as well as with other statistical sources covering turnover and/or administrative data. Countries that do not make regular confrontation make comparisons on an ad-hoc basis with other short-term or structural statistics.

8. Index calculation

43. *Type of index*. When the retail trade turnover index is calculated as volume index it is expressed in its Laspeyres type. Only two countries use Paasche type indices. For the calculation of the real (volume) turnover series in retail trade the appropriate price indices are used as deflators. Indices could be presented relative to the previous month and to the same month of the previous year. For the purpose of disseminating the indices to Eurostat countries calculate them with 2005 as a base year.

44. The member states' practice varies regarding the use of fixed base or chain-linked Laspeyres indices. Countries are also not uniform in their practice on index compilation. Some of them compile distributive trade indices on the basis of the grossed-up population totals. Others prefer to compile them directly from the survey results.

45. *Deflation of turnover*. Nearly all member states (all except Malta) compile a retail trade volume index (either retail sales index or retail turnover index) by using some kind of price index to deflate the turnover, as in majority of the cases, this deflator is a consumer price index, assumed to be based on the data collection for the HICP, although in a few cases the type of price index was not specified. In nearly all countries the deflation takes place at the detailed level of activity headings as foreseen in the STS Regulation, the only exception appears to be in Denmark where just three deflators are used (Food and other basic commodities, Clothing etc., and Other consumption goods). Many countries deflate at the 4-digit level of NACE, Rev.2 or more detailed levels of the national activity classifications like France, the Netherlands, Austria, Sweden and the United Kingdom.

46. Frequent practice of some European Union countries is, as far as the wholesale trade and motor trade turnover indices are concerned, to calculate them as a simple value index, i.e. as a ratio between the turnover in the reference and the base period. Small

number of countries does not disseminate at all trade turnover data in the index form, rather they produce only current turnover (sales) values as absolute numbers.

47. *Weights used and frequency of updating*. As well as being used to grossing-up the sample survey results to population figures, weights are used to aggregate indices according to a product or activity classification. For the retail trade turnover indices the most commonly used weighting factor is the turnover at a detailed activity level (for example 4-digit level of NACE, Rev.2) obtained from the annual structural business statistics surveys for base year 2005 of member states. The frequency of updating the weights used for index aggregation among countries is as follows: 48 percent of countries update the weights every 5 years; 19 percent – monthly; one country updates them annually and the practice of the others is unknown.

48. Several countries indicated that they do not use weights, and it is assumed that in these cases the aggregation by activity is done based on the value of turnover. Then, an index is compiled independently at each level or only data as absolute values are disseminated.

49. *Base year*. The current base year as per the provisions of the short-term Statistics Regulation is 2005.

9. Working-day adjustment and seasonal adjustment

50. *Calculations made*. According to the STS Regulation turnover indices have to be calculated and transmitted in working-day adjusted and seasonally adjusted form. In practice some countries carry out these two adjustments in an integrated (combined) manner, and the establishment of working-day adjustment series (including adjustment for calendar effects) for them is considered a pre-treatment for seasonal adjustment. Only a few European Union countries do not do any time series decomposition.

51. *Decomposition.* The most common justification for the use of decomposition is that it makes it possible to determine sub-annual growth rates that make sense and it provides a means to establish long-term developments uninfluenced by seasonal and sub-annual factors. The normal breakdown of a time series makes it possible to identify the trend, the cycle, the seasonal variation and the erratic fluctuations.

(a) The trend is a slow variation over several years, generally associated with the structural causes of the phenomenon involved;

(b) The cycle is an almost periodic fluctuation characterised by alternating periods of higher and lower rates of change (which may in fact be expansion and contraction); in the majority of cases, it is connected to the fluctuations of overall economic activity. As regards decomposition of the series, the trend and cycle are often associated (they are not differentiated);

(c) The seasonal variation represents the effect of the climatic and institutional events which recur more or less regularly each year (for example, summer holidays or Christmas sales);

(d) The erratic fluctuations represent unforeseeable movements linked to any type of events. In general, they are of an unpredictable, stable nature but can in certain cases present extreme values. These extreme or aberrant values can have various origins. They may be economic, such as strikes or the impact of a harsh winter on electricity production. These may be referred to as the irregular component of the series.

52. *Working-day adjustment*. The term "working-day adjustment", as mentioned by the STS-Regulation, covers both calendar and working/trading day effect adjustments. The calendar effect is related to the fact that the economic activity varies around the special periods and dates in the year (Easter, moving holidays) while the working/trading day effect originates from the varying number of days of the week (Mondays, Tuesdays, Wednesdays, ..., Sundays) in each month. Working-day effects cause deviations from the month specific "average" values disturbing the comparability between the equivalent months in consecutive years.

53. *Seasonal adjustment*. Seasonal adjustment, or the adjustment of seasonal variations, aims, after adjusting for calendar and working/trading day effects, to take account of the impact of the known seasonal factors that have been observed in the past.

54. *Software used*. Seasonal and working day adjustment procedures are done using the following software packages - TS Demetra, Demetra, X11 ARIMA, X12 ARIMA, and TRAMO/SEATS through the Demetra interface. Concerning the methods used for working day adjustment, vast majority of the countries use regression methods.

55. *Aggregation approach*. Slightly more than half of the countries perform seasonal adjustment independently at each classification level (direct approach), while the other group of countries perform seasonal adjustment on lower level indices, and the resulting indices then aggregate by NACE, Rev. 2 (indirect approach).

56. *Revision of models*. Member states adjust seasonal adjustment models and parameters once per year, as every time when the seasonal adjustment is performed, generally the whole series that is available is revised.

57. All methods have the common assumption that part of the indicator (i.e. turnover) varies with or is even proportional to the number of working (trading) days. The concept of working or trading days is dependent on specific national characteristics, in particular where calendars and holidays differ from one member state to another. The concept of working days also depends on the indicator under consideration. For example, five Sundays in a month impacts retail trade series because Sunday is not a business day and marks a low point in economic activity. The number of Fridays and Saturdays also has a significant impact on those series, as they are days when people do much of their

shopping. Trading-day variations are associated also with the accounting and reporting practices of trade units. Stores that conduct their bookkeeping activities on Friday tend to report higher sales in months with five Fridays than in months with four Fridays. The United Kingdom for example treats differences in working days through the use of standardised months (fixed 4 or 5 week periods) rather than calendar months, combined with a pre-adjustment in the seasonal adjustment.

10. Error measurement

58. *Non-sampling errors*. In very few cases countries were able to provide any quantitative information about non-sampling errors in retail trade index calculation. Countries mostly evaluated the non-sampling errors by assessing the use of consistent definitions such as reference period, consistency in application of variables definitions and of statistical units as well as processing and measurement errors.

59. Regarding reference period: the Czech Republic indicated that some respondents give cumulative figures from the beginning of the reference year rather than for the reference month itself; the Netherlands reported that reference periods have to be regularly converted; the United Kingdom reported that about 65 percent of respondents use the "standardised" reporting periods (4 or 5-weeks) requested, 20 percent of units use the calendar month, and the remaining part of respondents use other periods; Norway also noted that respondents do not always report for the calendar month.

60. Use of consistent definitions - variable definition: the Czech Republic reported that some units provide the turnover exempt from VAT rather than turnover excluding VAT; Germany reported that some retail agents report the value of the traded goods rather than just their commissions; Austria reported that there are measurement errors in the case of differences between fiscal turnover and turnover from company accounts - if such differences are recognised for important enterprises they are contacted by telephone.

61. Use of consistent definitions - statistical unit: Norway reported that units ("establishments") sometimes report about only part of their, or about the activity of the whole enterprise to which they belong.

62. *Processing and measurement errors.* Several countries mentioned that they used controls to check and/or correct for measurement and processing errors; several countries mentioned misunderstandings by respondents; Estonia reported that in about 19 percent of questionnaires the turnover was corrected in a particular month; Italy reported measurement errors in about 0.5 percent of cases; Latvia reported that around 5 percent of respondents are contacted to confirm large changes in turnover.

63. *Sampling errors.* Another type of error concerns sampling errors. Countries that use sampling surveys relay on a variety of software packages to calculate the sampling errors. The indicator for which the sampling error is measured is either the turnover or its index. Calculated coefficient of variation is the measure for the sampling error. It varies in 0.2-8 percent range.

64. *Dissemination of information about errors.* Only four countries specifically mentioned that they disseminate information on errors, namely Germany, Austria, Slovenia and the United Kingdom. France, Italy and Hungary reported that they disseminate internally such information. Eight countries reported that they do not disseminate information on errors, while the remaining nine countries did not provide any information for this point. It is likely that many countries do provide information when they disseminate their data, for example, information on response rates.

C. A country case: Compilation of Retail Sales Index in Ireland

1. Purpose and scope

65. The Central Statistical Office of Ireland (CSO) compiles Retail Sales Index (RSI) as its primary purpose is to provide a short-term indication of changes in the value and volume (or quantity) of retail sales in Ireland. In doing so the RSI provides a leading monthly indicator on economic activity. It provides an accurate and objective measure of retail trading and supplies a valuable guide to consumer spending behaviour in the Irish economy. More generally, in conjunction with several other monthly and quarterly economic indicators published by the CSO, the RSI offers a valuable tool for better understanding the general economic climate and performance in Ireland.

66. The reporting unit is the enterprise, where an enterprise is defined as the smallest legally independent unit, allowing enterprises to provide a single overall retail sales figure each month. It also ensures that any new branches opened by respondents are automatically included in the index. All enterprises are eligible for selection i.e. no size cut-off is applied to the enterprise population. Data is compiled and published at national level only i.e. NUTS 1 level[16]

67. The RSI is a statutory inquiry, collected under the Statistics (Retail Sales) Order 2008 No. 140/2008. The survey is also conducted in compliance with Council Regulation (EC) No. 1165/98 and Commission Regulation No. 472/2008 concerning short-term statistics. Retail Sales Index is compiled in accordance with the statistical classification of economic activities in European Communities, i.e. NACE Rev. 2[17].

68. The retail sector as defined for the purposes of the RSI is:

Business Group Description	**NACE, Rev. 2**
Motor Trade (Excluding wholesale)	45

[16] Nomenclature of Territorial Units.

[17] For more information on the new NACE Rev. 2 classification and a detailed breakdown of the codes see http://www.cso.ie/px/u/NACECoder/NACEItems/searchnace.asp.

Non specialised stores with food, beverages or tobacco predominating	47.11
Department Stores	47.19
Food, Beverages and Tobacco in specialised stores	47.2
Fuel	47.3
Pharmaceutical Medical and Cosmetic Articles	47.73-5
Clothing, Footwear and Textiles	47.51, 47.71-2
Furniture and Lighting	47.59
Hardware Paints and Glass	47.52
Electrical Goods	47.41-3, 47.54
Books, Newspapers and Stationery	47.61-2
Other Retail Sales	47.53, 47.63-5, 47.76-8
Bars	56.3

69. The RSI coverage differs from the strict NACE, Rev.2 retail trade classification (NACE 47) owing to the inclusion of the retail trade and repair of motor vehicles and motorcycles (NACE 45) and Bars (NACE 56.3). Also, the RSI excludes sales by street stalls and markets, street based newspaper vendors and other retailing activities not conducted from permanent business premises. In addition, the following are excluded: mail-order, internet, second hand and repairs of personal, electrical and household goods unless included as turnover arising from a secondary activity but classified to the principal activity. The direct retail sales of non-distribution enterprises (e.g. manufacturing enterprises with no separate sales establishments) together with the incidental sales of wholesale businesses are also excluded.

70. The RSI is designed as a short-term indicator and should not be used to examine long term or structural changes in the retail sector. The Annual Services Inquiry, also published by the CSO, is more suited to this purpose. The RSI publishes indices on the level of retail sales for each month. It does not provide any information on actual values of turnover generated. The RSI provides breakdowns at NACE, Rev.2 or economic activity level but does not provide any information at product level.

2. Population and Sample size

71. The Annual Services Inquiry 2005 estimated there were approximately 28,800 enterprises in the Irish retail sector as defined for RSI purposes. In total, a sample selection of 2,200 enterprises has been drawn to represent the entire population. In practice however, owing to non-response and non-relevants (enterprises which have ceased trading etc.) only a total of about 1,800 enterprises respond in any given month. This gives an average sampling fraction of over 6%, however this fraction can differ significantly from sector to sector and within size class. If coverage is viewed from a turnover perspective, the coverage is considerably higher, with an average sampling fraction of approximately 50%.

3. Working day adjustment[18]

72. The RSI is a monthly turnover index. This presents a comparability problem as months differ in length i.e. the number of days in each month. In particular, it is expected that months with extra days and, in particular, months with 5 Fridays or 5 Saturdays to have a higher turnover. To overcome this difficulty, CSO compiles the RSI indices using standardised reporting periods (SRPs) of 4, 4 and 5 weeks, i.e. the first two months of every quarter comprises of 4 weeks while the third month has 5 weeks. With this SRP approach the number of days in every month is equalised. So not only does each month have a standardised number of weeks, turnover is "trading day" adjusted so that effectively, each of those weeks are identical – every week begins with a Sunday and finishes on a Saturday.

73. For each period, enterprises have the option of reporting their turnover using the either the standardised month or the actual calendar month. About 30 percent of respondents, particularly large enterprises, supply data corresponding to the 4-4-5 pattern. The remaining enterprises provide calendar month data. This calendar month is then adjusted using calendar correction factors to the standardised month. These calendar correction factors are based directly on trading day micro data provided by enterprises on the RSI sample. Every 5 years, as part of the rebasing process, enterprises are asked to distribute the average weekly sales over the 7 days of the week. This data is then compiled to construct the trading day weights. These fixed trading weights are then used to calculate calendar correction factor for each month.

74. The 4-4-5 pattern adds up to 364 day year and consequently requires a re-calibration every 5th or 6th year (depending on when leap years fall) to account for the missing week. Here the exact 52 week year is replaced by an exact 53 week year. This additional week is added to February, replacing the 4-4-5 pattern with a 4-5-5 pattern for the 1st quarter of the re-calibrated year.

75. The retail turnover data provided by respondent enterprises are treated as strictly confidential in accordance the Statistics Act, 1993 and cannot be accessed under the terms of the Freedom of Information Act, 1997. Data are not disclosed by the CSO to any other Government Department or outside body.

4. Seasonal adjustment

76. Retail sales are subject to a high degree of seasonality, particularly for individual businesses. To facilitate interpretation of underlying trends value and volume indices are adjusted to remove these seasonal fluctuations. Seasonal adjustment is conducted using the direct seasonal adjustment approach. Under this approach each individual series is independently adjusted, e.g. aggregate series are adjusted without reference to the component series. Each individual seasonally adjusted series is calculated based on unadjusted data spanning from January 2000 to the current period. The adjustments are completed by applying the X-12-ARIMA taking into consideration: (a) calendar effects,

[18] See annex III for the Irish experience with calendar corrected turnover.

e.g. the timing of Easter; (b) the phase shift effect, i.e. the fact the reporting period of the RSI does not coincide with the calendar month; and (c) outliers, temporary changes and level shifts in the series.

5. Index formula

77. The RSI is calculated using a modified fixed weight Laspeyres index with 2005 as a base period as 12 distinct sets of "seasonal" base weights are used, one for each month of the year. The compilation of the index for the current month is based on the percentage change in average weekly sales (based on a matched sample) over the corresponding monthly period of the previous year.

78. *Retail sales volume index*. The unadjusted[19] volume indices are calculated by deflating each value indices using specially constructed deflators calculated for each individual index. The deflators used for the RSI are calculated based on a combination of current prices gathered for the Consumer Price Index (CPI) and deflator base-weights[20] constructed using product micro data gathered from enterprises as part of the rebasing process.

6. Weights

79. The Retail Sales Index is calculated using a seasonal basket of weights i.e. a different set of monthly weights are used for each month. These monthly weights reflect the changing relative importance of different groups (according to NACE, Rev.2) throughout the year. For example, consumers typically spend more on Clothing and Footwear in September because of the return to school. More new cars are purchased in January than any other month with the introduction of new registration plates.

80. The base weights are derived from the Annual Services Inquiry (ASI) turnover data where the wholesale element of sales in retail outlets and the associated VAT is removed from the total turnover figure. However, the ASI can only provide annual turnover data. The monthly pattern of retail sales needed to convert annual ASI turnover data to a set of monthly turnover figures is derived from micro data collected for the RSI in 2005.

7. Data processing

81. *Data editing*. Edit checks are conducted initially at the data entry stage. Atypical data is usually queried directly with the respondents at this stage. Automated edit checks are generated through the whole RTI database system. The primary edit rule applied is a query range edit of 0.8-1.4 (where the value for the current month is compared to the value for the same month in the previous year). Any observation outside this range is

[19] These indices are trading day adjusted as a result of the 4-4-5 pattern of data recording.
[20] The base weights are distributions of COICOP (Classification of individual consumption by product) classified products to the various indices which are based on NACE Rev. 2 classifications.

examined and queried if necessary. A period of 3-4 weeks out of a 6-7 week survey process is spent dealing with micro-editing.

82. Macro editing is conducted using VAT information from the Revenue Commissioners as well as some motor trade information from the Society of Irish Motor Industry and the Transport Section of the CSO. The RSI deflators and prices are also compared to the CPI data and other price sources.

83. *Imputation (for non-response or Incomplete data sets).* The retail sales index adopts a matched sample approach and therefore there is generally no need to conduct imputation. Occasionally, however, some ad-hoc imputation is carried out for some significant firms. In these cases each firm is looked at individually and an extension of nearest neighbour and last observation carried forward techniques are used to impute the missing values.

84. High quality of data is ensured due to a high response rate (75 percent). The response rates for the provisional survey are typically in the order of 60 percent covering about 90 percent of the value of the turnover surveyed. The corresponding figures for the final month are 75 percent covering about 95 percent of the value of the turnover.

8. Dissemination

85. *Timeliness*. Retail Sales Provisional Index is published 7 weeks after the end of the survey period. Final index is published 11 weeks after the end of the survey period.

86. *Revisions*. Each month the provisional data from the previous month is revised on the receipt of late returns or amendments of existing returns. The current month?s data is always provisional and only becomes final when the next month is published. The size of the revision varies from month to month but would typically be in the order of +/- 2% for „All Industries? indices.

87. As turnover indices are seasonally adjusted, the complete series are revised monthly due to updated seasonal factors. Other revisions are flagged as such in the Release. Updating methodologies are not usually announced in advance but simultaneously with implementation. A significant change (e.g. rebasing of the indices) will be notified in advance.

Chapter IV
The USA experience in measuring changes in value of the retail trade

A. The USA retail trade surveys: an overview

1. The US Census Bureau is producing a measure of change in the value of retail trade on the monthly and annual basis. The Advance Monthly and Monthly Retail Trade Surveys (MARTS and MRTS), the Annual Retail Trade Survey (ARTS) produce the most comprehensive data available on retail economic activity in the United States. Changes in retail trade sales, as measured in these surveys, do not account for changes in prices and represent a value index.

2. An overview of the main features of these three surveys and their relationships is contained in a table below while further details are provided in the subsequent sections.

	MARTS	MRTS	ARTS
Purpose	To provide an early indication of sales of retail and food service companies. Voluntary responses.	To provide current estimates of sales at retail and food services stores and inventories held by retail stores. Voluntary responses.	To provide detailed industry measures of retail company activities. Mandatory responses.
Data content	Companies provide data on dollar value of sales, reporting period, and number of retail establishments.	Retail firms provide data on dollar value of retail sales and end-of-month inventories.	Companies provide data on dollar value of retail sales, sales taxes collected, inventories, method-of-inventory valuation, cost of purchases, and account receivables balances.
Frequency	Monthly. Reported data are for activity taking place during the previous month.	Monthly; A new sample is chosen approximately every 5 years; most recently for 2006.	Annually; Reported data are for activity taking place over the prior calendar year. Data collection begins in January following the end of the survey year. New samples are chosen approximately every 5 years and are updated quarterly. Use of

			the latest sample began in the 2005 survey year.
Methods	A mail-out/mail-back survey of a sub-sample of monthly retail trade survey sample. Forms are mailed 5 working days before the end of the reporting month and responses are due 3 working days after the reporting month. The advance survey has a sample of about 5,000 firms. Some 1300 firms, because of their relatively large effect on the sales of certain industry groups, are selected with certainty.	A mail-out/mail-back survey of about 12,000 retail businesses with paid employees; supplemented by estimates for non-employers, new employers, and missed employers obtained from benchmarking to the Annual Retail Trade Survey. The sample of retail firms is drawn from the Business Register. Approximately 3,300 of the 12,000 are selected with certainty.	A mail-out/mail-back survey of about 22,000 retail businesses with paid employees, supplemented by administrative data to account for non-employer businesses. The employer sample is drawn from the Business Register.
Products	Advance Monthly Retail Sales reports are released about 9 working days after the close of the reference month. They contain the advance estimates for the reporting month and preliminary sales data for the previous month by major kind-of-business group. Data are presented both in terms of value and percent change. Seasonally adjusted and unadjusted data are published.	Monthly Retail Trade Sales and Inventories estimates are released approximately 6 weeks after the end of the reference month. Statistics include retail sales, inventories, and ratios of inventories-to-sales. Estimates are both seasonally adjusted and unadjusted.	The Annual Benchmark Report for Retail Trade and Food Services is released annually each spring. The 2008 report was released on March 31, 2009. This report contains estimates of annual sales, per capita sales, gross margins, monthly and year-end inventories, sales/inventory ratios, merchandise purchased, gross margin/sales ratios, and accounts receivable balances for the U.S. by kind of business. Comparable

			statistics are shown for the previous year, along with year-to-year percentage changes. Monthly data, both seasonally adjusted and unadjusted, for the most recent 10 years are also presented.

3. The US Census Bureau estimates of changes in retail trade sales are in high demand by many users including:

(a) The Bureau of Economic Analysis uses these data for the nation's Gross Domestic Product (GDP) estimates and in developing the national accounts' input-output tables;

(b) The Bureau of Labor Statistics uses these data as input to its Producer Price Indices and in developing productivity measurements;

(c) Trade and professional organizations use these data to analyze industry trends and benchmark their own statistical programs, develop forecasts, and evaluate regulatory requirements;

(d) The media use these data for news reports and background information;

(e) Private businesses use these data to measure market share, analyze business potential, and plan investments.

1. Coverage

4. Retail trade, as defined by the North American Industry Classification System (NAICS) sectors 44-45, includes establishments engaged in selling merchandise in small quantities to the general public, without transformation, and rendering services incidental to the sale of merchandise. Two principal types of establishments classified in retail trade are distinguished:

(a) Store retailers operate fixed point-of-sale locations, located and designed to attract a high volume of walk-in customers. They have extensive displays of merchandise, use mass-media advertising to attract customers and typically sell merchandise to the general public for personal or household use. Some store retailers also provide after-sales services, such as repair and installation; for example, new automobile dealers;

(b) Non-store retailers also serve the general public, but their retailing methods differ. Such methods include paper and electronic catalogs, door-to-door solicitation, in-home demonstration, "infomercials", selling from portable stalls or through vending machines.

5. Food services, as defined by NAICS sub-sector 722, include establishments that prepare meals, snacks, and beverages to customer order for immediate on-premises and off-premises consumption.

NAICS	**Retail and food services,**
	Total
	Total (excl. motor vehicle and parts)
	Retail
	GAFO
441	**Motor vehicle and parts dealers**
4411, 4412	Auto and other motor vehicles dealers
44111	New car dealers
4413	Auto parts, accessories and tire stores
442	**Furniture and home furnishing stores**
4421	Furniture stores
4422	Home furnishings stores
443	**Electronics and appliance stores**
44311, 13	Appliance, television and camera
44312	Computer and software stores
444	**Building material and garden equipment and supplies dealers**
4441	Building materials and supplies dealers
445	**Food and beverage stores**
4451	Grocery stores
4453	Beer, wine and liquor stores
446	**Health and personal care stores**
44611	Pharmacies and drug stores
447	**Gasoline stations**
448	**Clothing and clothing accessories stores**
44811	Men's clothing stores
44812	Women's clothing stores
44814	Family clothing stores
4482	Shoe stores
451	**Sporting goods, hobby, book and music stores**
452	**General merchandise stores**
4521	Department stores (except Discount Department Stores)
4521	Department stores (including Discount Department Stores)
4529	Other general merchandise stores
45291	Warehouse clubs and super-centers
45299	All other general merchandise stores

453	**Miscellaneous store retailers**
454	**Non-store retailers**
4541	Electronic shopping and mail-order houses
722	**Food services and drinking places**

2. Main concepts

6. *Sales* include merchandise sold (for cash or credit at retail or wholesale) by establishments primarily engaged in retail trade. Services that are incidental to the sale of merchandise, and excise taxes that are paid by the manufacturer or wholesaler and passed along to the retailer are also included. Sales are net, after deductions, for refunds and allowances for merchandise returned by customers. Sales exclude sales taxes collected directly from customers and paid directly to a local, state, or federal tax agency.

7. The estimates of sales measure the operations receipts rendered by stores that primarily sell at retail. The sales estimates represent total sales and receipts of all establishments primarily engaged in retail trade. They do not include sales at retail by manufacturers, wholesalers, service establishments, and others whose primary activity is other than retail trade. Because the retail establishment is the basic unit of measure, the published estimates of sales by type of retail store are not intended to measure the total sales for a given commodity or merchandise line.

8. *Inventories*. Merchandise inventories are the value of stocks of goods held for sale. The inventories estimates represent the value, at cost, of the merchandise available for sale as of the last day of the report period. Methods of valuation may vary according to the accounting practices of each firm. The estimates provided in this report are valued on a non-LIFO (last in, first out) basis. LIFO is a method of valuing inventory where the latest items of merchandise added to the inventory are the first ones taken out. Non-LIFO would mean that another method, such as FIFO (first in, first out), was used to establish the value of the inventory available for sale. Merchandise inventories are shown for stores and warehouses servicing retail establishments. Included are only those warehouses that maintained supplies of merchandise primarily intended for distribution within the organization.

9. *Inventories/ Sales Ratios*. The inventories/ sales ratios show the relationship of the end-of-month values of inventory to the monthly sales. These ratios can be looked at as indications of the number of months of inventory that are on hand in relation to the sales for a month. For example, a ratio of 2.5 would indicate that the retail stores have enough merchandise on hand to cover two and a half months of sales.

10. *Leased Department*. Leased departments are broadly defined as operations of one company conducted within the establishment of another company. Typical examples may include jewelry counters or optical centers within department stores.

11. *GAFO*. GAFO represents sales at stores that sell merchandise normally sold in department stores. GAFO includes the following kinds of retail businesses:

(a) General merchandise stores (NAICS 452);
(b) Clothing and clothing accessories stores (NAICS 448);
(c) Furniture and home furnishings stores (NAICS 442);
(d) Electronics and appliance stores (NAICS 443);
(e) Sporting goods, hobby, book, and music stores (NAICS 451);
(f) Office supplies, stationery, and gift stores (NAICS 4532).

3. Confidentiality

12. Title 13 of the United States Code authorizes the Census Bureau to conduct censuses and surveys. Section 9 of the same Title requires that any information collected from the public under the authority of Title 13 be maintained as confidential. Section 214 of Title 13 and Sections 3559 and 3571 of Title 18 of the United States Code provide for the imposition of penalties of up to 5 years in prison and/or up to $250,000 in fines for wrongful disclosure of confidential census information. In accordance with Title 13, no estimates are published that would disclose the operations of an individual firm. The Census Bureau's Internal Disclosure Review board sets the confidentiality rules for all data releases. A checklist approach is used to ensure that all potential risks to the confidentiality of the data are considered and addressed.

13. *Disclosure Limitation*. A disclosure of data occurs when an individual can use published statistical information to identify either an individual or firm that has provided information under a pledge of confidentiality. Disclosure limitation is the process used to protect the confidentiality of the survey data provided by an individual or firm. Using disclosure limitation procedures, the Census Bureau modifies or removes the characteristics that put confidential information at risk for disclosure. Although it may appear that a table shows information about a specific individual or business, the Census Bureau has taken steps to disguise or suppress the original data, while making sure the results are still useful. The techniques used by the Census Bureau to protect confidentiality in tabulations vary, depending on the type of data.

B. Sample design and estimation procedures

14. The U.S. Census Bureau introduced new samples with the 2005 Annual Retail Trade Survey (ARTS) and the September 2006 Monthly Retail Trade Survey (MRTS). The new samples are designed to produce estimates based on the 2002 North American Industry Classification System (NAICS).

1. Sampling Frame

15. The sampling frame used for the MRTS and the ARTS (ARTS) has two types of sampling units represented - Employer Identification Numbers (EINs) and large,

multiple-establishment firms. Both sampling units represent clusters of one or more establishments owned or controlled by the same firm. The information used to create these sampling units was extracted from data collected as part of the 2002 Economic Census and from establishment records contained on the Census Bureau's Business Register. The Business Register is a multi-relational database that contains a record for each known establishment that is located in the United States or one of its territories and has employees.

16. The treatment of establishments on the Business Register differs according to whether the establishment is part of a single-unit or multiunit firm. In particular, the structure of an establishment's primary identifier on the Business Register differs depending on whether it is owned by a single-unit firm or by a multiunit firm. A single-unit firm's primary identifier is its EIN. The Internal Revenue Service (IRS) issues the EIN and the firm uses it as an identifier to report social security payments for its employees under the Federal Insurance Contributions Act (FICA). The same act requires all employer firms to use EINs. Each employer firm is associated with at least one EIN and only one firm can use a given EIN. Because a single-unit firm has only one establishment, there is a one-to-one relationship between the firm and the EIN. Thus the firm, the EIN, and the establishment all reference the same physical location and all three terms can be used interchangeably and unambiguously when referring to a single-unit firm.

17. For multiunit firms, however, a different structure connects the firm with its establishments via the EIN. Essentially, a multiunit firm is associated with a cluster of one or more EINs and EINs are associated with one or more establishments. A multiunit firm consists of at least two establishments. Each firm is associated with at least one EIN and only one firm can use a given EIN. However, one multiunit firm may have several EINs. Similarly, there is a one-to-many relationship between EINs and establishments. Each EIN can be associated with many establishments, but each establishment is associated with only one EIN. Because of the possibility of one-to-many relationships, we must distinguish between the firm, its EINs, and its establishments. The multiunit firm that owns or controls a particular establishment is identified on the Business Register by way of the establishment's primary identifier.

18. The primary identifier of an establishment owned by a multiunit firm consists of a unique combination of an alpha number and a plant number. The alpha number identifies the multiunit firm, and the plant number identifies a particular establishment within that firm. All establishments owned or controlled by the same multiunit firm have the same alpha number. Different multiunit firms have different alpha numbers, and different establishments within the same multiunit firm have different plant numbers. The Census Bureau assigns both the alpha number to the multiunit firm and plant numbers to the corresponding establishments based on the results of the quinquennial economic census and the annual Company Organization Survey.

19. To create the sampling frame, the records for all employer establishments located in the United States and classified in the Retail Trade and Accommodation and Food

Services sectors as defined by the 2002 NAICS are extracted. The extraction includes records on sales, payroll, employment, name and address information, as well as primary identifiers and, for establishments owned by multiunit firms, associated EINs. To create the sampling units for multiunit firms, the economic data of the establishments owned by these firms to an EIN level by tabulating the establishment data for all in scope establishments associated with the same EIN are aggregated. Similarly, the data to a multiunit firm level by tabulating the establishment data for all in scope establishments associated with the same alpha number is aggregated as well. No aggregation is necessary to put single-unit establishment information on an EIN basis or a firm basis. Thus, the sampling units created for single-unit firms simultaneously represent establishment, EIN, and firm information. In summary, the sampling frame is a complex amalgam of establishments, EINs, and firms.

3. Stratification, Sampling Rates, and Allocation

20. The primary stratification of the sampling frame is by industry group based on the detail required for publication. The sampling units within industry group are stratified by a measure of size (sub-stratification) related to their annual revenue. Sampling units expected to have a large effect on the precision of the estimates are selected "with certainty". This means they are sure to be selected and will represent only themselves (i.e., have a selection probability of 1 and a sampling weight of 1).

21. Within each industry stratum, a substratum boundary (or cut-off) is determined that divides the certainty units from the non-certainty units. These cut-offs are based on a statistical analysis of data from the 2002 Economic Census. Accordingly, these values are on a 2002 sales basis. This analysis is used to determine the number of size substrata for each industry stratum and to set preliminary sampling rates needed to achieve specified sampling variability constraints on revenue estimates for different industry groups. The size substrata and sampling rates are later updated through analysis of the sampling frame.

4. Sample Selection

22. The first step in the sample selection identified firms selected with certainty. If a firm's annual sales or end-of-year inventories were greater than the corresponding certainty cut-off, that firm was selected into the sample with certainty. The MRTS and ARTS samples use the same certainty firms. All firms not selected with certainty were subjected to sampling on an EIN basis.

23. If a firm had more than one EIN, each of its EINs is treated as a separate sampling unit. To be eligible for the initial sampling, an EIN had to have non-zero payroll in 2003. The EINs were stratified according to their major industry and their estimated revenue (on a 2002 basis). Within each non-certainty stratum, a simple random sample of EINs was selected without replacement. The selected non-certainty EINs are divided into two equal groups. One group is canvassed for both the monthly and the annual survey, the other group is canvassed for only the annual survey. Therefore, the non-certainty sample

for the annual survey is twice the size of the non-certainty sample for the monthly sample.

5. Quarterly Birth Sampling

24. Periodically, the samples are updated to represent new EINs appearing on the Business Register. These new EINs, called births, are EINs recently assigned by the IRS on the latest available IRS mailing list for FICA taxpayers and assigned an industry classification (if possible) by the Social Security Administration (SSA). EIN births are sampled on a quarterly basis using a two-phase selection procedure. To be eligible for selection, a birth must either have no industry classification or be classified in an industry within the scope of the ARTS, the Annual Wholesale Trade Survey (AWTS), or the Service Annual Survey (SAS), and it must meet certain criteria regarding its number of paid employees or quarterly payroll.

25. In the first phase, births are stratified by broad industry groups and a measure of size based on quarterly payroll or expected number of paid employees. The birth is assigned to the payroll or employment stratum with the larger sampling fraction. This procedure is conservative because it results in the birth being assigned the smaller of two possible first phase sampling weights. A relatively large sample is selected using equal probability systematic sampling. The selected births are canvassed to obtain a more reliable measure of size, consisting of sales in 2 recent months, company affiliation information, and a new or more detailed industry classification code. Births that have not returned their questionnaire after 30 days are contacted by telephone.

26. Using this more reliable information, the selected births from the first phase are subjected to probability proportional-to-size sampling with overall probabilities equivalent to those used in drawing the initial MRTS and ARTS samples from the December 2004 Business Register. Because of the time it takes for a new employer firm to acquire an EIN from the IRS, and because of the time needed to accomplish the two-phase birth-selection procedure, births are added to the samples approximately 9 months after they begin operation. The births selected for the MRTS sample are a subset of the births selected for the ARTS sample.

27. If a firm was selected with certainty and had more than one establishment at the time of sampling, any new establishments that the firm acquires, even if under new or different EINs, are included in the sample with certainty. However, if a single-unit firm was selected with certainty, only future establishments associated with that firm's originally-selected EIN are included in the sample with certainty; any new EINs that might later be associated with that firm are subjected to sampling through the quarterly birth-selection procedure.

28. Single-unit EINs selected into the sample with certainty are not dropped from canvass and tabulation if they are no longer on the IRS mailing list. Rather, the firm that used the EIN is contacted, and if a successor EIN is found, it is added to the survey. For

both inactive and reactivated EINs, data are tabulated for only the portion of the reference year that these EINs reported payroll to the IRS.

6. Sample Maintenance

29. *Procedures for the Annual Survey*. Births that are selected in the quarterly birth-selection procedure in November of the annual survey reference year are included in the initial mailing of the annual survey questionnaires in January of the following year. To better represent all EIN births in the reference year, and specifically to account for the lag between the time a business starts operation and the time it takes to acquire an EIN and identify and select the EIN into one of our surveys, births are added to the annual survey sample that are selected in February, May, and August of the year following the annual survey reference year. We mail annual survey forms to these births in June and August to supplement the initial annual survey mailings.

30. *Procedures for the Monthly Survey*. Because births are not represented in the monthly survey until they go through the two-phase selection procedure, an interim procedure is used to account for births during the period between the onset of activity and the time of birth selection. This interim procedure consists of imputing data for all EINs currently in the monthly survey that go out of business but are still on the IRS mailing list. Births are added to the monthly survey in February, May, August, and November of each year. At the same time, deaths are removed from the survey.

31. To minimize the effect of births and deaths on the month-to-month change estimates, these changes are phase-in by incrementally increasing the sampling weights of the births and decreasing the sampling weights of the deaths in a similar fashion. In the first month, the births are tabulated at one-third their sampling weight and the deaths are tabulated at two-thirds their sampling weight. In the second month, the births are tabulated at two-thirds their sampling weight and the deaths are tabulated at one-third their sampling weight. In the third month, the births are tabulated at their full sampling weight and the deaths are dropped (sampling weight equal zero).

7. Procedures for Producing Monthly Estimates

32. Estimates of monthly sales and end-of-month inventories are derived from data collected in the MRTS. Each month, firms in the MRTS sample are asked to report their sales and inventory data for the month just ending. Monthly totals are computed as the sum of weighted data (reported and imputed) for all selected sampling units that meet the sample canvass and tabulation criteria given below. The weight for a given sampling unit is the reciprocal of its probability of selection into the sample. The monthly totals are then benchmarked to the latest available annual survey totals

33. To be eligible for the sample canvass and tabulation, an EIN selected in the non-certainty sampling operations must meet both of the following requirements:

(a) It must be on the latest available IRS mailing list for FICA taxpayers from the previous quarter;

(b) It must have been selected from the Business Register in either the initial sampling or during the quarterly birth-selection procedure;

34. Monthly total estimates for broad industry groups (e.g., two-, three-, and four-digit NAICS levels) are computed by summing the benchmarked monthly totals for the appropriate detailed industries comprising the broader industry group. Variances are estimated using the method of random groups.

8. Procedures for Producing Annual Estimates

35. Estimates of annual sales and end-of-year inventories are derived from data collected in the ARTS. Firms in the ARTS sample are asked to report their sales and inventory data for the year just ending. Two years of data are requested in the year in which a new sample is introduced. Annual totals are computed as the sum of weighted data (reported and imputed) for all selected sampling units that meet the sample canvass and tabulation criteria given above. The weight for a given sampling unit is the reciprocal of its probability of selection into the ARTS sample. The annual estimates are adjusted using results of the 2002 Economic Census. Annual total estimates for broad industry groups (e.g., two-, three-, and four-digit NAICS levels) are computed by summing the census-adjusted annual totals for the appropriate detailed industries comprising the broader industry group. Variances are estimated using the method of random groups.

9. Reliability of Estimates

36. The published estimates may differ from the actual, but unknown, population values. For a particular estimate, this difference represents the total error of the estimate. When describing the accuracy of survey results, it is convenient to discuss total error as the sum of sampling error and non-sampling error. Sampling error is the error arising from the use of a sample, rather than a census, to estimate population values. Non-sampling error encompasses all other factors that contribute to the total error of a sample survey estimate. The sampling error of an estimate can usually be estimated from the sample, whereas the non-sampling error of an estimate is difficult to measure and can rarely be estimated. Consequently, the actual error in an estimate exceeds the error that can be estimated. Data users should take into account the estimates of sampling error and the potential effects of non-sampling error when using the published estimates.

10. Sampling Error

37. Because the estimates are based on a sample, exact agreement with results that would be obtained from a complete enumeration of firms on the sampling frame using the same enumeration procedures is not expected. However, because each firm on the sampling frame has a known probability of being selected into the sample, it is possible to estimate the sampling variability of the survey estimates. The particular sample used in

this survey is one of a large number of samples of the same size that could have been selected using the same design. If all possible samples had been surveyed under the same conditions, an estimate of a population parameter of interest could have been obtained from each sample. For the parameter of interest, estimates derived from the different samples would, in general, differ from each other.

38. Common measures of the variability among these estimates are the sampling variance, the standard error, and the coefficient of variation (CV). The sampling variance is defined as the squared difference, averaged over all possible samples of the same size and design, between the estimator and its average value. The standard error is the square root of the sampling variance. The CV expresses the standard error as a percentage of the estimate to which it refers. For example, an estimate of 200 units that has an estimated standard error of 10 units has an estimated CV of 5 percent. The sampling variance, standard error, and CV of an estimate can be estimated from the selected sample because the sample was selected using probability sampling. Note that measures of sampling variability, such as the standard error and CV, are estimated from the sample and are also subject to sampling variability. (Technically, the estimated standard error or the estimated CV of an estimator should be referred to as well but, for the sake of brevity, this detail is omitted) It is important to note that the standard error and CV only measure sampling variability. They do not measure any systematic biases in the estimates.

39. The estimate from a particular sample and its associated standard error can be used to construct a confidence interval. A confidence interval is a range about a given estimator that has a specified probability of containing the average of the estimates for the parameter derived from all possible samples of the same size and design. Associated with each interval is a percentage of confidence, which is interpreted as follows. If, for each possible sample, an estimate of a population parameter and its approximate standard error were obtained, then: (a) for approximately 90 percent of the possible samples, the interval from 1.65 standard errors below to 1.65 standard errors above the estimate would include the average of the estimates derived from all possible samples of the same size and design, (b) for approximately 95 percent of the possible samples, the interval from 1.96 standard errors below to 1.96 standard errors above the estimate would include the average of the estimates derived from all possible samples of the same size and design.

An example. To illustrate the computation of a confidence interval for an estimate of total revenue, assume that an estimate of total revenue is $10,750 million and the CV for this estimate is 1.8 percent, or 0.018. First, obtain the standard error of the estimate by multiplying the total revenue estimate by its CV. For this example, multiply $10,750 million by 0.018. This yields a standard error of $193.5 million. The upper and lower bounds of the 90-percent confidence interval are computed as $10,750 million ± 1.65 x $193.5 million. Consequently, the 90-percent confidence interval is $10,431 million to $11,069 million. If corresponding confidence intervals were constructed for all possible samples of the same size and design, approximately 9 out of 10 (90 percent) of these intervals would contain the average of the estimates derived from all possible samples.

40. The Census Bureau recommends that individuals using published estimates incorporate this information into their analyses, as sampling error could affect the conclusions drawn from these estimates.

11. Non-sampling Error

41. Non-sampling error encompasses all other factors, other than sampling error, that contribute to the total error of a sample survey estimate and may also occur in censuses. It is often helpful to think of non-sampling error as arising from deficiencies or mistakes in the survey process. Non-sampling errors are difficult to measure and can be attributed to many sources: the inclusion of erroneous units in the survey (over-coverage), the exclusion of eligible units from the survey (under-coverage), non-response, misreporting, mistakes in recording and coding responses, misinterpretation of questions, and other errors of collection, response, coverage, or processing. Although non-sampling error is not measured directly, the Census Bureau employs quality control procedures throughout the process to minimize this type of error.

42. A potential source of bias in the estimates is non-response. Non-response is defined as the inability to obtain all the intended measurements or responses about all selected units. Two types of non-response are often distinguished. Unit non-response is used to describe the inability to obtain any of the substantive data for a sampled unit. In most cases of unit non-response, the questionnaire was never returned to the Census Bureau after several attempts to elicit a response. Item non-response occurs either when a question is unanswered or the response to the question fails computer or analyst edits.

12. Use of imputation

43. For both unit and item non-response, a missing value is replaced by a predicted value obtained from an appropriate model for non-response. This procedure is called imputation and uses survey data and administrative data as input. In any given month, imputed data amount to about 23 percent of the total monthly retail and food services sales estimate and about 29 percent of the total retail end of month inventory estimate.

44. For the annual survey, imputed data amount to about 6 percent of the total retail sales and food services estimate and about 7 percent of the total retail end-of-year inventory estimate. Estimates with a coefficient of variation greater than 30 percent or with a total quantity response rate less than 50percent have been suppressed from publication. These estimates have been replaced with an "S" in the published table.

C. Benchmarking and revisions

45. The U.S. Census Bureau produces the Annual Revision of Monthly Retail and Food Services to provide revised national estimates by kind of business of annual and monthly sales for establishments classified in the retail trade and food services industries. Estimates of end-of-month inventories and inventory-to-sales ratios are also provided, but only for retail trade.

46. Not adjusted estimates of monthly sales are revised for January 2005 through the current or previous month (if an advance sales estimate is computed), as well as end-of-month inventory estimates for January 1999 through the current month. We revised the not adjusted estimates to: (a) reflect corrections to data for the current MRTS and ARTS samples; (b) introduce results from the 2006 ARTS; and (c) link the previously published estimates from the prior sample to estimates from the current sample.

47. New seasonal, trading-day, and holiday factors are computed and used to adjust sales for January 2002 through current or previous month (if an advance sales estimate is computed). For inventories, new seasonal factors are computed and used to adjust inventories for January 1996 through the current month. Adjusted estimates start 3 years before the revised, not adjusted estimates because these revised, not adjusted estimates can affect the computation of seasonal factors as far back as 3 years ago. For both sales and inventories, the new seasonal factors are computed using not adjusted estimates as input to the seasonal adjustment programme.

48. *Annual estimates*. Totals estimated from the current sample survey are computed as the sum of weighted data for all selected sampling units that meet the tabulation criteria given in the Sample Maintenance section. The weight for a given sampling unit is the reciprocal of its probability of selection into the sample. The sample-based estimated totals from the current sample are then linked to the estimates from the prior sample using the procedure described on the Census Bureau website.

49. *Estimates of Monthly Sales*. For select detailed NAICS codes, corrections are applied to the monthly retail and food service sales estimates for August 2006 through the current month. Then, for each detailed NAICS code, the monthly retail and food service sales estimates for January 1992 (the beginning of the series) through August 2006 from the prior sample are linked to the estimates derived from the current sample. The linkage is performed for each detailed NAICS level by multiplying the sample-based estimates, or unmodified estimates, from the prior sample by a geometric mean. The geometric

mean is computed as the square root of the product of two ratios. The numerators of the ratios are the unmodified sales estimates for August and September 2006 from the current sample. The denominators of the ratios are the unmodified estimates for August and September 2006 from the prior sample.

50. After performing the above linkage, the resulting sales estimates for December 2004 through February 2008 are input to the benchmarking program. The estimates for a given detailed NAICS code are revised in a manner that (a) for 2005 and 2006, constrains the sum of the 12 monthly sales estimates to equal the corresponding annual sales estimate from ARTS, (b) minimizes the sum of the squared differences between the month-to-month changes of the input and revised estimates for December 2004 through February 2008, (c) uses the previously published December 2004 sales estimate as a constraint, linking the revised estimates to the previously published sales estimates and resulting in no revision to the December 2004 estimate.

51. If an advance sales estimate is computed for an industry, the monthly estimate (for example the estimate for July) is revised using the previously estimated month-to-month ratio (from the originally published MARTS release). This ratio is applied to the revised June sales estimate output from the benchmarking to obtain a new July sales estimate[21].

52. A mathematical result of the benchmarking methodology is that all revised estimates following the end of the last benchmark year (2006) are derived by multiplying the corresponding input estimates by the ratio of the benchmarked-to-input estimate for the last month of the last benchmark year. Therefore, for a given NAICS code, a ratio of the benchmarked-to-input estimate for December 2006 is computed. Monthly sales estimates after December 2006 are multiplied by this constant ratio, which is called a carry-forward factor, to derive published sales estimates. The carry-forward factor remains the same until the next benchmarking operation. Revised estimates for aggregate industry levels are computed by summing the revised estimates for the appropriate detailed industries comprising the aggregate.

53. *Estimates of End-of-Month Inventories*. For select detailed NAICS codes, corrections are applied to the monthly retail end-of-month inventory estimates for August 2006 through the current month. Then, for each detailed NAICS code, the monthly retail end-of-month inventory estimates for January 1992 (the beginning of the series) through August 2006 from the prior sample are linked to the estimates derived from the current sample. The linkage is performed using a procedure similar to the one used for sales, except the geometric mean is based on end-of-month inventory. After performing the above linkage, the resulting end-of-month inventory estimates for December 1998 through the current month are input to the benchmarking program. The estimates for a given detailed NAICS code are revised in a manner that: (a) for 1998 through 2006, constrains the December end-of-month inventory estimates from MRTS to equal the end-of-year inventory estimates derived from ARTS; (b) minimizes the sum of squared

[21] For more information on how advance estimates are computed, see the Census Bureau website at http://bhs.econ.census.gov/BHS/RTFS/About.html.

differences between the month-to-month changes of the input and revised estimates for December 1998 through the current month; (c) uses the previously published December 1998 estimate as a constraint, linking the revised estimates to the previously published estimates and resulting in no revision to the December 1998 estimate.

54. For a given detailed NAICS code, end-of-month inventory estimates subsequent to December 2006 are derived by multiplying the input estimates by the ratio of the benchmarked-to-input estimate for December 2006. This ratio is the carry-forward factor for inventory, and it remains the same until the next benchmarking operation.

55. Revised estimates for aggregate industry levels are computed by summing the revised estimates for the appropriate detailed industries comprising the aggregate.

1. Reasons for Revisions

56. There are several reasons for revisions of monthly and annual changes in retail sales. The main contributors to the revision from the previously published estimates are:

(a) *Timing.* The respondents have more time to prepare their annual and census reports than they do for their monthly reports. The annual and census responses are requested at a time when many firms have already compiled audited book figures for their own use. The timing of the annual survey is such that we are also able to obtain independent verification of the reported data from such sources as a company's annual report. On the other hand, respondents to the monthly survey have just a few weeks to provide reports of their sales and end-of-month inventories. Sometimes these reports are based on incomplete or un-audited records and may include estimates made by respondents to represent their understanding of their business.

(b) *Sample Size*. The estimates derived from the annual survey are based on a sample that is much larger than the samples used to produce the monthly sales or inventory estimates. Furthermore, the monthly inventory estimates are based on a sample with fewer units than the sample used to produce the monthly sales estimates.

(c) *Response*. The annual estimates are based on more reported data than are the monthly estimates. The response to the ARTS is required by law. This requirement results in a dollar volume response rate for sales above 94 percent. The response to our monthly survey is not mandatory. The dollar volume response rates for the monthly surveys are usually around 78 percent for sales and 72 percent for inventories. The sales and inventories for the non-responding retailers are accounted for by an imputation process. This process on the monthly surveys assumes that non-responding firms have trends similar to the responding firms in their respective kinds of business.

2. Unpublished Estimates

57. Additional statistics, such as dollar volume estimates for some kinds of business not separately shown in the report, are produced as a by-product of the regularly published statistics. These additional estimates are not included in the publication because of high sampling variability, poor response, or other factors that may make them potentially misleading. It should be noted that some unpublished estimates can be derived directly by subtracting published estimates from their respective totals. However, the estimates obtained by such subtraction would be subject to the poor response rates or high sampling variability described previously for unpublished kinds of business.

3. Adjustment Factors

58. The X-12 ARIMA programme was used to derive the factors for adjusting estimates for seasonal variations and, in the case of sales, for trading-day and holiday differences. Seasonal adjustment of estimates is an approximation based on current and past experiences. Therefore, the adjustment could become less precise because of changes in economic conditions and other elements that introduce significant changes in seasonal, trading-day, or holiday patterns.

Chapter V
Retail trade value and chain volume measures by Australian Bureau of Statistics

A. An overview

1. Australian Bureau of Statistics (ABS) compiles and publishes estimates of the value of turnover of "retail trade" businesses classified by industry, and by state and territory. Turnover includes: retail sales; wholesale sales; takings from repairs, meals and hiring of goods (except for rent, leasing and hiring of land and buildings); commissions from agency activity (e.g. commissions received from collecting dry cleaning, selling lottery tickets, etc.); and, from July 2000, the goods and services tax.

2. The estimates of turnover are compiled from the monthly Retail Business Survey. About 500 'large' businesses are included in the survey every month, while a sample of about 2,750 'smaller' businesses is selected. The 'large' business' contribution of approximately 62% of the total estimate ensures a highly reliable Australian total turnover estimate.

3. Monthly estimates are presented in current price terms. Volume measures at the state and industry levels are prepared quarterly.

1. Defining retail trade

4. The industries included in the survey are as defined in the *Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006* (cat. no. 1292.0). Industry statistics are presented at two levels of detail:

(a) Industry group - the broadest industry level comprising 6 industry groups. This level is used to present monthly current price and quarterly chain volume measure estimates;

(b) Industry subgroup - the most detailed industry level comprising 15 industry subgroups. This level is used to present monthly current price estimates in time series spreadsheets.

5. The retail trade statistics are compiled and released in terms of ANZSIC 2006 classes as presented below:

Food retailing

Supermarket and grocery stores and non-petrol sales (convenience stores) of selected fuel retailing

Supermarket and grocery stores (4110)

Non-petrol sales (convenience stores) of selected Fuel retailing (4000)

Liquor retailing
Liquor retailing (4123)

Other specialized food retailing
Fresh meat, fish and poultry retailing (4121)
Fruit and vegetable retailing (4122)
Other specialized food retailing (4129)

Household goods retailing

Furniture, floor coverings, house-ware and textile goods retailing
Furniture retailing (4211)
Floor coverings retailing (4212)
Houseware retailing (4213)
Manchester and other textile goods retailing (4214)

Electrical and electronic goods retailing
Electrical, electronic and gas appliance retailing (4221)
Computer and computer peripheral retailing (4222)
Other electrical and electronic goods retailing (4229)

Hardware, building & garden supplies retailing
Hardware and building supplies retailing (4231)
Garden supplies retailing (4232)

Clothing, footwear and personal accessory retailing

Clothing retailing
Clothing retailing (4251)

Footwear and other personal accessory retailing
Footwear retailing (4252)
Watch and jewellery retailing (4253)
Other personal accessory retailing (4259)

Department stores (4260)

Other retailing

Newspaper and book retailing
Newspaper and book retailing (4244)

Other recreational goods retailing
Sport and camping equip ment retailing (4241)
Entertainment media retailing (4242)
Toy and game retailing (4243)

Pharmaceutical, cosmetic and toiletry goods retailing

Pharmaceutical, cosmetic and toiletry goods retailing (4271)

Other retailing n.e.c
Stationery goods retailing (4272)
Antique and used goods retailing (4273)
Flower retailing (4274)
Other-store based retailing n.e.c (4279)
Non-store retailing (4310)
Retail commission-based buying and/or selling (4320)

Cafes, restaurants and takeaway food services
Cafes, restaurants and catering services
Cafes and restaurants (4511)
Catering services (4513)

Takeaway food services
Takeaway food services (4512)

B. Measuring change in value of turnover

1. Sample frame

6. The scope of the Retail Business Survey is all employing retail trade businesses who predominantly sell to households. Like most Australian Bureau of Statistics economic surveys, the frame used for the survey is taken from the ABS Business Register which includes registrations to the Australian Taxation Office's (ATO) pay-as-you-go withholding (PAYGW) scheme. Each statistical unit included on the ABS Business Register is classified to the ANZSIC industry in which it mainly operates. The frame is supplemented with information about a small number of businesses which are classified to a non-retail trade industry but which have significant retail trade activity.

7. The frame is updated quarterly to take account of new businesses, businesses which have ceased employing, changes in industry and other general business changes. The estimates include an allowance for the time it takes a newly registered business to get on to the survey frame. Businesses which have ceased employing are identified when the ATO cancels their Australian Business Number (ABN) and/or PAYGW registration. In addition, businesses with less than 50 employees which do not remit under the PAYGW scheme in each of the previous five quarters are removed from the frame.

8. To improve coverage and the quality of the estimates and to reduce the cost to the business community of reporting information to the ABS, turnover for franchisees is collected directly from a number of franchise head offices. The franchisees included in this reporting are identified and removed from the frame.

2. Statistical units

9. The ABS Business Register statistical units model is used to describe the characteristics of businesses, and the structural relationships between related businesses. The units model is also used to break groups of related businesses into relatively homogeneous components that can provide data to the ABS.

10. The units model allocates businesses to one of two sub-populations. The vast majority of businesses are in what is called the ATO Maintained Population, while the remaining businesses are in the ABS Maintained Population. Together, these two sub-populations make up the ABS Business Register population. Most businesses and organizations in Australia need to obtain an ABN, and are then included on the ATO Australian Business Register. Most of these businesses have simple structures; therefore the unit registered for an ABN will satisfy ABS statistical requirements. The businesses with simple structures constitute the ATO Maintained Population, and the ABN unit is used as the statistical unit for most economic collections.

11. For the population of businesses where the ABN unit is not suitable for ABS statistical requirements, the ABS maintains its own units structure through direct contact with each business. These businesses constitute the ABS Maintained Population. This population consists typically of large, complex and diverse businesses. The statistical unit used in the Retail Business Survey for this population is the Type of Activity Unit. The Type of Activity Unit is comprised of one or more business entities, sub-entities or branches of a business entity within an Enterprise Group that can report production and employment data for similar economic activities. When a minimum set of data items are available, a Type of Activity Unit is created which covers all the operations within an ANZSIC subdivision and the unit is classified to that subdivision. Where a business cannot supply adequate data for each industry, a Type of Activity Unit is formed which contains activity in more than one industry subdivision.

3. Survey methodology

12. The Survey is conducted monthly primarily by telephone interview although a small number of questionnaires are mailed to businesses. The businesses included in the survey are selected by random sample from a frame stratified by state, industry and business size. The survey uses annualized turnover as the measure of business size. For the ATO Maintained Population, the annualized turnover is based on the ATO's Business Activity Statement item Total sales and for the ABS Maintained Population a modelled annualized turnover is used. For stratification purposes the annualized turnover allocated to each business is not updated each quarter as to do so would result in increased volatility in the estimates.

13. Each quarter, some businesses in the sample are replaced, at random, by other businesses so that the reporting load can be spread across smaller retailers. This sample replacement occurs in the first month of each quarter which may increase the volatility of estimates between this month and the previous month especially at the state by industry subgroup level.

14. Generalized regression estimation methodology is used for estimation. For estimation purposes, the annualized turnover allocated to each business is updated each quarter.

15. Most businesses can provide turnover on a calendar month basis and this is how the data are presented. When businesses cannot provide turnover on a calendar month basis, the reported data and the period they relate to are used to estimate turnover for the calendar month.

16. Most retailers operate in a single state/territory. For this reason, estimates of turnover by state/territory are only collected from the larger retailers which are included in the survey each month. These retailers are asked to provide turnover for sales from each state/territory in which the business operates. Turnover for the smaller businesses is allocated to the state of their mailing address as recorded on the ABS Business Register.

4. Seasonal adjustment and trend estimation

17. Seasonally adjusted estimates are derived by estimating and removing systematic calendar related effects from the original series. In the retail trade series, these calendar related effects are known as:

(a) Seasonal, e.g. annual patterns in sales, such as increased spending in December as a result of Christmas;
(b) Trading day influences arising from weekly patterns in sales and the varying length of each month and the varying number of Sundays, Mondays, Tuesdays, etc. in each month;
(c) An Easter proximity effect, which is caused when Easter, a moveable holiday, falls late in March or early in April;
(d) A Father's Day effect, which is caused when the first Sunday in September falls in the first few days of the month and Father's Day shopping occurs in August.

18. Each of these influences is estimated by separate factors which, when combined, are referred to as the combined adjustment factors. The combined adjustment factors are based on observed patterns in the historical data. It is possible that with the introduction of ANZSIC 2006 from July 2009 the historical patterns may not be as relevant to some series. For example watch and jewellery retailing moved from the "Other retailing n.e.c" industry subgroup to the "Footwear and other personal accessory retailing" industry subgroup under ANZSIC 2006. The seasonal patterns for other businesses in the "Footwear and other personal accessory retailing" industry sub-group appear to differ from watch and jewellery retailers. The combined adjustment factors will evolve over time to reflect any new seasonal or trading day patterns, although in this example, an estimate for this impact (seasonal break) has been implemented in the combined adjustment factors.

19. The following Retail trade series are directly seasonally adjusted: (i) Australian turnover; (ii) turnover for each state total; (iii) each Australian industry sub-group total; and (iv) each state by industry sub-group.

20. A "two-dimensional reconciliation" methodology is used on the seasonally adjusted time series to force additivity - that is, to force the sum of fine-level (state by industry sub-group) estimates to equal the Australian, state and industry sub-group totals. The industry group totals are derived from the lower level estimates.

21. Quarterly seasonally adjusted series used in the compilation of the chain volume measures are the sum of their applicable monthly series.

22. Autoregressive integrated moving average (ARIMA) modelling can improve the revision properties of the seasonally adjusted and trend estimates. ARIMA modelling relies on the characteristics of the series being analysed to project future period data. The projected values are temporary, intermediate values that are only used internally to improve the estimation of the seasonal factors. The projected data do not affect the original estimates and are discarded at the end of the seasonal adjustment process. The retail collection uses an individual ARIMA model for each of the industry totals and state totals. The ARIMA model is assessed as part of the annual reanalysis.

23. In the seasonal adjustment process, both the seasonal and trading day factors evolve over time to reflect changes in spending and trading patterns. Examples of this evolution include the slow move in spending from December to January; and, increased trading activity on weekends and public holidays. Due to external forces affecting the Retail Trade spending patterns, forward factors (based on data up to November 2008) have been used to seasonally adjust the Retail series from December 2008 onwards. It is expected that the concurrent seasonal adjustment methodology will be reintroduced in the September 2009 issue.

24. The seasonal and trading day factors are reviewed annually at a more detailed level than possible in the monthly processing cycle. The annual reanalysis can result in relatively higher revisions to the seasonally adjusted series than during normal monthly processing. For Retail Trade, the results of the latest review are normally included in the July issue based on data up to June. However for ANZSIC 2006 series, the seasonal reanalysis was based on data up to November 2008 and a further seasonal reanalysis will be undertaken when the concurrent seasonal adjustment methodology is re-introduced.

25. The seasonally adjusted estimates still reflect the sampling and non-sampling errors to which the original estimates are subject. This is why it is recommended that trend series be used with the seasonally adjusted series to analyze underlying month-to-month movements.

26. The trend estimates are derived by applying a 13-term Henderson moving average to the seasonally adjusted monthly series and a 7-term Henderson moving average to the seasonally adjusted quarterly series. The Henderson moving average is symmetric, but as

the end of a time series is approached, asymmetric forms of the moving average have to be applied. The asymmetric moving averages have been tailored to suit the particular characteristics of individual series and enable trend estimates for recent periods to be produced. An end-weight parameter 2.0 of the asymmetric moving average is used to produce trend estimates for the Australia, State and Australian industry group totals. For the other series a standard end-weight parameter 3.5 of the asymmetric moving average is used. Estimates of the trend will be improved at the current end of the time series as additional observations become available. This improvement is due to the application of different asymmetric moving averages for the most recent six months for monthly series and three quarters for quarterly series. As a result of the improvement, most revisions to the trend estimates will be observed in the most recent six months or three quarters.

27. Trend estimates are used to analyze the underlying behavior of the series over time. As a result of the introduction of The New Tax System, a break in the monthly trend series has been inserted between June and July 2000. Care should therefore be taken if comparisons span this period.

5. Analyzing trend estimates

28. The following terms are used in this publication to describe month to month movements in the trend series:

- in decline - percentage change in trend estimate less than zero;
- no change or flat - percentage change in the trend estimate equal to zero;
- weak growth - percentage change in the trend estimate of 0.1 to 0.3%;
- moderate growth - percentage change in the trend estimate of 0.4 to 0.7%;
- strong growth - percentage change in the trend estimate greater than 0.7%.

C. Volume measures of turnover

29. Monthly current price estimates reflect both price and volume changes. To reflect volume changes in retail trade ABS adopted the quarterly chain volume estimates. The chain volume measures of retail turnover are annually re-weighted chain Laspeyres indexes referenced to current price values in a chosen reference year. The reference year is advanced each September issue (currently 2006-07). Each year's data in the Retail chain volume series are based on the prices of the previous year, except for the quarters of the 2008-09 financial year which will initially be based upon price data for the 2006-07 financial year. Comparability with previous years is achieved by linking (or chaining) the series together to form a continuous time series.

30. Further information on the nature and concepts of chain volume measures is contained in the ABS publication *Information Paper: Introduction of Chain Volume Measures in the Australian National Accounts* (cat. no. 5248.0). A summary of the approach adopted in this publication is presented below.

1. Selection of index formula

31. In deciding whether to proceed with the introduction of chain volume measures, and if so which index formula should be used, there are five considerations: (i) index number theory; (ii) empirical results for Australia; (iii) consistency within the national accounts; (iv) cost; and, most importantly, (v) what is best for users. In situations where price and volume relativities are changing monotonically, index number theory is quite clear: chain volume indexes provide better indicators of growth than fixed-weighted indexes and the more rapid the change the greater the imperative to chain frequently.

32. In an environment of rapidly changing price and volume relativities it is impossible to have both good indicators of volume growth rates and additivity for more than a year or two. Given that the principal use of volume measures is to determine growth rates free of the direct effects of price change, then it follows that the ABS should adopt chain volume indexes and forsake additivity. However, the cost of compiling chain Fisher volume measures is considerably higher than chain Laspeyres volume measures. Therefore, the ABS has decided that it will compile chain Laspeyres volume measures as the additional cost does not justify the modest improvements in accuracy offered by chain Fisher volume measures evident over recent years. Nevertheless, the relative performance of chain Fisher volume measures will be kept under review.

33. The choice of reference year is not so simple. Keeping the reference year fixed for a number of years, as is the case with the currently published constant price estimates, has some attractions, including minimizing revisions. However, it would mean that the impact of non-additivity would be more significant in recent time periods. Choosing a reference year that is close to the current period will reduce the impact of non-additivity. On balance, this seems to be the better option, and so the reference year will be the year of the latest weights, i.e. the year prior to the latest complete financial year.

2. Compilation of quarterly, annually re-weighted, chain Laspeyres volume measures

34. There are three key steps taken in deriving the existing constant price estimates. First, volume measures expressed in the prices of the latest base year are derived for each of the elemental components. Second, these are added together to form the desired aggregates. Third, the aggregates are linked to their counterparts valued in the prices of an earlier base year to form long, continuous time series. Linking is accomplished by first choosing a link year. (For example, at the time the new approach was introduced the link year chosen for linking estimates at average 1989–90 prices to estimates at 1984–85 prices was 1984–85). Link factors are then derived at the link year for each aggregate by dividing the annual estimate on the latest base year by the annual estimate on the earlier base year. The estimates on the earlier base year are then multiplied by the link factor in every period.

35. The annually re-weighted, chain Laspeyres volume measures for quarterly series are compiled using a similar multi-step process. There are some important differences, namely:

(a) The volume measures are valued in the prices of the previous year;

(b) Linking is conducted annually at the June quarter using June quarter data;

(c) Linking by calculating link factors and applying them to the preceding values, as is done to link the existing constant price series, is operationally inefficient when done annually. It is better to calculate quarter-to-quarter indexes and form a quarterly chain index;

(d) The chain indexes are benchmarked to annual chain Laspeyres volume indexes; and

(e) The benchmarked indexes are referenced to the year of the latest weights so that the problem of non-additivity is non-existent for subsequent years and relatively small for the reference year and immediately preceding years.

36. The steps to be followed in compiling annually re-weighted, chain Laspeyres volume measures for a quarterly series are best illustrated using an example. Here are the steps to be followed for private final consumption expenditure. Assume that there are n financial years of data to be linked, t = 1 to n.

(a) For each of the 44 components for each state — a total of 352 components - derive volume estimates in the prices of year t–1 for the five quarters from June quarter year t–1 to June quarter year t for years 1 to n–1. For the quarters of the final, incomplete year, year n, derive the estimates in the prices of year n–2.

(b) Sum all 352 components in each time period.

(c) Calculate quarter-to-quarter indexes of the aggregate. For each year t up to year n–2, the indexes from September quarter to December quarter, December quarter to March quarter and March quarter to June quarter are calculated at year t–1 prices, but the following June quarter to September quarter index is calculated at year t prices. For year n–1 and the final, incomplete year, year n, all quarter-to-quarter indexes are calculated at year n–2 prices.

(d) Compound the quarter-to-quarter indexes to form a chain index.

(e) Benchmark the quarterly, annually re-weighted, chain Laspeyres volume index of private final consumption expenditure to the annual Laspeyres chain volume index referenced to the annual current price value in the reference year.

3. Reliability of estimates

37. Seasonally adjusted and trend estimates and chain volume measures are subject to sampling variability. For seasonally adjusted estimates, the standard errors are approximately the same as for the original estimates. For trend estimates, the standard errors are likely to be smaller. For quarterly chain volume measures, the standard errors may be up to 10 percent higher than those for the corresponding current price estimates because of the sampling variability contained in the prices data used to deflate the current price estimates.

38. Estimates, in original terms, are made available to users for downloading. Estimates that have an estimated relative standard error (RSE) between 10 and 25 percent are annotated with the symbol "^". These estimates should be used with caution as they are subject to sampling variability too high for some purposes. Estimates with a RSE between 25 and 50 percent are annotated with the symbol "*", indicating that the estimates should be used with caution as they are subject to sampling variability too high for most practical purposes. Estimates with a RSE greater than 50 percent are annotated with the symbol "**" indicating that the sampling variability causes the estimates to be considered too unreliable for general use.

39. To further assist users in assessing the reliability of estimates, key data series have been given a grading of A to B, where "A" represents a relative standard error on level of less than 2 percent. The published estimates are highly reliable for movement analysis. "B" represents a relative standard error on level between 2 and 5 percent, meaning the estimates are reliable for movement analysis purposes.

40. The trending process dampens the volatility in the original and seasonally adjusted estimates. However, trend estimates are subject to revisions as future observations become available.

41. Quarterly retail trade chain volume estimates contribute to the quarterly national accounts in two main areas. First, they are an indicator of household final consumption expenditure in the expenditure side of gross domestic product. Historically retail trade estimates contribute about 55-60 percent of household final consumption expenditure but this relative contribution can vary from quarter to quarter as household expenditure shifts between retail trade and areas like personal services, travel and leisure activities which are outside the scope of retail trade. Second, retail trade estimates, along with estimates from *Business Indicators, Australia*, contribute to estimates for the Retail trade Division in the production side of gross domestic product.

4. Comparability with other ABS estimates

42. The estimates of retail turnover will differ from sales of goods and services by the retail trade industry in *Business Indicators, Australia* (cat. no. 5676.0). The monthly estimates of the value of turnover of retail businesses, is sourced from the *Retail Business*

Survey, includes the Goods and Services Tax and includes some retail trade businesses classified to a non-retail trade industry but which have significant retail trade activity. Estimates for sales of goods and services in *Business Indicators, Australia* are sourced from the economy wide *Quarterly Business Indicators Survey* and exclude the Goods and Services Tax. In addition, the *Retail Business Survey* does not include all classes in the ANZSIC Retail trade Division but includes Cafes, restaurants and take-away food services from the Accommodation and Food Services Division. The use of different samples in the two surveys also contributes to differences.

Chapter VI
Re-basing and revision of Singapore's distributive trade indices

A. Wholesale trade index

1. Since 1995, the Department of Statistics of Singapore has been compiling the Wholesale Trade Index (WTI) to measure the quarterly business performance of wholesale trade sector. The index series consist of *Domestic WTI* and *Foreign WTI* for measuring the wholesale sales in and outside Singapore. The indices give a quick overview of the domestic/foreign sales performance of major wholesaling activities in Singapore, thus providing useful and timely information on the sector's short term performance in the economy. These indicators are used extensively by the government as well as the business community.

2. The Wholesale Trade Index is re-based at regular intervals to reflect changes in the structure of wholesale trade sector. The coverage and weightings are revised and methodology is also reviewed during the rebasing exercise. The current WTI series compiled by the Department is based on year 2000 and the latest re-basing to year 2007 is the second rebasing of the series (previous re-basing to the year 2000 took place in 2002).[22]

1. Profile of wholesale trade sector

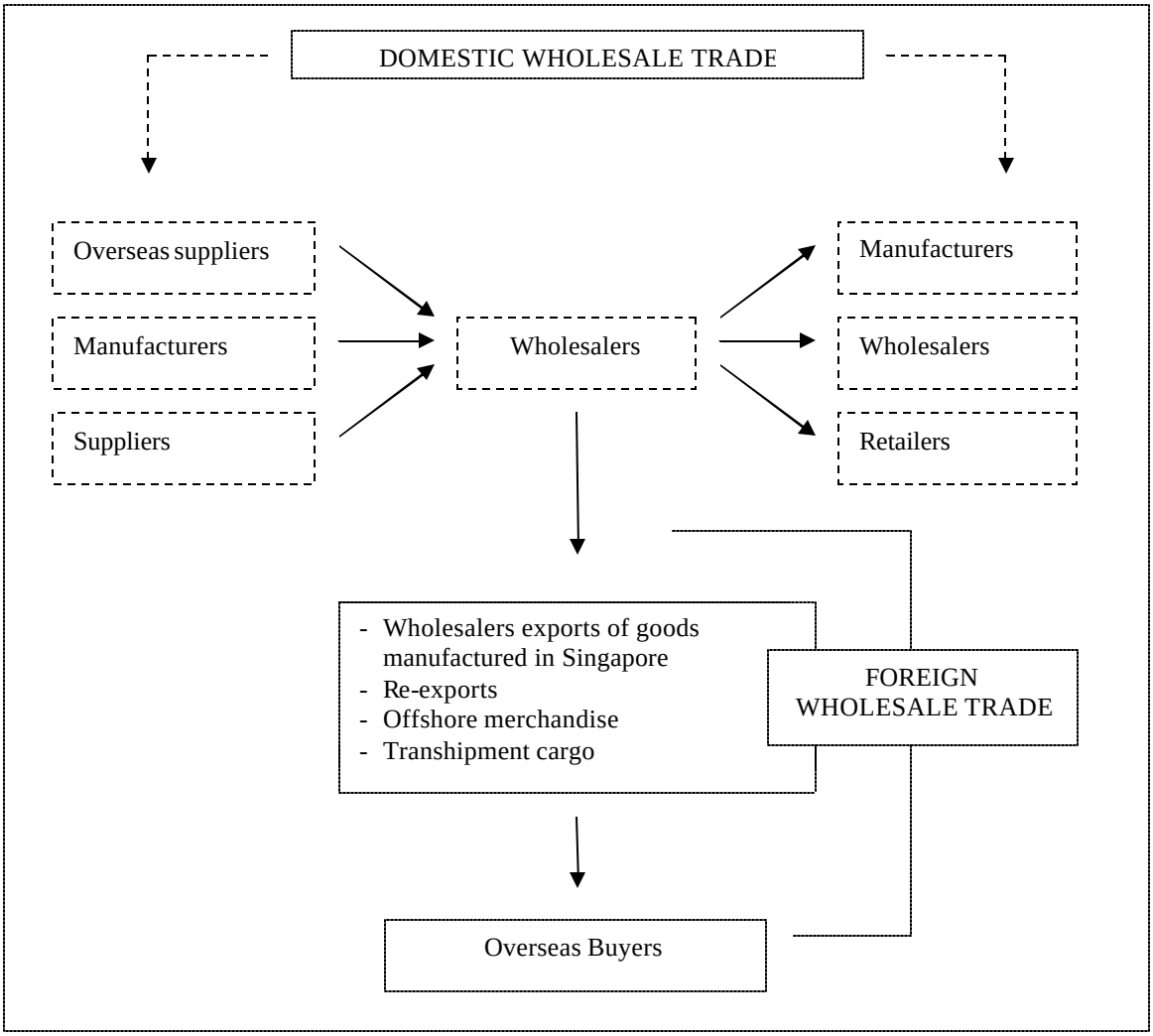
3. The wholesale trade sector is an important sector in the distribution of merchandise. Wholesale supply the merchandise to manufacturers, commercial and institutional clients for use in production, or to other wholesalers and retailers for resale. Wholesalers may also perform related functions such as sorting, breaking bulk, packaging and logistics. Wholesale trade sector contributed 14.3 percent of nominal gross domestic product (GDP) in 2007.[23] There were about 35 400 wholesaling establishments in year 2006,[24] employing a total of 234 000 workers.

2. What does the wholesale trade index measure?

4. The WTI measures the quarterly sales of wholesale establishments in the economy. It is an indicator of business performance in the wholesale trade. Transactions are illustrated in the chart below by the dotted arrows.

[22] Re-basing and revision of the wholesale trade index (2000=100), Information paper on Business Statistics, Singapore Department of Statistics, November 2002.
[23] Economic Survey of Singapore, 2007.
[24] Annual Survey of Wholesale Trade, 2006.

Coverage of wholesale trade



5. *Domestic WTI*. The wholesale trade can be transacted in the form of domestic or foreign sales. The Domestic WTI records the sales transactions made in Singapore. For example, it captures the sale of wholesale goods from wholesalers to other wholesalers, manufacturers and retailers whose business operations are in Singapore.

6. *Foreign WTI*. The Foreign WTI is represented by transactions pertaining to wholesale sales outside Singapore and comprise one or more of the following types:

(a) wholesale exports of goods manufactured in Singapore;

(b) re-export: goods which are exported from Singapore in the same form as they have been imported;

(c) offshore merchandise: sale and purchase of goods that are billed, transacted or brokered in Singapore, but shipped directly from the source to destination without entering into Singapore at all;

(d) transhipment cargo: goods that are moved across Singapore purely in the course of transportation to another country, and are supported by through bills of lading or through airway bills without local consignee.

7. The WTI indices are presented at both current prices and constant prices. The indices at current prices measure the change of sales value which can result from changes in both price and quantity. By removing the price effect, the indices at constant prices measure the changes in the sales volume.

8. Seasonal effects are observed in some of the Domestic WTI and Foreign WTI series, due to intra-year periodic variations that repeat in the same quarter every year. For example, overall domestic wholesale sales are usually lower in the first quarter compared to other quarters of the same year. To better reflect the underlying trend, both Domestic WTI and Foreign WTI are seasonally adjusted to remove the seasonal effects.

9. Singapore Department of Statistics uses the X-12 ARIMA for seasonal adjustment. For quarterly series like Wholesale Trade Index the Department performs seasonal adjustment concurrently, i.e. when a new data point is available, the X-12 ARIMA programme is run on the entire series to obtain the seasonally adjusted series up to the current period. The concurrent adjustment however results in frequent and significant revisions to the seasonally adjusted data.[25]

3. Data sources

10. The data used for the compilation of the WTI are primarily obtained from Quarterly Wholesale Trade Survey (WTS). The survey covers wholesale establishments belonging to the 50 two-digit division of the Singapore Standard Industrial Classification 2005 (SSIC 2005). At the end of each reference quarter, questionnaires are sent to a sample of the wholesale establishments to collect the quarter's domestic wholesale sales and foreign wholesale sales.

4. Index computation

11. The sales indices at current prices are computed from the sales value using the following formula:

$$I_{0n} = \sum_i W_{i0} \frac{V_{in}}{V_{i0}} \times 100$$

[25] Seasonal Adjustment of time series. Statistics Singapore Newsletter, September 2005.

Where:

I_{0n} is the index of the overall wholesale trade sector for the current period n compared to the base period 0 (the base year is 2007);

V_{in} is the sales value of i^{th} industry during the current period n;

V_{i0} is the sales value of i^{th} industry during the base period 0;

W_{i0} is the normalised weight assigned to the i^{th} industry, i.e. its share in terms of turnover with respect to the overall wholesale trade sector in the base period 0;

$\sum_i$ is the summation of all industries in the wholesale trade sector.

12. In other words, the overall sales index at current prices is a weighted average of indices from the detailed industry level. To derive the WTI index at detailed industry level, the quarterly wholesale sales for that industry is divided by the average quarterly wholesale sales for the same industry in 2007 (base year). The overall WTI sales index is then computed by combining the sales indices of the detailed industries, using the weights to measure each industry's relative importance in the overall wholesale trade sector.

13. To derive the constant price indices, the sales at current prices at the detailed industry level are first deflated by appropriate price indices. These component indices at constant prices are then weighted and aggregated to derive the overall indices at constant prices.

5. The re-based WTI series

14. *Industry groupings.* WTI indices are computed separately for major wholesale industry groups to measure the performance of these industries. During the re-basing exercise, the industry groupings were reviewed based on the share of industry turnover in the overall wholesale trade sector. The wholesale of "Transport Equipment" has been identified as a major industry in the re-based series due to its increased share in overall wholesale trade. With the change, the WTI categories in the 2007-based series have been expanded to twelve groups, as listed in Table 1 below.

15. *Selection of the new sample.* Wholesale Trade Survey uses a stratified random sampling design to select over 1000 establishments for the new sample out of over 35 000 establishments in the sampling frame. The sampling frame is constructed from the Department's Commercial Establishment Information System (CEIS), which is a centralized depository containing basic information of all establishments in Singapore. The sampling frame is stratified first by industry group, and then each group is further

stratified by size of turnover. Size stratification is based on the Hidiroglou (1986) method with design coefficient of variation of 10 per cent for each of the twelve industry groups.

16. The old WTS sample (used for the years up to 2002) covered wholesale firms with relatively higher turnover within each industry as larger firms are deemed to have a bigger impact on the wholesale trade sector's performance. To provide adequate representation of small and medium-sized establishments in the WTI, the sampling methodology was once revised in the previous re-basing exercise (in 2002 when the index was re-based to the year 2000) to include stratification by employment size.

17. *Weighting pattern*. The weight for each industry reflects its relative importance in the overall wholesale trade sector. The weights for Domestic WTI and Foreign WTI are computed based on the domestic wholesale sales and foreign wholesale sales of the respective industries as obtained from the Annual Survey of Wholesale Trade for reference year 2006.

18. Table 1 compares the old and the new weights for Domestic WTI and Foreign WTI for wholesale trade categories.

Table 1. Weighting pattern of wholesale trade in 2000 and 2007

	Domestic		*Foreign*	
	2000=100	*2007=100*	*2000=100*	*2007=100*
Total	**10,000**	**10,000**	**10,000**	**10,000**
1. Food, Beverages and Tobacco	882	407	275	374
2. Household Equipment and Furniture	780	298	548	287
3. Petroleum and Petroleum Products	3,235	4,396	5,199	4,544
4. Chemical and Chemical Products	291	406	366	513
5. Electronic Components	1,391	839	676	1,084
6. Industrial and Construction Machinery	380	285	410	257
7. Telecommunications and Computers	687	567	495	799
8. Transport Equipment*	-	190	-	288
9. Timber, Paints and Construction Materials	460	357	216	186
10. General Wholesale Trade	409	572	861	574
11. Ship Chandlers and Bunkering	469	883	162	229
12. Other Wholesale Trade	1,016**	800	792**	865

* New grouping in 2007-based series.

** Includes "Transport Equipment" for 2000-based series.

19. *Linking of historical series*. To facilitate the time series analysis of the WTI series, the 2000-based old series were linked to the 2007-based new series. The relationship between the old and the new series can be illustrated as follows: Linked 2007-based index = 2000-based index x Linking Coefficient, where the Linking Coefficient is the ratio of the average value of the 2007-based index in 2007 to the average value of the 2000-based index in 2007.

Example:

Average value of the 2000-based index in 2007	= 164.8
Average value of the 2007-based index in 2007	= 100
Linking Coefficient	= 100/164.8
2000-base index in 1Q2006	= 135.7
2007-based index in 1Q2006	= 135.7 x (100/164.8)=82.3

20. *Data dissemination*. The 2007-based series were released with the effect from 1Q2008 report. The Domestic WTI and Foreign WTI are also published separately in the Monthly Digest of Statistics and Yearbook of Statistics. Subscribers to the Department's Singstat Time Series may download the historical data electronically.

B. Retail sales index

21. The Retail Sales Index (RTI) is a short-term indicator that provides a macro-view of the business trend of retail trade industries. To reflect changes in the structure of retail trade in the index, the coverage and weighting patterns and revised at regular intervals. The current RSI series compiled by the Department are based on year 1997 and the latest re-basing to year 2005 represents the forth revision of the series.

1. What does Retail Sales Index measure?

22. The RSI shows the monthly movements in the retail trade sales. Based on the sales records of retail establishments, the index measures the short-term performance of retail trade industries.

23. The index can be presented at both current prices and constant prices. Changes in the index at current prices measure the changes of sales values which can result from changes in both prices and quantity. By removing the price effect, the indices at constant prices can be derived to measure the changes in the volume of economic activity.

24. Seasonal effects are observed in the RSI as there are usually intra-year periodic variations that occur during the fixed period of time. For example, the retail sales are normally higher in the months of December and January compared with other months of the year due to festive purchases. To better reflect the underlying trend of the monthly sales, the RSI is seasonally adjusted to remove the seasonal effects. The unadjusted data series are also provided for users who are interested in the changes of the actual series.

2. Data sources

25. The data used for the compilation of RSI are primarily obtained from the Monthly Retail Sales Survey (RSS) conducted by the Department. The RSS surveys retail establishments for monthly retail sales. Retail establishments refer to those selling

merchandise directly to the consumers, which include residents and tourists. The establishments are classified according to the latest Singapore Standard Industrial Classification 2005 (SSIC 2005). Hawkers and stall-holders (selling cooked food and prepared drinks) which do not register with the Accounting and Corporate Regulatory Authority (ACRA) are not considered as catering establishments.

26. For the compilation of the index, the data from the RSS are further supplemented by survey data and administrative records from other Statutory Boards as indicated below:

(a) records from the Land Transport Authority (LTA) on newly registered motor vehicles and motorcycles and scooters for estimating the sales of motor vehicles and motorcycles and scooters;

(b) data from the Economic Development Board (EDB) on the volume of petrol and diesel supplied by petrol companies to petrol service stations for petrol retailing. The sales values of petrol and diesel are derived using the volume data and the prices of petrol and diesel obtained through the Department's monthly survey on retail prices.

3. Index computation

27. The sales indices at current prices are computed using the same formula as the one used for the Wholesale Trade Index (WTI):

$$I_{0n} = \sum_i W_{i0} \frac{V_{in}}{V_{i0}} \times 100$$

Where:

I_{0n} is the index of the overall retail trade sector for the current period n compared to the base period 0 (the base year is 2005);

V_{in} is the sales value of i^{th} industry during the current period n;

V_{i0} is the sales value of i^{th} industry during the base period 0;

W_{i0} is the normalised weight assigned to the i^{th} industry, i.e. its share in terms of turnover with respect to the overall retail trade sector in the base period 0;

$\sum_i$ is the summation of all industries in the retail trade sector.

28. In other words, the overall sales index is a weighted average of indices from the detailed industry level. To derive the sales index at detailed industry level, the monthly retail sales for that industry is divided by the average monthly sales for the same industry in 2005 (base year). The index at the category level is then computed by combining the sales indices of the detailed industries within that category, using the weights to measure each industry's relative importance in that category. To obtain the overall retail sales index, the same method is used, i.e. aggregating the indices of the categories, making use of their weights.

29. To derive the constant price indices, the sales indices at current prices at the detailed industry level are first deflated by appropriate price indices. These component indices at constant prices are then weighted and aggregated to derive the overall indices at constant prices.

4. The re-based RSI series

30. *Industry groupings*. Besides compiling the index at the overall retail trade level, the index is also computed separately for major industry groups within the retail trades. During the re-basing exercise, the retail groupings were reviewed based on the share of industry turnover in the overall retail trade sector. The review did not make any change to the retail trade categories used in the re-based series.

31. *Selection of firms for the new survey sample*. Establishments covered in RSS are selected based on the stratified random sampling. The sampling frame is based on the list of "active" establishments obtained from the Department's Commercial Establishment Information System (CEIS). Information in the CEIS is regularly updated through simple postal surveys of newly registered enterprises, information from administrative sources such as ACRA and other sources. New establishments are added to the survey samples to ensure that the survey samples remain representative over time.

32. The sampling frame is stratified first by industry and then further stratified by size of turnover into take-all stratum and take-some stratum. Establishments in the take-all strata, which consist of large establishments, are selected with certainty. Establishments in take-some strata, which consist of relatively smaller establishments, are randomly selected. The sample size was optimized with an appropriate cut-off value (i.e. the value that delineates the boundary of the take-all and take-some strata) determined by the required precision level specified by the coefficient of variation. This would ensure an optimal sample size to achieve the targeted accuracy of the survey result.

33. The new RSS sample comprised about 2500 retail establishments, or 12.2 per cent of the population in retail trade sector. The new sample, together with the supplementary data from the Land Transport Authority (LTA) and the Economic Development Board (EDB), accounted for 71.5 per cent of overall retail sales of the retail trade sector in 2004.

34. *Weighting pattern*. The weight for each industry reflects its relative importance in the overall retail trade sector. The weights are computed based on the operating receipts of the respective industries as obtained from the latest Annual Survey of Retail Trade for the reference year 2004.

35. Table 2 compares the old and new weights for retail trade categories. The top three categories in retail trade in 2004 were "Motor Vehicles", Department Stores" and "Furniture and Household Equipment." The three categories accounted for 55.3 per cent of total weights in the retail trade sector in 2004, higher that the 50.8 per cent in the previous base year of 1997.

Table 2. Weighting pattern of retail trade in 1997 and 2004

	1997 weights	*2004 weights*
Total	**10,000**	**10,000**
1. Department Stores	1,395	1,322
2. Supermarkets	301	411
3. Provision and Sundry Shops	592	536
4. Food and Beverages	200	200
5. Motor Vehicles	2,640	3,449
6. Petrol Service Stations	310	456
7. Medical Goods and Toiletries	319	332
8. Wearing Apparel and Footwear	713	574
9. Furniture and Household Equipment	1,047	755
10. Recreational Goods	201	190
11. Watches and Jewellery	911	607
12. Telecommunications Apparatus and Computers	356	366
13. Optical Goods and Books	381	344
14. Others	634	458

36. *Linking of historical series*. To facilitate the time series analysis of RSI series, the 1997-based old series were linked to the 2005-based new series. The linking methodology of the retail trade historical series is done in an analogous to the wholesale trade manner. The following linking relationship is reproduced for the sake of completeness - Linked 2005-based index = 1997-based index x Linking Coefficient, where the Linking Coefficient is the ratio of the average value of the 2005-based index in 2005 to the average value of the 1997-based index in 2005.

37. *Data dissemination*. The 2005-based series were released with the effect from August 2006 index. The monthly report is published at the Department's homepage. The RSI is also published separately in the Monthly Digest of Statistics, Yearbook of Statistics and Economic Survey of Singapore. Subscribers to the Department's Singstat Time Series may download the historical data electronically.

Chapter VII
Deflation of distributive trade output for the purposes of national accounts: an overview of the main issues and the EU recommendations

A. Introduction

1. Many developing countries do not possess the required capacity, both in terms of resources and statistical infrastructure, for compilation of distributive trade indices in their own right even in their simplest form – the value indices. Lack of monthly or quarterly surveys of trade establishments, not updated or not existing statistical business registers to define the frame population or the presence of fragmented administrative data sources are the obstacles that often constrain implementation of integrated economic statistics programmes by countries and prevent compilation of sound distributive trade indices by them having an impact on countries' capacity to respond to the increasing demands of users for timely short-term information. In the absence of satisfactory monthly distributive trade data, the growth of distributive trade value added at constant prices estimated in quarterly national accounts is an extremely important short-term economic indicator. However, its estimation is accompanied with all problems encountered in the compilation of quarterly national accounts[26].

2. The Eurostat *"Handbook on price and volume measures in national accounts"*[27] provides a unified framework for price and volume measures of all economic activities, including distributive trade, which is consistent with the System of National Accounts 1993 and is both theoretically sound and practically useful for improving existing methods used by countries. Although the methodology is primarily concerned with methods available for constructing constant price national accounts on an annual basis, it is equally applicable to quarterly accounts since they adopt the same principles, definitions and structure as the annual accounts, subject to certain modifications, due to the period covered.

3. Possible methods that could be used for the estimation of prices and volumes are classified into three groups based on their suitability – *A methods* are the most appropriate, *B methods* can be used in case an A method cannot be applied and *C methods* are those methods which shall not be used. The A/B/C classification used in the context of quarterly national accounts will undoubtedly mean that A methods are less achievable and that more B methods will be used.

4. A general difficulty, raised when compiling constant price quarterly accounts for distributive trade, is the availability of data to undertake the "double-deflation" methods that are recommended for calculation of GDP from the production side. Usually this is

[26] For more information on compilation of quarterly national accounts see the IMF *"Quarterly National Accounts Manual"* (http://www.imf.org/external/pubs/ft/qna/2000/textbook/index.htm) and Eurostat *"Handbook on Quarterly Accounts"* (available from the Office for Official Publications of the European Comminities, ISBN 93-828-7259-9).

[27] Available from the Office for Official Publications of the European Communities, ISBN 92-894-2000-6.

caused by a lack of information on intermediate consumption of trade units. Therefore, the most common methods used in the quarterly area would be "single indicator" methods that extrapolate value added by using an output indicator.

B. A/B/C methods for wholesale and retail trade services

5. The most appropriate way of compiling national accounts at both current and constant prices is within the framework of supply and use tables. In this framework: (i) *per product* - the total supply (domestic production and imports) should be equal to the total use (domestic uses and exports); and (ii) *per industry* – output is equal to the intermediate consumption and value added. The next paragraphs describe the most appropriate methods for obtaining price and volume measures for wholesale and retail trade services. The product approach is chosen because prices and volumes are first of all observed for products. Distributive trade services by product are classified in divisions 61 and 62 of the *Central Product Classification, Version 2* (CPC, Ver. 2).[28]

6. The main part of the output of the two divisions consists of wholesale and retail trade margins. The trade margin can be seen as the price the buyer pays for the trade service although there is no direct transaction. Wholesale and retail trade is thus treated rather differently than other activities in the national accounts. In measuring the volume of the output of trade services, in principle an analysis should be made of the actual services provided by the trader to the customer.

7. Different forms of trade provide different services, and these services change continuously over time. Good volume measurement would imply keeping track of the amount of each different service provided over time, including their changes in quality. It is however very difficult to exactly define the types of services provided, let alone to measure their quantities. The current state of statistical information on wholesale and retail trade does at least not allow such measurement.

8. Statistical offices have so far used data on the volume of sales as indicators for the volume of trade services. In general, one can expect that there is a reasonable correlation between the volume of sales and the volume of trade services, but it does leave aside all changes in the quality of trade services provided, and therefore does not give a complete picture of the activity of this branch.

1. Taking quality changes in of trade services into account

9. One approach that could in theory take changes in the quality of trade services into account is to apply the way output in current prices is calculated (as the margin) also to the constant price calculations, i.e. to calculate the margin in constant prices as the difference between the sales and the purchases in constant prices.

Example

[28] United Nations publication, Sales No. E.08.XVII.7.

	Purchases of goods for resale	Retail trade margin	Sales of goods for resale
Value T	214	47 (18%)	261
Price index	101.9	105.4	102.5
Volume T (prices T-1)	210	44.6 (17.5%)	254.6
Volume index	105.0	111.5	106.1
Value T-1	200	40 (16.7%)	240

10. In the table above the margin-to-sales ratio in current prices increased from 16.7 percent to 18 percent. The question is how much of that is a volume change and how much a price change. Suppose we have a price index for the sales (i.e. a retail price index, in the example 102.5) and a separate index for the purchases (i.e. a wholesale price index, in the example 101.9). The sales price index will relate to the composite product "good + trade service". That means that this price index should take account of changes in the quality of the good as well as of the trade service. The price index for the purchases only captures the price change of the good (and perhaps other services included up to this point, but ignored here).

11. The margin in constant prices is derived by deflating sales and purchases with the corresponding price indices. The value of the margin in prices of the previous year is equal to the difference between the values of sales and purchases in prices of the previous year. The derived price index for the margin in the example is 105.4, dividing the change in the margin-to-sales ratio into a price and a volume components. If wholesale and retail trade were to be recorded on a gross basis and double deflation were used to estimate value added at constant prices, the result would be exactly the same. Output would be deflated by a sales price index (a CPI for example) and intermediate consumption (which would include the purchase of goods for resale) by a index reflecting the prices of the purchases (a PPI for example).

12. Regarding the volume indices, if there are no changes in inventories, the change in the quantity of goods purchased will be equal to the change in the quantity of goods sold. The volume change of purchases, however, need not be equal to the volume change of sales since the quality of the trade service might have changed. This is the case in the example: sales grow at 6.1% while purchases grow at 5%. If the two price indices were the same, the margin-to-sales ratio in prices of the previous year would be 18 percent (as in the current year), so that the whole of the change in margin would be attributed to the volume component. In the opposite case, the two volume indices would be equal implying no quality change (the margin-to-sales ratio in prices of the previous year would be 16.7 percent).

13. Such a procedure requires high quality price indices. In particular, the sales price index should take account of changes in quality of the trade service, and the sales price index and the purchase price index should measure the price of the good in a consistent way. Clearly, these requirements will in practice not easily be met.

2. Using the volume of sales

14. The most widely used method of estimating the volume of margin output is to assume that the volume of margins follows the volume of sales. This assumes that margin-to-sales ratios are constant in constant prices. As can be seen from the example in the previous section, this implies that it is assumed that there are no quality changes in the trade service.

15. A volume index of sales can be obtained by deflating sales by a sales price index. For retail trade, this should be an index of retail sales prices, e.g. a CPI. For wholesale trade, the appropriate index would be a wholesale price index, provided this measures the sales prices of wholesalers (and not the price of their purchases). Where a wholesale price index is not available, a CPI or PPI can be used as proxy. Which one is the more appropriate depends on the product in question and on the importance of wholesale compared with retail in the distribution chain of the product.

16. In the example above relating to a retailer, the sales price index (e.g. the CPI) is 102.5, yielding a volume index of 106.1. The latter would be used to extrapolate the margin value of the previous year. The result would be as follows:

	Purchases of goods for resale		Retail trade margin		Sales of goods for resale	
Value T	214		47 (18%)		261	
Price index		100.9		105.4		102.5
Volume T (prices T-1)	212.2		44.6 (17.5%)		254.6	
Volume index		106.1		111.5		106.1
Value T-1	200		40 (16.7%)		240	

17. This method can be applied at the level of the overall economy, i.e. to deflate total margin output. However, it would be much better to add product detail, preferably by calculating trade margins in constant prices within the detailed framework of supply and use tables. Then, the margin-to-sales ratio on a specific cell of the use table calculated in the previous year can be applied to the volume of that cell in the current year. In this process, account should be taken of changes in the share of wholesale and retail trade in the total distribution chain of a particular product, since not all products need necessarily be purchased through a wholesaler or retailer.

18. If the price indices used to deflate sales do not make use of a breakdown of outlets, so that no quality changes at all are taken into account, then one could breakdown the trade margins into a number of different trade channels or outlets, and apply the above procedure of constant margin ratios in constant prices at the level of these different trade channels. This would again include shifts between trade channels in the volume component. It would be worthwhile to investigate whether it is possible to make explicit quality adjustments to the sales volume indices, for example based on quality indicators of the trade industry such as indicators of the variety of products on sale, waiting times at

check-out, availability of parking space, etc. Currently, this kind of quality indicators does not seem readily available in most of the countries.

3. A/B/C methods

19. The preferred[29] (A) method for margin output is a method taking the changes in quality of the trade services into account. So far, the only method that can do so - in theory - is by taking the difference between deflated sales and deflated purchases. It should be stressed though that it is necessary to continue research into more accurate descriptions of the trade industry, in order to improve the volume measurement and in general the understanding of the trends in wholesale and retail trade. A number of European countries are experimenting with "margin price indices". These are price indices that view the margin as the price of the trade service provided, and follow these margins over time keeping the quality of the trade services constant. This method has the potential of becoming an A method, provided it can indeed take appropriate account of quality changes.

20. As an alternate (B) method can be used the assumption that the volume of margins follows the volume of sales, or - equivalently - that margin-to-sales ratios are constant in constant prices. This should preferably be applied in the framework of detailed supply and use tables in constant prices, and - if possible – in such a way that shifts between outlets are included in the volume component of output. Any other methods, in particular the deflation of margin output directly by a sales price index, are C methods.

4. Other products of CPC divisions 61 and 62

21. *Trade, maintenance and repair services of motor vehicles and motorcycles*. For this type of output, PPIs could be available, in which case they constitute the A method. If they are not available, the products can be deflated using CPIs (corrected for any taxes or subsidies), which are a B method, because it might not sufficiently cover business expenditure.

22. *Trade services on a fee or contract basis*. For these services, the fees paid should be the basis for deflation, in combination with the prices of the products sold.

C. A country case: United Kingdom's experience in compiling distributive trade indices

1. The services sector in UK accounts for more than 75 percent of the gross domestic product. To provide a timely indicator of growth in the output of service industries UK has developed a monthly Index of Services (IoS). Recognizing the importance of the distributive industries within the services sector, the ONS is publishing

[29] See Annex V for the recommended variables and deflators and their source by ISIC class and A/B/C method.

an Index of Distribution (IoD) as a monthly National Statistics First Release index. The weight of IoD in IoS at present is about 16-17 per cent (12 per cent in GDP). The index of distribution (as well as the IoS) shows the monthly movements in the gross value added of the tree divisions of section G – 50. Motor Trades, 51. Wholesale Trades and 52. Retail. The index is estimated using the same data sources and national accounts methodology as the quarterly estimate of service industries' gross value added within the output measure of GDP.

1. Motor trade industry review

Methodology

2. *Methodology*. This industry review has made changes to the data sources and methods currently used by IoS and GDP (output measure) to measure the motor trade industry. The main thrust of the changes is to replace volume indicators with monthly deflated turnover data.

3. *Previous methodology*[30] Within the motor trade there are 5 4-digit industry groups according to the Standard Industrial Classification (SIC), covering the following:

SIC	Industry description	GVA weight per 1000	Weight in Division	Current proxies used			
				New cars	Other new vehicles	Used cars	Petrol
50.10	Sale of motor vehicles	11.6	55.5%	22.3%	2.4%	29.2%	46.1%
50.20	Maintenance and repair of motor vehicles	4.2	20.1%	3.9%	0.3%	6.8%	89.0%
50.30	Sale of motor vehicle parts and accessories	3.0	14.4%	0.8%	0.2%	0.7%	98.3%
50.40	Sale, maintenance and repair of motorcycles	0.3	1.4%	0.3%	5.3%	23.5%	70.9%
50.50	Retail Sale of automotive fuel	1.8	8.6%	1.2%	0%	5.2%	93.6%

4. The motor trade industry was previously measured by a combination of output indices for new cars, used cars, other new vehicles and petrol and oil. The table above gives details of the five groups that make up Division 50 and the weights of each output index.

5. *Background to previous data.* The three vehicle based proxies (new cars, used cars and other new vehicles) were derived from data supplied by the Society of Motor Manufacturers and Traders (SMMT). They supplied the new vehicle registration data to ONS, this was based upon census data sourced from the Driver and Vehicle Licensing

[30] In this report, the previous methodology refers to the methodology used prior to Blue Book 2002, and the new methodology to the methodology taken on at Blue Book 2002

Agency (DVLA). The registration data was combined with vehicle price data to derive a constant price series.

6. The Department of Trade and Industry (DTI) supplied petrol data on a monthly basis. These data were virtually a census (over 99 percent coverage) and were a volume measure of the tonnage of fuel delivered from refineries to filling stations for resale. These data sources were introduced into the methodology around 10 years ago, and at that time were the most appropriate data sources available.

7. *Reasons for change:*

(a) Petrol was used as a proxy to measure two-thirds of division 50:

- Petrol should only be used to measure the retail sale of automotive fuel (50.5);
- For maintenance and repair and sales of parts the assumption that the more petrol consumed, the more maintenance and thus parts are required for a vehicle was used;
- This was not a direct measure and any such relationship would be constantly changing due to technological advancements in the reliability and durability of cars and their components.

(b) Problems with the petrol data:

- The petrol volume data was benchmarked annually to the Annual Business Inquiry (ABI) and this resulted in level shifts each year;
- Data on the imports of fuel supplied by the DTI were estimated and subject to revisions.

(c) The previous methodology used registration data as a proxy for sales:

- For franchised dealers more emphasis has been placed on the bonuses paid by manufacturers on achieving sales targets, rather than on discounts;
- For this reason, dealers have been pre-registering new vehicles in order to meet short-term sales targets;
- These cars are assumed under the previous method to be sales when the cars are still on the garage forecourt.

(d) New car registrations were lagged and combined with current registrations to derive a proxy for used car sales:

- All used car data were lagged estimates of the new car data;
- They were based on the methodology of 55 percent new car registrations this month and 45% new cars registrations this time last year;
- Used cars were not being measured directly.

(e) The previous methodology measured products rather than the 4-digit industries:

- The previous data sources were based upon products, and using them assumes that all companies that sell these products are classified to Division 50;
- This is not true and leads to overlap and gaps in data coverage.

8. *What should be done?* For the motor trade, in accordance with Eurostat's *Handbook on price and volume measures in national accounts*[31] guidance, the A method for margin output is a method taking the changes in quality of the trade services into account. So far, the only method that can do so - in theory - is by taking the difference between deflated sales and deflated purchases. The B method is to use the assumption that the volume of margins follows the volume of sales, or - equivalently - that margin-to-sales ratios are constant in constant prices.

9. *Options that were considered.* It was clear early on in the industry review that data sources were not available to meet Eurostat's ideal A method for measuring margin output. Efforts were concentrated on meeting Eurostat's B method (volume of sales). Although turnover data were available the areas of consideration were around which deflators to use and how to weight them together.

(a) *Turnover.* Currently there are two sources of turnover data available, Monthly Inquiry of Distributive and Service Sector (MIDSS) and Value Added Tax (VAT), but due to the VAT data not being timely enough, a lack of data briefing and classification problems, MIDSS are the preferred option.

(b) *Deflators.* It is clear that in the motor trade there is a wide range of price series available, mainly for vehicle prices. Within the Office for National Statistics (ONS), there are price series available with the Retail Price Index (RPI), as well as Producer Price Indices (PPI) and a Corporate Service Price Indices (CSPI) for maintenance and repair. There are also a number of external suppliers of data, the three key ones for cars are Glass's Guide, Car Auction Prices (CAP) and Car Price Index (from the Alliance and Leicester). The Glass's data is already used as the basis for the RPI's vehicle price indices.

(c) *Weights.* For the manufacturing sector, the ONS publish a Prodcom survey. This survey collects data on the sales by UK based manufacturers of individual products. This data is used to weight together deflators to derive industry deflators for the Index of Production (IoP). This survey does not cover the service sector, hence the two possible sources of weights are the ABI (which collects data on turnover by product) and the volume information from SMMT on vehicle registrations.

Issues faced by the industry review

[31] *Handbook on price and volume measures in national accounts*, Office for Official Publications of the European Communities, 2001, ISBN 92-894-2000-6.

10. *Products versus industry*. The main issue for the motor trade review was the product versus industry measurement problem. The previous methodology uses proxies that measure the products of the motor trade, rather than measuring the companies classified to the industry classification. By using a product based proxy, it is implicitly assuming that all output of that product comes from the SIC for which it is being proxied. This causes the biggest problems in the retail sale of automotive fuel. The previous proxy measures products, and while the data are comprehensive, there are two main problems:

(a) The proxy only measures petrol, and does not account for the other activities of petrol stations, the main one being the sale of convenience goods from forecourt shops;
(b) The petrol data covers all sales of automotive fuel, and therefore includes companies that also retail petrol, but are not classified to the motor trade, the main ones are:
    - supermarkets, which are classified to 52.1 (retail sales in predominately food stores);
    - motorway service stations, which are classified to 55.3 (restaurants).

11. Under the previous methodology double counting occurs as motorway service station fuel sales are already picked up in the current data sources used.

12. *Prices.* Although there are no shortage of price data available both internally and externally for the motor trade, a number of problems have been encountered. On balance the RPI was considered the most suitable series together with the one CSPI for maintenance and repair, as they measure the outputs of the motor trade. However the use of the RPI does present the following issues.

13. Firstly, the RPI measures the Recommended Retail Price (RRP) of new vehicles, rather than the actual transaction price. Although Glass's guide do make adjustments to the RRP's to reflect forecourt prices, it is not of the magnitude of the actual transaction price. It is clear that to measure the transaction price would be extremely difficult and costly, and that every vehicle price index would suffer from this problem.

14. The second issue is that although there are established RPI series for cars and motorcycles, there is no comparable series available for commercial vehicles (as this would not covered by the scope of the RPI as it only measures products and services bought by households). By not having such a series it has to be assumed that commercial vehicle prices and car prices move in a similar fashion - commercial vehicles represent 13 percent of vehicle registrations by volume.

15. Similarly, the prices for used cars are only measured at two and three years old. Hence older cars are not included - but it is fair to assume that the prices of used cars older than three years old move in the same direction of used cars less than three years old.

16. Finally, the RPI is a purchasers' price index[32]2 whereas a basic price index[33] should be used - but when looking at estimates of change this is not such a big problem, for most products. However, it is a problem when looking at petrol prices as duty and VAT on average account for 75% of the retail price.

17. *Weights.* As indicated earlier, there is a general problem in weighting price series in the service sector, and the only practical solution is to use data from the ABI. These data break down turnover into broad product headings, but is two years out-of-date. Although this is not ideal, the ratio of turnover by product has proven to be stable between the products within the motor trade.

18. In the maintenance sector of the motor trade, fleets normally have contracts to maintain and service cars. This would be a different price to that charged by local garages. Therefore since a RPI and CSPI series for maintenance is available, it is necessary to weight these together, but there are no ONS weights to do this. The use of SMMT/DVLA weights that show car registrations by type of customer have been recommended instead.

19. *Who was consulted as part of the Industry Review process?* Within the ONS, there was comprehensive consultation with relevant teams both within National Accounts and in the survey areas. Externally, the main consultation was with Eurostat, for guidance on measuring the output of motor trade in constant prices (the handbook on price and volume was used in assessing the options). Other organisations that were consulted were Cardiff University's Centre for Automotive Industry Research, Department for Transport Local Government and the Regions (DTLR),[34] SMMT and Yewtree.

New methodology

20. For all five series the new methodology is to use MIDSS turnover deflated by motor trade specific components of the RPI (and in one case a CSPI) series to measure the output of the motor trade. This is a conceptually better methodology in accordance with Eurostat guidance. The table below shows the deflators by product:

Deflator component	Source	50.10	50.20	50.30	50.40	50.50
New cars	RPI	**v**	**v**	**v**	**x**	**x**
Used cars	RPI	**v**	**v**	**v**	**x**	**x**
New motorcycles	RPI	**x**	**x**	**x**	**v**	**x**
Used motorcycles	RPI	**x**	**x**	**x**	**v**	**x**

[32] This is the price paid by consumers - which includes taxes on products and distributors trading margins.
[33] This is the price at the factory gate, but excluding any taxes on products and inclusive of subsidies on products.
[34] Under recent government re-organisation the Department of Transport has replaced the transport section of the DTLR.

Maintenance and repair (commercial)	CSPI	**x**	**v**	**x**	**x**	**x**
Maintenance and repair (household)	RPI	**v**	**v**	**v**	**v**	**x**
Sale of spare parts and accessories	RPI	**v**	**v**	**v**	**v**	**x**
Automotive fuel (excluding duty and VAT)	RPI	**x**	**x**	**x**	**x**	**v**
Other retail sales (petrol station forecourt shops)	RPI	**x**	**x**	**x**	**x**	**v**

21. *Benefits of new methodology*. The following are the benefits of introducing the new methodology:

(a) Deflated turnover includes the other revenue activities (servicing, repairs, parts, etc.) of businesses in the same industry;
(b) Data measures sales rather than registrations (not all cars registered are actually sales due to pre-registration);
(c) Detailed briefing is supplied with the MIDSS and CSPI data each month;
(d) Measures used car sales, maintenance and sale of parts more directly rather than through an indirect proxy;
(e) Quality changes are accounted for within the price series;
(f) By using MIDSS series across all the division, there is consistency in coverage (i.e. no overlaps or gaps);
(g) Measures output of companies within each industry rather than of all companies selling motor vehicles, parts, etc.;
(h) Proposed methods are in line with Eurostat's guidelines;
(i) Data sources are internal to ONS.

22. *Assumptions*. There are some assumptions that have to be made with the new methods:

(a) The volume of margins follows the volume of sales;
(b) Commercial vehicle prices move in the same way as motor vehicle prices;
(c) Used car prices for cars over three years move in the same way as cars less than three years old;
(d) Weights for combining price deflators are two years out-of-date - this assumes that the relationship in 2000 applies for 2001 and 2002;
(e) Method for combining the maintenance for fleets and private customers is based upon DVLA registrations data.

23. *Impact of new methodology*. The main difference between the new and previous methodology is that petrol proxies no longer dominate the output measurement. Instead, the proposed series is made up of proxies that represent the various activities of the motor trade. Therefore, these differences would be expected and justifiable.

2. Wholesale industry review

Methodology

24. This industry review has made changes to the data sources and methods currently used by IoS and GDP (output estimate) to measure the wholesale industry. The main thrust of the changes are to replace the Retail Sales Indices (RSI) and Index of Production (IoP) proxies that are currently used to estimate wholesale output with deflated monthly wholesale turnover data and to improve the current deflators.

25. *Previous methodology.*[35] In summary, wholesale was measured by RSI proxies (42 percent), IoP proxies (35 percent) and deflated monthly wholesale turnover (23 percent). The table over the page provides a more detailed description.

SIC	Industry Description	Weight in Division 51 (%)	Indicator type	Deflators-Producer Price Indices
51.10	Wholesale on a fee or contract basis	4	Monthly turnover data	- Other materials - Clothing, furs, textiles and footwear - Builder merchant goods and materials - Food and drink - Other goods
	Wholesale of:			
51.20	Agricultural raw materials and live animals	1	Monthly turnover data	- Agricultural and raw materials - Textiles - Clothing and footwear
51.3 and 51.4	Food, beverages, tobacco and household goods	42	RSI proxies	N/A
51.511	Petroleum and petroleum products	3	Monthly turnover data	- Fuels - Industrial materials - Coal
51.519	Other fuels and related products	1	Monthly turnover data	- Fuels - Industrial materials - Coal
51.52	Metals and metal ores	2	Monthly turnover data	- Fuels - Industrial materials - Coal
51.53	Wood, construction materials and sanitary equipment	6	Monthly turnover data	- Non-metallic mineral products - Timber and wooden furniture
51.54	Hardware, plumbing and heating equipment supplies	3	Monthly turnover data	- Non-metallic mineral products - Timber and wooden furniture
51.55	Chemical products	2	Monthly turnover data	- Fuels - Industrial materials - Coal

[35] In this report, the previous methodology refers to the methodology used prior to Blue Book 2002, and the new methodology to the methodology taken on at Blue Book 2002.

51.56, 51.6 and 51.7	Other intermediate products, machinery, equip ment, supplies and other wholesale	35	**IoP proxies for**: - Mechanical engineering - Electrical machinery - Office machinery and Computers - Agricultural and forestry Machinery	N/A
51.57	Waste and Scrap	1	Monthly turnover data	Waste and scrap

26. *Background to data.* The following data sources were introduced into the methodology around 10 years ago, and at that time were the most appropriate data sources available:

(a) Monthly wholesale turnover data are provided via ONS's Monthly Inquiry into the Distribution and Services Sector (MIDSS);

(b) The Retail Sales proxies are provided via ONS's Retail Sales Inquiry; this inquiry provides retail turnover data. These data are deflated using Retail Price Indices to produce volume of retail sales data;

(c) The IoP proxies are provided via ONS's Monthly Production Inquiry (MPI); this inquiry provides turnover data for the production sector. These data are then deflated using Producer Price Indices to produce volume of production sales data.

(d) The PPIs measure the price movement of goods bought and sold by UK manufacturers. It is a based weighted index working on a basket of goods concept. These price indices are used to deflate the wholesale and production turnover data.

27. *Reasons for change*. The main reason for change was that the output of 77 percent of wholesaling was not measured directly, but through Retail Sales or IoP proxies. The weaknesses of this approach included the assumption that there is no time interval between wholesale and retail, or between production and wholesale.

28. A comparison between the current proxies and deflated monthly wholesale turnover proved this assumption correct for the relationship between production and wholesale but incorrect (for monthly data) for the relationship between retail and wholesale:

(a) The IoP proxies do not capture wholesaler's import activity;
(b) The Retail Sales and IoP proxies do not directly correspond to the products being wholesaled;
(c) The Retail Sales proxies includes retail activity not originated from wholesalers, i.e. retailers importing their own goods;

(d) More appropriate PPIs are now available to use as deflators;
(e) Current deflation methods take a limited account of the price of imported goods.

29. The weakness of the Retail Sales and IoP proxies is not only that they measure the activity either side of wholesale but they also do not have a direct relationship with the products that they are attempting to measure. For example, the IoP proxies for Mechanical Engineering and Electrical Machinery were used to measure the wholesale of (i) other intermediate products; (ii) machine tools and construction machinery; (iii) machinery for use in industry, trade and navigation; and (iv) other wholesale.

30. Although imports can be a significant source of goods for wholesalers only a few of the current deflators take account of the price of imported goods. As well as the weaknesses that are specified above, there are also alternative data sources now available e.g. monthly wholesale turnover data via the MIDSS.

31. *What should be done?* For the wholesale trade, in accordance with Eurostat guidance, the A method for margin output is a method taking the changes in quality of the trade services into account. So far, the only method that can do so - in theory - is by taking the difference between deflated sales and deflated purchases. The B method is to use the assumption that the volume of margins follows the volume of sales, or - equivalently - that margin-to-sales ratios are constant in constant prices.

Issues faced by the industry review

32. *PPI versus Retail Price Indices (RPIs) to deflate the wholesale of food, drink, tobacco and household goods*. Retail Sales proxies are currently used to measure the wholesale of food, drink, tobacco and household goods. Does this indicate that historically it was thought that RPIs rather than PPIs better reflect the wholesale prices of these products? The strengths of each approach were weighed up to help reach a conclusion. It was concluded that PPIs should be used for the following reasons:

+ for PPIs		**+ for RPIs**
Better weighting structure available (from ONS's PRODCOM inquiry, which provides turnover by type of product information) Consistent approach to measuring wholesale (PPIs are used as deflators elsewhere in wholesale) PPIs match up better to the products being wholesaled	**V**	Historically, RPIs were thought to better reflect the wholesale price of products that tend to be bought by households

Other countries use PPIs (if wholesale prices not available)		

33. *Deflating the wholesale of computers*. The wholesale margin should be measured but this is not possible to do directly with the data sources that are available; therefore deflated turnover is used as a proxy (in line with Eurostat guidelines). This approach causes a problem with the deflation of the wholesale of computers because of the level of quality adjustment made to ONS's computer PPI (the price index is now at about a third of the level it was in 1994). When this PPI is used as a deflator, the output of wholesalers of computers rise at an indefensible rate.

34. When measuring the volume of trade services (margins) it is only changes in the quality of the service that should be accounted for, not changes in the quality of the products. Wholesalers, in their roles as middlemen, do not contribute significantly to the increase in quality of the computers being distributed by them. For example, the fact that the computer being sold by them today may be twice as powerful as the one they were selling last year is largely irrelevant to them. Computers, whatever their features, come in boxes, and wholesalers are primarily in the business of managing the flow of boxes into and out of their warehouses.

35. *What does Eurostat recommend?* Eurostat recommends that a non-quality adjusted PPI should be used; unfortunately, this price index is not currently available.

36. *What has been recommended?* A view has been taken that over time, computer prices have stayed relatively stable but due to changes in product specifications you get much more "computer" for your money, which, as explained earlier, is irrelevant to wholesalers. Based on this assumption, and the further assumptions that: (i) the quality of the service provided by wholesalers does not change greatly; and (ii) as middle-men, wholesalers do not significantly increase the quality of the computers they distribute (and therefore the wholesale price remains stable), it was felt that the deflator that should be used for the wholesaling of computers should be relatively flat. It would be too simplistic to simply use a flat deflator and therefore price movements of similar products to computers (which do not have the same level of quality adjustment) was studied. The best option was to use an electrical goods PPI.

37. *Who was consulted as part of the Industry Review process?* Within the ONS, there was comprehensive consultation with relevant teams both within National Accounts and in the survey areas. Externally the main source for consultation was with Eurostat, for guidance with measuring the output of wholesale in constant prices. The Department of Trade and Industry was also consulted.

New methodology

38. The new methodology is to use monthly wholesale turnover data deflated by appropriate and representative PPIs and Import Prices (IPIs). This is a conceptually better methodology in accordance with Eurostat guidance.

39. *Benefits of new methodology*. The following are the benefits of introducing the new methodology:

(a) The output of wholesale is measured more directly;
(b) Import activities of wholesalers are captured;
(c) The wholesale turnover data are representative of the products being wholesaled;
(d) Turnover from retailers importing their own goods will no longer be included in the wholesale output estimate;
(e) Deflators are more appropriate and representative and includes the effects of imported goods;
(f) Proposed methods are in line with Eurostat's guidelines;
(g) Consistent methods are used to measure the output of wholesale.

40. *Assumptions*. There are some assumptions that have to be made with the new methods:

(a) Volume of margins follows the volume of sales;
(b) PPIs are a reasonable proxy for wholesale prices;
(c) Electrical goods PPI is a reasonable proxy for deflating the wholesale of computers.

41. *Impact of new methodology*. The stronger growth has been observed mainly due to the fact that the turnover data captures wholesalers import activities (the IoP proxies previously used did not); imports can be significant for certain industries where the IoP proxies were used. The data has been revised back to January 1996. This is in line with National Accounts Revisions Policy for Blue Book 2002.

3. Retail industry review

Methodology

42. This industry review recommended changes to the data sources and methods currently used by IoS and GDP (output measure) (they both use the same data sources and methodology) to measure the Retail industry. The main changes are to use:

(a) Retail Sales Index (RSI) Seasonally Adjusted (SA) Constant Price (KP) data (rather than RSI Non Seasonally Adjusted (NSA) KP) as the raw data source. This means that the Time Series Methodologists will only need to review the seasonal adjustment of one output measure of retail (the RSI) instead of three. Retail is recognized as a particularly difficult industry to seasonally adjust.

(b) ONS Methodology Group recommended office standard benchmarking methods in the process of converting the initial data source (RSI's indicator of GB retail output) to total UK output of the Retail Industry (GDP(output measure)/IoS required indicator) - non-standard are currently used.

43. Although the new methodology will be changed all the way back to 1994 in the system, only the open period from 2000 will be revised. The main impact caused by the change in methodology is that Retail shows weaker growth in 2001.

44. *Previous methodology*.[36] Monthly retail turnover data (sourced from the Retail Sales Inquiry[37]) were deflated by appropriate and representative components of the Retail Price Index (RPI) to derive a volume of retail sales. Since the RSI only covers GB[38] and asks for retail turnover and GDP(output measure) and IoS require total turnover data at the UK level the following process took place:

(a) RSI NSA KP data were split into three groups (food, non-food and non-store retail and repair of household and personal goods);
(b) An estimate for National Health Service (NHS) receipts were added to the food and non-food groups (as the RSI data excludes NHS receipts);
(c) The data were then benchmarked onto the Annual Business Inquiry (ABI) total turnover for Division 52;[39]
(d) An estimate for each of the three groups was then calculated by weighting together the series that have been allocated to each group, using gross margin weights derived from the ABI;
(e) At this stage the NSA data was delivered to GDP(output measure) where it was then seasonally adjusted;
(f) However, for IoS - seasonal factors were derived by: RSI NSA KP Data/RSI SA KP Data and then delivered to IoS as a SA dataset.

45. *Reasons for review*. The main reasons for reviewing retail were:

(a) The methodology of moving from GB retail output to the total UK output for the retail industry used non-standard ONS methods;
(b) The previous system was not able to deliver annually chain-linked data (this is a requirement from Blue Book 2003 onwards);
(c) IoS and GDP(output measure) used different seasonal adjustment methods;
(d) The way the three sets of groupings of retail based upon the SIC for quality assuring purposes needed to be reviewed to ensure that they were still relevant;

[36] In this report, the previous methodology refers to the methodology used prior to Blue Book 2003, and the new methodology to the methodology taken on at Blue Book 2003.
[37] The Retail Sales Inquiry is the survey source used to compile the Retail Sales Index - in this report RSI refers to the Retail Sales Index rather than the underlying survey. For further information on this please see http://www.statistics.gov.uk/rsi.
[38] Great Britain covers England, Scotland and Wales, United Kingdom covers Great Britain and Northern Ireland.
[39] The ABI current price data were deflated by RSI implied deflators to produce ABI constant price data, which were then used as the benchmarks.

(e) The differences caused by benchmarking between IoS/GDP(output measure)'s retail estimate and the RSI were difficult to explain to users.

46. *What should be done?* For the retail trade, in accordance with Eurostat guidance, the A method for margin output is a method taking the changes in quality of the trade services into account. So far, the only method that can do so - in theory - is by taking the difference between deflated sales and deflated purchases. The B method is to use the assumption that the volume of margins follows the volume of sales, or - equivalently - that margin-to-sales ratios are constant in constant prices.

Issues faced by the industry review

65. *NHS Adjustment*. The RSI asks retailers to exclude NHS receipts, however these data should be included in the estimation of total output for the retail industry; an estimate for NHS receipts is therefore added to the food and non-food groups for GDP (output measure) and IoS. In principle the data should go through this process as it improves the short-term path. Unfortunately a number of weaknesses were highlighted; the main points are given below:

(a) Data was supplied separately by country by the various NHS bodies, but no data was ever supplied for Northern Ireland;
(b) The data for the England, Wales and Scotland used different definitions of NHS receipts;
(c) Data was supplied to different timescales and in some cases could only be supplied after 6 months;
(d) Non-standard methods were used to estimate for non-response - the ONS have since established office-wide standard tools.

66. The review concluded that the difficulties in data supply together with the problems of estimation for non-response meant that the process added little value (and also had very little effect on the overall series). Given that no adjustment was made for any of the other items excluded from total turnover by the RSI and that a benchmarking process would pick this up anyway, the review recommended that this adjustment process should be stopped.

67. *Benchmarking*. In order to take the GB retail turnover estimate to UK total turnover a benchmarking process took place. Since this was set-up over eight years ago, the methods that were used have been superseded by ONS office standard methods. The review concluded that there are three possible options:

(a) Accept that a GB retail estimate is a reasonable proxy for total UK output of the retail industry;
(b) Ask total turnover (excl. VAT and excise duty) on the Retail Sales Inquiry form;
(c) Continue to benchmark to annual data that measures total UK output for the Retail Industry but using office standard methods.

68. The first option would mean that turnover from activities such as supermarket petrol sales would not be covered and no estimate would be made for Northern Ireland. Investigations of ABI data suggest that there are differences in the movements between non-retail and retail turnover (particularly in non-store retail and repair of personal and household goods). The second option would bring the RSI in line with other short-term turnover inquiries conducted by the ONS, and would obviate the need for benchmarking. However this is a longer-term issue. Given the issues with the first two options the review recommended that the ONS standard benchmarking tools should be used.

69. *Should WinCSDB be used to produce the estimate?* The review concluded that the production of the national accounts retail estimate should be done on WinCSDB (the ONS' bespoke time series analysis system). This would solve two key problems of chain-linking and benchmarking.

70. *Chain-linking.* National accounts moved over to using chained volume measures for GDP and GDP components at Blue Book 2003. The RSI is not currently scheduled to be annually chain-linked, however, IoS/GDP (output measure) need a chain-linked retail estimate. By moving the production of the retail estimate onto WinCSDB the same methods used for other IoS/GDP (output measure) industries could be used to chain-link the retail estimate.

71. *Benchmarking.* It was recommended above that the office standard tool for benchmarking should be used to benchmark the retail estimate. This function currently exists in WinCSDB and cannot be easily replicated in Excel, thus reinforcing the case for moving to WinCSDB.

72. *Seasonal adjustment*. The third issue of the review was over which raw data GDP (output measure) and IoS should use and the relation of this with the different seasonal adjustment methods used by GDP (output measure) and IoS. Under the previous methodology, GDP (output measure) took NSA data and ran their own seasonal adjustment whilst the IoS took the seasonal adjustment of the RSI.

73. In reviewing the choice of raw data the review narrowed the options down to RSI NSA Current Price (CP) indices and RSI SA KP indices. The review discounted the RSI NSA CP option as the IoS and GDP (output measure) systems would need to duplicate the RSI system and would also need to be changed whenever the RSI system changed, say their deflators. It would also have meant that the seasonal adjustment would have to be carried out separately for the national accounts estimate, in an area that is widely recognised to be very difficult anyway.

74. RSI SA KP indices were preferred and the benefits are given below:

(a) RSI's optimum seasonal adjustment via the RSI system are used (as mentioned above the SA of the RSI retail data are particularly difficult);
(b) Resources are saved as the time series methodologists would only need to conduct an annual seasonal adjustment review of the RSI;

(c) IoS/GDP (output measure) save resources as there is no need to make system changes (e.g. seasonal adjustment parameters) following their seasonal adjustment reviews.

75. It was deemed that these benefits outweigh the drawbacks of:

(a) Having to benchmark a SA KP series to an ABI KP series at a less detailed level e.g. nine SIC groups (the level at which the RSI is seasonally adjusted) instead of twenty-seven (the level at which the data are derived);
(b) By using the seasonal factors of the RSI the methodology does not completely reflect the data that are seasonally adjusted as the data are benchmarked to annual data.

76. *SIC industry aggregations.* Previously the 27 industry groups surveyed for the retail industry were aggregated into 3 groups (food, non-food and non-store retail and repair of personal and household goods). The review assessed whether these grouping are still valid. For the main two groups of food and non-food the rationale was as follows:

(a) Food companies tend to have high turnover/low margins and have a short inventory holding period;
(b) Non-food companies tend to have higher margins and a longer inventory holding period.

77. The review was unable to find any rationale why non-store retail and repair of personal and household goods were grouped together. The annual and short-term data was analysed to check if any homogeneity existed and the analyses show that there is little homogeneity between the two groups. The review finally recommended that the repair and non-store retail components should be quality assured separately.

78. *Who was consulted as part of the Industry Review process?* Within the ONS, there was comprehensive consultation with relevant teams both within National Accounts and in the survey areas. Externally the main source for consultation was with Eurostat, for guidance with measuring the output of retail trade in constant prices (their draft handbook on price and volume was used in assessing the options). The Department of Trade and Industry was also consulted.

New methodology

79. The review has not recommended any new data sources to derive IoS/GDP (output measure)'s retail estimate, as the data sources are already conceptually appropriate and are based upon ONS data that are currently fit for publishing. However the review has recommended an improved methodology for moving from GB retail turnover to UK total turnover, using ONS standard methods.

80. *Benefits of new methodology.* The following are the benefits of introducing the new methodology:

(a) Differences between the RSI and IoS/GDP (output measure)'s retail estimate can be explained more easily to users;
(b) Benchmarking methodology uses ONS standard methods;
(c) IoS and GDP (output measure) now use consistent methods;
(d) Improved industry groupings for quality assurance.

81. *Assumptions.* There are some assumptions that have to be made with the new methods:

(b) Benchmarking methodology is a satisfactory method of going from GB retail output to total UK output for retail industry;
(c) General principle that the volume of margins follow the volume of sales.

82. *Impact of new methodology.* The data has been revised back to January 2000 in line with the open period for revisions set-out in the National Accounts Revisions Policy for Blue Book 2003. The new series is linked on to the "current" series so that there is no step change at the beginning of 2000.

Annex I
Structure of section G - Wholesale and retail trade; repair of motor vehicles and motorcycles

45 - Wholesale and retail trade and repair of motor vehicles and motorcycles

451 - Sale of motor vehicles

4510 - Sale of motor vehicles

452 - Maintenance and repair of motor vehicles

4520 - Maintenance and repair of motor vehicles

453 - Sale of motor vehicle parts and accessories

4530 - Sale of motor vehicle parts and accessories

454 - Sale, maintenance and repair of motorcycles and related parts and accessories

4540 - Sale, maintenance and repair of motorcycles and related parts and accessories

46 - Wholesale trade, except of motor vehicles and motorcycles

461 - Wholesale on a fee or contract basis

4610 - Wholesale on a fee or contract basis

462 - Wholesale of agricultural raw materials and live animals

4620 - Wholesale of agricultural raw materials and live animals

463 - Wholesale of food, beverages and tobacco

4630 - Wholesale of food, beverages and tobacco

464 - Wholesale of household goods

4641 - Wholesale of textiles, clothing and footwear
4649 - Wholesale of other household goods

465 - Wholesale of machinery, equipment and supplies

4651 - Wholesale of computers, computer peripheral equipment and software
4652 - Wholesale of electronic and telecommunications equipment and parts
4653 - Wholesale of agricultural machinery, equipment and supplies
4659 - Wholesale of other machinery and equipment

466 - Other specialized wholesale

4661 - Wholesale of solid, liquid and gaseous fuels and related products
4662 - Wholesale of metals and metal ores
4663 - Wholesale of construction materials, hardware, plumbing and heating equipment and supplies
4669 - Wholesale of waste and scrap and other products n.e.c.

469 - Non-specialized wholesale trade

4690 - Non-specialized wholesale trade

47 - Retail trade, except of motor vehicles and motorcycles

471 - Retail sale in non-specialized stores

4711 - Retail sale in non-specialized stores with food, beverages or tobacco predominating
4719 - Other retail sale in non-specialized stores

472 - Retail sale of food, beverages and tobacco in specialized stores

4721 - Retail sale of food in specialized stores
4722 - Retail sale of beverages in specialized stores
4723 - Retail sale of tobacco products in specialized stores

473 - Retail sale of automotive fuel in specialized stores

4730 - Retail sale of automotive fuel in specialized stores

474 - Retail sale of information and communications equipment in specialized stores

4741 - Retail sale of computers, peripheral units, software and telecommunications equipment in specialized stores
4742 - Retail sale of audio and video equipment in specialized stores

475 - Retail sale of other household equipment in specialized stores

4751 - Retail sale of textiles in specialized stores
4752 - Retail sale of hardware, paints and glass in specialized stores
4753 - Retail sale of carpets, rugs, wall and floor coverings in specialized stores
4759 - Retail sale of electrical household appliances, furniture, lighting equipment and other household articles in specialized stores

476 - Retail sale of cultural and recreation goods in specialized stores

4761 - Retail sale of books, newspapers and stationery in specialized stores
4762 - Retail sale of music and video recordings in specialized stores
4763 - Retail sale of sporting equipment in specialized stores
4764 - Retail sale of games and toys in specialized stores

477 - Retail sale of other goods in specialized stores

4771 - Retail sale of clothing, footwear and leather articles in specialized stores
4772 - Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles in specialized stores
4773 - Other retail sale of new goods in specialized stores
4774 - Retail sale of second-hand goods

478 - Retail sale via stalls and markets

4781 - Retail sale via stalls and markets of food, beverages and tobacco products
4782 - Retail sale via stalls and markets of textiles, clothing and footwear
4789 - Retail sale via stalls and markets of other goods

479 - Retail trade not in stores, stalls or markets

4791 - Retail sale via mail-order houses or via Internet
4799 - Other retail sale not in stores, stalls or markets

Annex II
Alternative methods for measuring turnover volume

1. If appropriate price indices are not available to deflate turnover owing to the difficulties in measurement of price changes or the complexity of data sources, its volume might be estimated using output volume indicators or input indicators, as described below:

(a) *Output volume indicators.* Output variables (for example, physical quantity of goods sold) are accepted as the second-best option if they represent well-defined products and are applied in sufficient level of details;

(b) *Input indicators.* Employment is considered one of the main input indicators and can be used as a proxy measure of production. There are many situations where information on input measures, although not recommended, is the only readily available source. In this case, it is assumed that the changes in input and output are proportional to each other. Compilers should be very cautious regarding use of estimates based on input variables.

2. The objective of the *turnover index* is to show the evolution of the market for goods and services. It should be noted, in this connection, that there are significant conceptual differences between this index and the *index of output of wholesale and retail trade services* (also called the index of production of wholesale and retail services). The main differences are as follows:

(a) Turnover includes sales of goods bought for resale in the same condition as received which are not considered in the indices of output of wholesale and retail trade services;

(b) Goods produced (or purchased) and stocked before sale are included in both output and turnover, but are considered at different moments in time;

(c) The index of output of wholesale and retail trade services takes account of changes in the quality of the trade *service* supplied.

3. Both indices are important in their own right. While the volume of turnover is recommended for compilation within the framework of short-term statistics, the indices of output of wholesale and retail trade services are meaningfully compiled only within the framework of national accounts, preferably within the framework of supply and use tables.

4. The indices of output measure changes in production of services by various distributive trade activities. One of the major incentives for compilation of these indices is their use as inputs in the compilation of quarterly national accounts as an appropriate estimate of short-term changes in gross value added for wholesale and retail trade

services. Therefore, in principle, they should be calculated as weighted averages of the outputs of these activities using value-added weights, with the assumption that the ratio of value added to output is constant in the short run. In practice, however, the required value-added data might not be available at such a detailed level for the required periods. Therefore, in the absence of value added, alternative measures for producing these indices, such as volume of turnover, should be used.

Annex III
Irish experience with calendar corrected turnover

A. The Standardised Month

1. Differences in calendar composition (the number of trading days and what those days are in each calendar month) are a source of month to month variation in retail sales. This variation causes problems for comparability. In order to overcome this problem, adjustments are made to some of the actual turnover figures of responding enterprises in order to standardise the accounting period. Each month participants in the survey are requested to return their turnover figure (inclusive of VAT) for the reference month. Respondents are offered the option of responding in:

(a) a 4-4-5 week pattern; or
(b) on a calendar month basis.

2. By a 4-4-5 week pattern it is meant that each quarter has exactly 13 weeks, distributed so that the first 2 months have exactly 4 weeks each while the third month has exactly 5. Data returned on a calendar month basis will require adjustment to this standardised pattern. If a responding enterprise opts to return data in a 4-4-5 week pattern, their data may still require adjustment if the 4-4-5 week pattern selected does not match the pattern of the Irish CSO i.e. if their accounting periods do not match those of the CSO.

3. The Retail Sales uses the following 4-4-5 week pattern:

Quarter	4 week month	4 week month	5 week month
1	January	February	March
2	April	May	June
3	July	August	September
4	October	November	December

4. This 4-4-5 pattern adds up to exactly 52 weeks or 364 days ((13 weeks * 7 days) * 4 quarters) and consequently leaves a shortfall of 1 day for every normal year and 2 days for every leap year. This shortfall is carried forward until a full week has been unaccounted for. This takes 5 or 6 years depending on how the leap years fall. The full shortfall is then added to give a 53 week year. The extra week is added to the first quarter to give a 14 week quarter or 4-5-5 pattern, in other words the extra week is added to February.

5. During a 53 week year the RSI uses the following pattern:

Quarter	4 week month	4 week month	5 week month	5 week month
1	January		February	March
2	April	May		June
3	July	August		September
4	October	November		December

6. This re-calibration will happen in Q1 2010 and again in Q1 2015. If a respondent's reporting period differs from the 4-4-5 week pattern, the turnover figure for that enterprise will be converted to the "standardised month". There are 3 possible scenarios:

(a) *Scenario 1*: Respondent provides turnover figures for a period that corresponds exactly with the standardised month. In this instance the figure is not amended in any way and therefore the actual turnover figure received will not have a calendar correction factor applied i.e. actual turnover = calendar corrected turnover;

(b) *Scenario 2*: Respondent provides a figure on a 4 or 5 week pattern but that pattern differs from the standardised month used to calculate the RSI. In this case a manual adjustment is made to the turnover figure before it is keyed into the system;

Example: Enterprise XYZ provides data on a 4-4-5 week pattern. However the 5 week month occurs in the second month of the quarter instead of the third month. Taking Quarter 3 2008 as an example, August is the 5 week month rather than September. So it could be said that Enterprise XYZ provides data on a 4-5-4 week pattern.

Figures for Quarter 3 2008 are as follows:

Month	Actual pattern	"Standard" pattern	Turnover
July	4 weeks	4 weeks	€ 80,000
August	5 weeks	4 weeks	€ 100,000
September	4 weeks	5 weeks	€ 80,000

In order to bring these figures into line with the standardised month, a weeks trading from the August figure must be removed and added to the September figure. To do this it is assumed that turnover is evenly distributed across all weeks of the month and we re-distribute it pro-rata.

The amended figures are calculated as follows:

Month	Actual Turnover	Adjustment	Amended Turnover
July August September	€ 80,000 € 100,000 € 80,000	None - 1week (€20,000) + 1week (€20,000)	€ 80,000 € 80,000 € 100,000
Q 3	€ 260,000		€ 260,000

(c) *Scenario 3:* Respondent provides data on a calendar month basis. Turnover figures are from the 1st of the month to the 28th/30th/31st and so will have extra days in comparison with the standard month in 4 week month or will have fewer days in 5 week periods. Turnover from these enterprises will have a "Calendar Correction Factor" (CCF) applied. The adjustment to standardise calendar composition (i.e. calculate Calendar Corrected Turnover) is carried out by applying a Calendar Correction Factor (CCF).

$$CCT = \left(\frac{T}{CCF} \right)$$, where T is actual Turnover.

B. Calendar Correction Factors (CCFs)

7. It has been noted earlier that differences in calendar composition are a source of variation for retail sales and this variation poses a difficulty for comparisons. This is important as sales on Fridays and Saturdays are generally higher than on other days of the week and therefore months containing 5 Fridays or 5 Saturdays normally have a higher turnover than those with only 4. Adjustments are made for these trading day variations by applying fixed Calendar Correction Factors (CCFs).

8. As enterprises are offered the option of returning data on a "calendar month" basis or on a "4-4-5 week" basis, any returns that don't match the standardised 4-4-5 week accounting periods require adjustment. For example, enterprises that return their data on a calendar month basis during a standardised 4 week month will have extra days and fewer days during a standardised 5 week month. These returns must be adjusted to the standardised 4-4-5 week pattern. There are 2 inputs necessary to calculate Calendar Correction Factors:

(a) *Trading Day Weights (TDWs):* The daily trading weight is an estimate of the proportion of weekly sales that occur on a given day. Within each Business Group, Trading Day Weights sum to 1 for the week. These weights are based on results from a special survey where retailers are asked to estimate the percentage of turnover attributed to each day of the week for an average week. These Trading Day Weights or factors are unique to each Business Group. For Non-specialised

stores where trading patterns differ significantly between size classes, distinct sets of TDWs are used to distinguish between these size classes.

(b) *Composition of the month:* That is, the number of days in the month (28, 29, 30 or 31) and what those days are (Mondays, Tuesdays etc.). Calendar Correction Factors (CCFs) are calculated as follows:

$$\left(\frac{N \pm \left(\sum TDWs \right)}{N} \right)$$

Where:

N is number of weeks in the standardised month (i.e. 4 or 5),

$\sum TDWs$ is the sum of the trading day weights (TDWs) for the days that must be added or subtracted only.

Example 1: Motor Trades – August 2008:

Monday		4	11	18	25
Tuesday		5	12	19	26
Wednesday		6	13	20	27
Thursday		7	14	21	28
Friday	1	8	15	22	**29**
Saturday	2	9	16	23	**30**
Sunday	3	10	17	24	**31**

In the model the standardised August has 4 weeks (*see A. The standardised month*) and consequently 4 Mondays, 4 Tuesdays, 4 Wednesdays etc. Enterprise XYZ in the Motor Trades sector returns turnover figures for August 2003 on a calendar month basis and consequently includes sales for 5 Fridays, 5 Saturdays and 5 Sundays (*see shaded area in calendar*). In order to compare turnover from this calendar month with a 4 week month it is necessary to strip out the extra days. The Trading Day Weights for the extra days in question are:

Business Group 01 – Friday	0.2292
Business Group 01 – Saturday	0.1156
Business Group 01 – Sunday	0.0068
Total	**0.3516**

In other words, for the motor trades sector, sales during Friday, Saturday and Sunday normally account for just over 35% of weekly turnover. This gives an August 2008 CCF for Motor Trades of 1.0879 i.e.:

$$\left(\frac{4 + (0.3516)}{4} \right)$$

Calendar Corrected Turnover (CCT) is then calculated by applying this CCF to actual turnover.

$$CCT = \left(\frac{T}{CCF} \right), \text{ where } T \text{ is actual turnover.}$$

Applying this CCF to actual turnover effectively reduces monthly turnover for the enterprise by 9% i.e. calendar corrected turnover is 9% lower than actual turnover.

Example 2: Motor Trades – September 2008

Monday	1	8	15	22	29
Tuesday	2	9	16	23	30
Wednesday	3	10	17	24	
Thursday	4	11	18	25	
Friday	5	12	19	26	
Saturday	6	13	20	27	
Sunday	7	14	21	28	

In the model the standardised September has 5 weeks (*see A. The standardised month*) and consequently 5 Mondays, 5 Tuesdays, 5 Wednesdays etc. Enterprise XYZ in the Motor Trades sector (Business Group 01, Sub-Group 2) returns turnover figures for September 2003 on a calendar month basis and consequently includes sales for only 4 Wednesdays, 4 Thursdays, 4 Fridays, 4 Saturdays and 4 Sundays (*see shaded area in calendar*). In order to compare turnover from this calendar month with a 5 week month it is necessary to include these missing days. The Trading Day Weights for the missing days in question are:

Business Group 01 – Wednesday	0.1779
Business Group 01 – Thursday	0.1732
Business Group 01 – Friday	0.2292
Business Group 01 – Saturday	0.1156
Business Group 01 – Sunday	0.0068
Total	**0.7027**

In other words, for the motor trades, sales for Monday to Friday normally account for 70% of weekly turnover. This gives a September 2008 CCF for Motor Trades of 0.85946 i.e.:

$$\left(\frac{5 - (0.7027)}{5} \right)$$

Applying the CCF yields a CCT 16% higher than actual turnover.

C. Calculating weights and updated values

9. *Base Weights:* The current base for the Retail Sales Index in Ireland is the year 2005. The weights that correspond to the base period are referred to as base weights. The base weights for the current series are derived from the Annual Services Inquiry (ASI) 2005. By convention, base year weights are expressed as 100 i.e. Base Year = 100.

10. *Monthly Base Weights:* The Retail Sales Index is calculated using a seasonal basket of weights i.e. a different set of monthly weights are used for each month, or in other words, for each Business Group there are 12 different base weights, one for each month of the year. These monthly weights reflect the changing relative importance of different Business Groups throughout the year. For example, consumers typically spend more on Clothing & Footwear in September because of the return to school. More new cars are purchased in January than any other month with the introduction of new registration plates. In order for such seasonal peculiarities to be accurately reflected in the "All Businesses" index, a different base weight for each month of the base year is required.

11. The base weights are derived from the Annual Services Inquiry (ASI) turnover data where the wholesale element of sales in retail outlets and the associated VAT is removed from the total turnover figure. However, the ASI can only provide annual turnover data for each Business Group. The monthly pattern of retail sales needed to convert annual ASI turnover data to a set of monthly turnover figures is derived from micro data collected for the RSI in 2005.

12. *Average Weekly Turnover*. The Retail Sales Index is calculated on a 4-4-5 week basis, i.e. each quarter has exactly 13 weeks, distributed so that the first 2 months have exactly 4 weeks while the third month has exactly 5. The monthly turnover calculated by applying sales patterns from the Retail Sales Index is converted into Average Weekly Turnover by dividing the monthly turnover figure by the appropriate number of weeks. The average weekly turnover for each Business Group is used as the Base Year Weight for the respective Business Group.

13. *Updated Values:* Base Weights are updated every month after their base period passes. Updating is done by applying the appropriate relative to the weight. An updated weight is generally referred to as an Updated Value. So by convention, "Weights" typically mean base weights and "Updated Values" mean any updated weights thereafter.

$$W_{T-1}(R_m) = W_m$$

Where:

W_{T-1} is an Updated Value from the same month in the previous year;

W_m is the Updated Value for the current month *m;*

R_m is Relative for the current month *m*.

D. Calculating a relative

14. *What is a relative?* The ratio of the turnover for a single group (enterprise, cell or business group) between two particular time periods is called a relative. For the Retail Sales Index, the relatives in question are annual turnover relatives.

15. *Calculation of the Cell Relative.* Before a group relative (or business group relative) can be calculated the 4 cell relatives (or size class relatives) must first be calculated for that group. Once calendar corrected turnover cell totals are calculated they can be compared with previous periods. A cell total for the current month *CTm* is compared with the cell total for the previous month *CTm-1* (i.e. the corresponding month in the previous year) to produce the cell relative *Rc*.

$$R_c = \left(\frac{CT_m}{CT_{m-1}} \right)$$

Where:

R_c is the cell relative,

CT_m is current cell total,

CT_{m-1} is previous cell total.

16. The cell relatives for each size class are applied to their respective base cell weights each month to produce updated weights (known as updated values). These updated values are subsequently used in the calculation of the following years monthly indices. This process continues until the index is rebased and new base weights are introduced.

Example 1: January 2008 compared with January 2009

Business Group - Motor Trades
Size Class - 1

There are 4 enterprises in this cell. The total calendar corrected turnover for this cell is €50,900 for January 2008 and €57,000 for January 2009, respectively:

Motor Trades – Size Class 1 January 2008	
Enterprise Name	**Calendar Corrected Turnover (€)**
AAA	9,000
MMM	12,400
CCC	8,500
XYZ	21,000
	50,900

Motor Trades – Size Class 1 January 2009	
Enterprise Name	**Calendar Corrected Turnover (€)**
AAA	10,000
MMM	15,000
CCC	9,000
XYZ	23,000
	57,000

Then:

CT_m = €57,000 and CT_{m-1} = €50,900

$$R_c = \left(\frac{57,000}{50,900} \right) = 1.119843$$

17. *Matched samples.* Cell totals are calculated on a matched sample basis. This means an enterprise will only be included in the calculation of the cell total if there are figures for both current and previous months. In other words, if in January 2009 there are only 3 returns instead of 4 in the cell, then only the same 3 enterprises will be included when calculating a matching *CTt-1* (Jan 2008).

18. Even though there are 4 returns in the cell for January 2008, because there are only 3 in January 2009, only the matching 3 enterprises will be included in the calculation for January 2008 and January 2009 so that the 2 totals can be meaningfully compared. If this matching isn't done, then non-response could lead to a negative cell relative *Rc* where no actual decline has occurred.

Example 1b: January 2008 compared with January 2009 again

Business Group - Motor Trades
Size Class - 1

This time assume Enterprise CCC doesn't return a turnover figure for January 2009, then the total cell turnover *CTt* is €48,000 instead of €57,000.

Motor Trades – Size Class 1 January 2009	
Enterprise Name	**Calendar Corrected Turnover (€)**
AAA	10,000
MMM	15,000
CCC	9000
XYZ	23,000
	48,000

Motor Trades – Size Class 1 January 2008	
Enterprise Name	**Calendar Corrected Turnover (€)**
AAA	9,000
MMM	12,400
CCC	8,500
XYZ	21,000
	42,400

If €48,000 is compared with the January 2008 total (€50,900) on a non matched sample basis, a cell relative will be 0.943026 which clearly doesn't make any sense as the turnover has increased for every enterprise where the data are comparable. Therefore, the corresponding cell total must be calculated for January 2008 by excluding the turnover for Enterprise CCC. Excluding Enterprise CCC data, a cell total is then €42,400. Then:

$$R_c = \left(\frac{48,000}{42,400} \right) = 1.132075$$

19. *Business Group Relatives.* Each Business Group relative (R_{bg}) is the weighted arithmetic average of the 4 size class or cell relatives R_c . It is calculated by dividing the sum of the current cell weights for that Business Group by the sum of the previous cell weights:

$$R_{bg} = \left[\frac{\sum W_m}{\sum W_{m-1}} \right]$$

Where:

R_{bg} is the Business Group relative,

W_m and W_{m-1} are the cell weights (or updated values) for the respective business group.

20. *Combined Group Relatives*: A Combined Group Relative is calculated in the same way as a Business Group Relative, except instead of comparing cell weights, the relevant Business Group weights are compared:

$$R_{cg} = \left[\frac{\sum W_m}{\sum W_{m-1}} \right]$$

Where:

R_{cg} is the Combined Group relative,

W_m and W_{m-1} are the Business Group weights (or updated values) for the respective Combined groups.

E. Updating unadjusted value indices

21. The monthly base year value indices are calculated along with the monthly base year weights at the beginning of the series. Thereafter, the unadjusted value indices are updated each month. The formula for updating an unadjusted Business Group value index is:

$$VAL_m = \left(VAL_{m-1} \times R_{bg} \right)$$

Where:

VAL_m is unadjusted Business Group value index for current period,

VAL_{m-1} is the unadjusted Business Group value index for previous period,

R_{bg} is Business Group relative for current period.

The Combined Group and All Businesses Indices are updated in the same way.

F. Updating unadjusted volume indices

22. Value indices are a function of price and quantity. Consequently, interpretation of value indices can be difficult as a change in the value of turnover, may be the result in an

actual increase or decrease in sales, the result of inflation or deflation or a combination of both.

23. Volume indices exclude the effects of retail price changes and so may be thought of as quantity indices i.e. price effects are held constant. Unadjusted volume indices are calculated by deflating unadjusted value indices using specially constructed retail price indices derived from the Consumer Price Index (CPI).

24. The monthly base year volume indices are calculated at the beginning of the series. Thereafter, the unadjusted volume indices are updated each month. The formula for updating an unadjusted volume index is:

$$\left(\frac{P_o}{P_m} \right) \times VAL_m$$

Where:

VAL_m is an unadjusted value index for the current period,

P_m and P_o are price deflators for the current and the base period respectively.

25. The price deflators *P* are price indices taken from the CPI. In most cases these indices are specially constructed price sub-indices, using weights derived micro data collected from the Trading Day and Product Profile Survey 2007.

Annex IV
Change in methodology for deflating retail trade sales in South Africa

1. Statistics South Africa (Stats SA) conducts and publishes a monthly survey of the retail trade industry. The publication contains estimated sales at both current and constant prices. Retail trade sales at constant prices have historically been calculated using the price index for commodities for the metropolitan areas from the Consumer Price Index (CPI) to deflate total sales at current prices.

2. As part of its improvement programme in economic statistics, Stats SA had introduced a new approach to deflating retail sales and a change in the reference year for constant estimates from 2000 prices to 2008 prices. Improvements in the collection of structural income and product data for the retail trade industry through a Large Sample Survey (LSS), as well as the newly revamped CPI, have provided the material for the new deflator.

3. The new approach to deflating the retail trade sales estimates has taken into account the detailed industry structure as contained in the LSS, to derive the relative importance (weight) of each product category within the different type of retailers. Thereafter, the weighted indices by type of retailer were derived by applying LSS weights to the related price indices per product category.

4. Retail trade sales at constant prices by type of retailer are obtained by deflating estimated sales at current prices by the relevant weighted price index. To obtain total retail trade sales at constant prices, estimates of the deflated sales for each type of retailer are aggregated.

5. The new approach to deflation has been in place and applied since January 2008, and it coincides with the start of the new CPI series. The new CPI series was introduced with effect from January 2009, but a parallel CPI was calculated in 2008 to provide like-on-like annual inflation rates as from January 2009.

6. To provide users with a historical time series for retail trade that is broadly consistent with the new series, retail trade sales at constant 2008 prices from January 2002 to December 2007 have been calculated. This was done by applying the Consumer Price Index (CPI) for goods, excluding petrol and purchases of vehicles, for all urban areas, to total sales at current prices for the period 2002 to 2007. This approach minimizes the weakness experienced in the previous deflation approach.

7. The levels and movements of the two series of retail trade sales at constants prices derived by the two methodologies described above for January to December 2008 are similar and this has provided the basis for linking the revised series (2002 to 2007) to the new series (2008 and onwards) without applying any linking factor. The application of the new deflator methodology has, in general, resulted in an upward revision of the year-

on-year growth rates in retail trade sales measured in constant prices. The long-term trends, however, are broadly similar.

Annex V
Recommended variables and deflators and their source[40]

ISIC Section G: Wholesale and retail trade; repair of motor vehicles and motorcycles Mining and quarrying

Division 45: Wholesale and retail trade and repair of motor vehicles and motorcycles

This division includes all activities (except manufacture and renting) related to motor vehicles and motorcycles, including lorries and trucks, such as the wholesale and retail sale of new and second-hand vehicles, the repair and maintenance of vehicles and the wholesale and retail sale of parts and accessories for motor vehicles and motorcycles. Also included are activities of commission agents involved in wholesale or retail sale of vehicles. This division also includes activities such as washing, polishing of vehicles etc.

This division does not include the retail sale of automotive fuel and lubricating or cooling products or the renting of motor vehicles or motorcycles.

This division is divided into four classes: ***4510 - Sale of motor vehicles, 4520 - Maintenance and repair of motor vehicles, 4530 - Sale of motor vehicle parts and accessories,*** and ***4540 - Sale, maintenance and repair of motorcycles and related parts and accessories.*** For measuring gross value added as deflated turnover it may be desirable to use a lower level of industrial activity such as sub-dividing sale of motor vehicles into the sale of new motor vehicle and the sale of used motor vehicles. This will depend on how important the industry is to the country's economy and how accurately the output can be measured (e.g. turnover and prices).

Turnover data are defined as receipts from sales excluding VAT and other taxes on products plus any subsidies on products. As the services are provided to both consumers and businesses, the preferred deflators to use are a mix of consumer price indices and service producer price indices.

Note: Within the wholesale and retail industries, output is the trade margin. Theoretically, this can be measured by taking the difference between deflated sales and deflated purchases. However, if it is assumed that the volume of margins follows the volume of sales (or equivalently, that the margin-to-sales ratios are constant at constant prices), then gross turnover deflated by appropriate quality adjusted price indices is a more achievable method.

Explanatory notes: The explanatory notes presented in the table below are a summary or subset of the complete Explanatory Notes as published in the *International Standard Industrial Classification of All Economic Activities, Revision 4* (ISIC, Rev.4).[41]

[40] Source: *Compilation Manual for an Index of Service Production*. Paris: Organization for Economic Cooperation and Development (OECD), 2007. Available from http://www.oecd.org/findDocument/0,2350,en_2649_34257_1_119669_1_1_1,00.html.
[41] Available from http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=27&Lg=1.

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
4510	Sale of motor vehicles	Includes: wholesale and retail sale of all types of new and used motor vehicles. Excludes: wholesale and retail sale of parts and accessories for motor vehicles; renting of motor vehicles with driver and without driver	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	4510
			Turnover from survey of motor vehicle wholesalers and retailers or administrative data taken from tax returns which could be split by type of vehicle. Examples are: - New cars - Other new vehicles - Used cars - Other used motor vehicles	Weighted appropriate price indices that reflect the mixed market. Examples are: - CPI: New cars - CPI: Other new vehicles - CPI: Used cars - PPI: New cars - PPI: New lorries and trailers - PPI: Used lorries and trailers	Turnover from survey of motor vehicle wholesalers and retailers or administrative data taken from tax returns	Deflated by partially representative CPIs and PPIs or a general price index Or Volume indicators Examples are: - Number of new cars sold - Number of used cars sold - Number of other new motor vehicles sold - Number of other used motor vehicles sold	Examples are: - Employment	
4520	Maintenance and repair of	Includes: - all types of maintenance and	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	4520

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
	motor vehicles	repair of motor vehicles • mechanical repairs; electrical repairs; • electronic injection systems repair; ordinary servicing; bodywork repair; • repair of motor vehicle parts; • washing, polishing, etc.; • spraying and painting; repair of screens and windows; • repair of motor vehicle seats. - tyre and tube repair, fitting or replacement - anti-rust treatment - installation of parts and accessories not as part of the manufacturing process Excludes: retreading and rebuilding of tyres	Turnover from survey of motor vehicle maintenance and repair companies or administrative data taken from tax returns which could be split by type of maintenance activity. Examples are: - Maintenance and repair of motor vehicles - Tyre and exhaust repairs - Towing and roadside assistance	Weighted appropriate price indices that reflect the mixed market. Examples are: - CPI: Car maintenance and repairs - PPI: Car maintenance and repairs - PPI: Lorry and truck maintenance and repairs	Turnover from survey of motor vehicle maintenance and repair companies or administrative data from tax returns	Deflated by partially representative CPIs and PPIs or a general price index	Examples are: - Employment	
4530	Sale of motor vehicles parts and accessories	Includes: wholesale and retail sale of all kinds of parts, components, supplies, tools and accessories for motor vehicles, such as: rubber tires and inner tubes for tires spark plugs, batteries, lighting equipment and electrical parts.	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	4530
			Turnover from survey of wholesalers or retailers of motor vehicle parts and accessories or administrative data taken from tax returns which could be	Weighted appropriate price indices that reflect the mixed market. Examples are: - CPI: Motor vehicle parts and accessories - PPI: Motor vehicle parts and accessories	Turnover from survey of wholesalers or retailers of motor vehicle parts and accessories and of motorcycle maintenance and repair companies or	Deflated by partially representative CPIs or a general price index	Examples are: - Employment	

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
			split by type of outlet. Examples are: - Wholesale - Retail		administrative data from tax returns			
4540	Sale, maintenance and repair of motorcycles and related parts and accessories	Includes: wholesale and retail sale of motorcycles, including mopeds; wholesale and retail sale of parts and accessories for motorcycles (including by commission agents and mail order houses) and maintenance and repair of motorcycles. Excludes: wholesale and retail sale of bicycles and related parts and accessories, renting of motorcycles, and repair and maintenance of bicycles.	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	4540
			Turnover from survey of wholesalers or retailers of motorcycles, related parts and accessories and of motorcycle maintenance and repair companies or administrative data taken from tax returns which could be split by type of motorcycle activity. Examples are: - Wholesale and retail sale of motorcycles - Wholesale and retail sale of motorcycle parts and accessories - Maintenance and repair of motorcycles	Weighted appropriate price indices that reflect the mixed market. Examples are: - CPI: Motorcycles - CPI: Motorcycle maintenance and repairs - PPI: Motorcycles - PPI Motorcycle maintenance and repairs	Turnover from survey of wholesalers or retailers of motorcycles, related parts and accessories and of motorcycle maintenance and repair companies or administrative data from tax returns Or Volume indicators Examples are: - Number of new motorcycles sold - Number of used motorcycles sold	Deflated by partially representative CPIs or a general price index	Examples are: - Employment	

Division 46: Wholesale trade, except of motor vehicles and motorcycles

This division includes wholesale trade on own account or on a fee or contract basis (commission trade) related to domestic wholesale trade as well as international wholesale trade (import/export).

Wholesale is the resale (sale without transformation) of new and used goods to retailers, business-to-business trade, such as to industrial, commercial, institutional or professional users, or resale to other wholesalers, or involves acting as an agent or broker in buying goods for, or selling goods to, such persons or companies. The principal types of businesses included are merchant wholesalers, i.e. wholesalers who take title to the goods they sell, such as wholesale merchants or jobbers, industrial distributors, exporters, importers, and cooperative buying associations, sales branches and sales offices (but not retail stores) that are maintained by manufacturing or mining units apart from their plants or mines for the purpose of marketing their products and that do not merely take orders to be filled by direct shipments from the plants or mines. Also included are merchandise brokers, commission merchants and agents and assemblers, buyers and cooperative associations engaged in the marketing of farm products.

Wholesalers frequently physically assemble, sort and grade goods in large lots, break bulk, repack and redistribute in smaller lots, for example pharmaceuticals; store, refrigerate, deliver and install goods, engage in sales promotion for their customers and label design.

This division excludes the wholesale of motor vehicles, caravans and motorcycles, as well as motor vehicle accessories, the renting and leasing of goods and the packing of solid goods and bottling of liquid or gaseous goods, including blending and filtering, for third parties.

This division is divided into seven groups (14 classes): ***461 - Wholesale on a fee or contract basis, 462 - Wholesale of agricultural raw materials and live animals, 463 – Wholesale of food, beverages and tobacco, 464 - Wholesale of household goods, 465 - Wholesale of machinery, equipment and supplies, 466 – Other specialized wholesale trade*** and ***469 –Non-specialized wholesale trade.*** For measuring gross value added as deflated turnover it may be desirable to sub-divide the groups into the underlying classes. This will depend on how important the industry is to the country's economy and how accurately the output can be measured (e.g. turnover and prices).

Turnover data are defined as receipts from sales excluding VAT and other taxes on products plus any subsidies on products. **Preferred deflators** to use are mostly service producer price indices. If available wholesale price indices can be substituted, or if imports are a significant source of goods for the wholesaler, then import price indices are an acceptable alternative.

Note: Within the wholesale and retail industries, output is the trade margin. Theoretically, this can be measured by taking the difference between deflated sales and deflated purchases. However, if it is assumed that the volume of margins follows the volume of sales (or equivalently, that the margin-to-sales ratios are constant at constant prices), then gross turnover deflated by appropriate quality adjusted price indices is a more achievable method.

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
461	Wholesale on a fee or contractual basis	Includes: one class 4610 - wholesale on a fee or contractual basis and activities of wholesale auctioneering houses. Excludes: wholesale trade in own name, retail sale by agents, activities of insurance and real estate agents	Gross turnover deflated by appropriate quality adjusted price indices Turnover from survey of commission agents, commodity brokers and wholesale auction houses or administrative data taken from tax returns	Weighted appropriate price indices. Examples are: - PPIs for all products sold	Gross turnover deflated by partially representative price indices Turnover from survey of commission agents, commodity brokers and wholesale auction houses. Or Production output index Lagged index of production for the manufacture of all goods	Deflated by partially representative PPIs or a general price index	Volume indicators Examples are: - Employment	461
462	Wholesale of agricultural raw materials and live animals	Includes: one class 4620 - wholesale of the following agricultural raw materials and live animals: grains and seeds, oleaginous fruits, flowers and plants, unmanufactured tobacco, live animals, hides and skins, leather, agricultural material, waste, residues and by-products used for animal feed. Excludes: wholesale of textile fibres	Gross turnover deflated by appropriate quality adjusted price indices Turnover from survey of wholesalers of agricultural raw materials and live animals or administrative data taken from tax returns which could be split by type of agricultural raw product. Examples are: - Agricultural raw materials	Weighted appropriate price indices. Examples are: - PPI: Agricultural raw materials	Gross turnover deflated by partially representative price indices Turnover from survey of wholesalers of agricultural raw materials and live animals or administrative data from tax returns Or Production output index	Deflated by partially representative PPIs or a general price index	Volume indicators Examples are: - Employment - Tones of agricultural raw materials	462

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
					Lagged index of production for: - Agriculture			
463	Wholesale of food, beverages and tobacco	Includes: one class 4630 - wholesale of food, beverages and tobacco. It also includes buying of wine in bulk and bottling without transformation and wholesale of feed for pet animals Excludes: blending of wine or distilled spirits	Gross turnover deflated by appropriate quality adjusted price indices Turnover from survey of wholesalers of food, beverages and tobacco or administrative data taken from tax returns which could be split by type of product. Examples are: - Food, beverages and tobacco	Weighted appropriate price indices Examples are: - PPI: Food and beverages - PPI: Tobacco products excluding duty	Gross turnover deflated by partially representative price indices Turnover from survey of wholesalers of food, beverages and tobacco, or administrative data from tax returns	Deflated by partially representative PPIs or a general price index Or Production output index	Volume indicators Examples are: - Employment	463
					Lagged index of production for: - The manufacture of food, beverages and tobacco			
464	Wholesale of household goods	Includes: wholesale of textiles, clothing and footwear and other household goods Excludes: wholesale of textile fibres, blank audio and video tapes, CDs, DVDs, radio and TV broadcasting equipment and office furniture	Gross turnover deflated by appropriate quality adjusted price indices Turnover from survey of wholesalers of household goods or administrative data taken from tax returns which could be split by type of household goods.	Weighted appropriate price indices. Examples are: - PPI: Textiles, clothing and footwear - PPI: Household furniture and	Gross turnover deflated by partially representative price indices Turnover from survey of wholesalers of household goods or administrative data from tax returns	Deflated by partially representative PPIs or a general price index Or Production output index	Volume indicators Examples are: - Employment	464

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
			Examples are: - Textiles, clothing and footwear - Other household goods	appliance - PPI: Pharmaceuticals and cosmetics - PPI: Other household goods	Lagged index of production for the manufacture of: - Textiles, clothing and footwear - other household goods, such as furniture, lighting equipment, cutlery and glassware			
465	Wholesale of machinery, equipment and supplies	Includes: wholesale of computers, telecommunications equipment, specialized machinery for all kinds of industries and general-purpose machinery. The group has 4 classes: 4651 - Wholesale of computers, computer peripheral equipment and software; 4652 - Wholesale of electronic and telecommunications equipment and parts; 4653 - Wholesale of agricultural machinery, equipment and supplies; and 4659 - Wholesale of other machinery and equipment Excludes: wholesale of recorded audio and video tapes, CDs, DVDs; consumer electronics; motor vehicles, trailers,	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	465
			Turnover from survey of wholesalers of machinery, equipment and supplies, or administrative data taken from tax returns which could be split by machinery and equipment type. Examples are: - Computers and software - Electronic and telecommunications equipment - Office machinery and equipment	Weighted appropriate price indices. Examples are: PPI: Computers and software PPI: Electronic and telecommunications equipment PPI: Office machinery and equipment	Turnover from survey of wholesalers of machinery, equipment and supplies or administrative data from tax returns Or Production output index Lagged index of production for the manufacture of: - Computers and computer peripherals - Electronic and telecommunications equipment - Office machinery and other machinery, equipment and supplies	Deflated by partially representative PPIs or a general price index	Examples are: - Employment	

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
		caravans, motor vehicle parts, motorcycles and bicycles						
466	Other specialized wholesale trade	Includes: other specialized wholesale activities not classified in other groups This includes the wholesale of intermediate products, except agricultural, typically not for household use The group has 4 classes: 4661 - Wholesale of solid, liquid and gaseous fuels and related products; 4662 - Wholesale of metals and metal ores; 4663 - Wholesale of construction materials, hardware, plumbing and heating equipment and supplies; and 4669 - Wholesale of waste and scrap and other products n.e.c. Excludes: collection, treatment and processing of household and industrial waste; dismantling of automobiles, computers, televisions and other equipment for	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	466
			Turnover from survey of wholesalers specialized in the trade of intermediate products, except agricultural, typically not for household use, or administrative data taken from tax returns which could be split by non-agricultural intermediate product. Examples are: - Solid, liquid and gaseous fuels - Metals and metal ores - Construction materials - Intermediate products, waste and scrap	Weighted appropriate price indices. Examples are: PPI: Coal and petroleum products (excluding duty) PPI: Metals and metal ores PPI: Construction materials PPI: Waste and scrap	Turnover from survey of wholesalers of non-agricultural intermediate products, waste and scrap, or administrative data from tax returns Or Production output index Lagged index of production for the manufacture of: - Solid, liquid and gaseous fuels - Metals and metal ores - Construction materials, hardware, plumbing and heating equipment supplies - Intermediate products, such as industrial chemicals, waste and scrap	Deflated by partially representative PPIs or a general price index	Examples are: - Employment - Tones of intermediate products	

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
		materials recovery; shredding of cars by means of a mechanical process; ship-breaking; and retail sale of second-hand goods						
469	Non-specialized wholesale trade	Includes: wholesale of a variety of goods without any particular specialization	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	469
			Turnover from survey of non-specialized wholesalers, or administrative data taken from tax returns.	Weighted appropriate price indices. Examples are: - PPIs of various miscellaneous goods	Turnover from survey of non-specialized wholesalers, or administrative data from tax returns	Deflated by partially representative PPIs or a general price index	Examples are: - Employment	
					Or Production output index			
					Lagged index of production for the manufacture of: - Miscellaneous goods			

Division 47: Retail trade, except of motor vehicles and motorcycles

This division includes the resale (sale without transformation) of new and used goods mainly to the general public for personal or household consumption or utilization, by shops, department stores, stalls, mail-order houses, hawkers and peddlers, consumer organizations. It does not include the sale of motor vehicles, motorcycles and automotive fuel, nor the sale of food and drinks for consumption on the premises.

This division is divided into nine groups (25 classes): ***471 – Retail sale in non-specialized stores; 472 - Retail sale of food, beverages and tobacco in specialized stores; 473 – Retail sale of automotive fuel; 474 – Retail sale of information and communications equipment in specialized stores; 475 - Retail sale of other household equipment in specialized stores; 476 - Retail sale of cultural and recreational goods in specialized stores; 477 – Retail sale of other goods in specialized stores; 478 - Retail trade via stall and markets; 479 - Retail sale not in stores, stalls or markets.*** For measuring gross value added as deflated turnover it may be desirable to sub-divide the groups into the underlying classes. This will depend on how important the industry is to the country's economy and how accurately the output can be measured (e.g. turnover and prices). An estimate for **smuggling of alcohol and tobacco** can also be included in this code.

Turnover data are defined as receipts from sales excluding VAT and other taxes on products plus any subsidies on products. If retail forms only part of the business, then ideally only the retail element of the business's turnover should be used. **Preferred deflators** to use are consumer price indices.

Note: Within the wholesale and retail industries, output is the trade margin. Theoretically, this can be measured by taking the difference between deflated sales and deflated purchases. However, if it is assumed that the volume of margins follows the volume of sales (or equivalently, that the margin-to-sales ratios are constant at constant prices), then gross turnover deflated by appropriate quality adjusted price indices is a more achievable method.

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
471	Retail sale in non-specialized stores	Includes: the retail sale of a variety of product lines in the same unit (non-specialized stores), such as supermarkets or department stores. This group has two classes: 4711-Retail sale in non-specialized stores with food, beverages or tobacco predominating, and 4719 - Other retail sale in non-specialized stores	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	471
			Turnover from survey of non-specialized retail stores or administrative data taken from tax returns which could be split by type of retail outlet. Examples are: - Non-specialized stores with food, beverages or tobacco predominating - Other non-specialized stores such as department stores	Weighted appropriate price indices. Examples are: - CPI: food and beverages - CPI: Cigarettes and tobacco - CPI: Pharmaceutical and medical goods, cosmetic and toilet articles - CPI: Textiles, clothing, footwear and leather goods - CPI: Household appliances - CPI: Hardware, paints and glass	Turnover from survey of non-specialized retail stores or administrative data from tax returns.	Deflated by partially representative CPIs or a general price index	Examples are: - Employment	
472	Retail sale of	Includes: stores	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	472

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
	food, beverages and tobacco in specialized stores	specializing in the sale of merchandize lines, such as fruits and vegetables, meat and meat products, fish and other seafood products, bakery products, alcoholic and non-alcoholic beverages or tobacco products. The group has 3 classes of retail sales in specialized shops: 4721- Retail sale of food; 4722 - Retail sale of beverages; 4723 - Retail sale of tobacco products	Turnover from survey of stores specializing in the retail sale of food, beverages and tobacco, or administrative data taken from tax returns which could be split by type of specialized outlet. Examples are: - Greengrocers, bakers, tobacconists, butchers, fishmongers.	Weighted appropriate price indices. Examples are: - CPI: Fruit and vegetables - CPI: Meat and meat products - CPI: Fish and seafood products - CPI: Bread and cakes - CPI: Alcoholic and non-alcoholic beverages - CPI: Cigarettes and tobacco	Turnover from survey of stores specializing in the retail sale of food, beverages and tobacco, or administrative data from tax returns	Deflated by partially representative CPIs or a general price index	Examples are: - Employment	
473	Retail sale of automotive fuels in specialized stores	Includes: one class 4730 for retail sale of fuel for motor vehicles and motorcycles as well as retail sale of lubricating products and cooling products for motor vehicles Excludes: stores specialized in retail sale of fuel in combination with food, beverages etc., with food and beverage sales dominating, and retail sale of liquefied petroleum gas for cooking or heating	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	473
			Turnover from survey of stores specializing in the retail sale of automotive fuels, or administrative data taken from tax returns	Weighted appropriate price indices Examples are: - CPI: Fuels and lubricants	Turnover from survey of stores specializing in the retail sale of automotive fuels, or administrative data from tax returns	Deflated by partially representative CPIs or a general price index	Examples are: - Employment	

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
474	Retail sale of information and communications equipment in specialized stores	Includes: stores specialized in retail sale of information and communications equipment, such as computers and peripheral equipment, telecommunications equipment (class 4741) and consumer electronics, such as audio and video equipment (class 4742)	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	474
			Turnover from survey of stores specializing in the retail sale of information and communications equipment, or administrative data taken from tax returns which could be split by type of specialized outlet. Examples are: - Stores for computers and peripheral equipment - Stores for audio and video equipment	Weighted appropriate price indices. Examples are: - CPI: Audiovisual, equipment - CPI: Information processing equipment	Turnover from survey of stores specializing in the retail sale of information and communications equipment, or administrative data from tax returns	Deflated by partially representative CPIs or a general price index	Examples are: - Employment	
475	Retail sale of	Includes: stores	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	475

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
	other household equipment in specialized stores	specialized in retail sale of household equipment, such as textiles, hardware, carpets, electrical appliances or furniture. This group includes retail sale of: 4751 - Textiles; 4752 - Hardware, paints and glass; 4753 - Carpets, rugs, wall and floor coverings; 4759 - Electrical household appliances, furniture, lighting equipment and other household articles	Turnover from survey of stores specializing in the retail sale of other household equipment, or administrative data taken from tax returns which could be split by type of specialized outlet. Examples are: - Textiles shops - Hardware, paints and glass shops Carpets, rugs, wall and floor coverings shops - Electrical household appliances shops - Furniture shops	Weighted appropriate price indices. Examples are: CPI: Textiles CPI: Household appliances CPI: Furniture and furnishing CPI: Carpets CPI: Glassware	Turnover from survey of stores specializing in the retail sale of other household equipment or administrative data from tax returns	Deflated by partially representative CPIs or a general price index	Examples are: - Employment	
476	Retail sale of cultural and		Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	476

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
	recreational goods in specialized stores	Includes: the retail sale in specialized stores of cultural and recreation goods, such as: 4761 - books, newspapers and stationary; 4762 - music and video recordings; 4763 - sporting equipment; and 4764 - games and toys.	Turnover from survey of stores specializing in the retail sale of cultural and recreational goods, or administrative data taken from tax returns which could be split by type of specialized outlet. Examples are: - Bookstores - Music stores - Sport shops - Toys shops	Weighted appropriate price indices. Examples are: - CPI: Books - CPI: Newspapers and periodicals - CPI: Equipment for sport and recreation - CPI: Games, toys and hobbies	Turnover from survey of stores specializing in the retail sale of cultural and recreational goods, or administrative data from tax returns	Deflated by partially representative CPIs or a general price index	Examples are: - Employment	
477	Retail sale of other goods in specialized stores	Includes: retail sale in specialized stores carrying a particular line of products, such as 4771 - clothing, footwear and leather articles; 4772 - pharmaceutical and medical goods, cosmetic and toilet articles; 4773 – other retail sale of new goods such as watches, souvenirs, cleaning materials,	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	477
			Turnover from survey of stores specializing in the retail sale of other new and used goods, or administrative data taken from tax returns which could be split by type of specialized outlet. Examples are:	Weighted appropriate price indices. Examples are: - CPI: Pharmaceutical and medical goods, cosmetic and toilet articles - CPI: Textiles and clothing - CPI: Footwear and	Turnover from survey of stores specializing in the retail sale of other goods, or administrative data from tax returns	Deflated by partially representative CPIs or a general price index	Examples are: - Employment	

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
		weapons, flowers and pets and others. Also included is 4774 - retail sale of used goods in specialized stores Excludes: retail sale of second-hand motor vehicles, pawn shops, Internet auctions and other non-store auctions	- Pharmacies - Clothing and textiles shops - Footwear and leather goods shops - Antiques and second-hand shops	leather goods				
478	Retail sale via stalls and markets	Includes: retail sale of any kind of new or second hand product in a usually movable stall either along a public road or at a fixed marketplace. The group has three classes – 4781 - Food, beverages and tobacco products; 4782 - Textiles, clothing and footwear; 4789 - Other goods	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	478
			Turnover from survey of retailers via stalls or markets, or administrative data from tax returns which could be split by type of stall or market. Examples are: - Stalls and markets selling food, beverages and tobacco products - Stalls or markets selling textiles, clothing and footwear - Stalls and markets selling other goods	Weighted appropriate price indices. Examples are: - CPI: Food and beverages - CPI: Pharmaceutical and medical goods, cosmetic and toilet articles - CPI: Textiles, clothing, footwear and leather goods - CPI: Household appliances, articles and equipment	Turnover from survey of retail sale via stalls and markets, or administrative data from tax returns	Deflated by partially representative CPIs or a general price index	Examples are: - Employment	
479	Retail trade not	Includes: 4791 -	Gross turnover deflated by appropriate quality adjusted price indices		Gross turnover deflated by partially representative price indices		Volume indicators	479

ISIC class	*Description*	*Explanatory notes*	*Preferred (A)*		*Alternate (B)*		*Other (C)*	*ISIC class*
	in stores, stalls or markets	Retail sale of any kind of product via mail order houses or via Internet, including direct sale via television, radio and telephone; and 4799 – Other retail sale not in stores, stalls or markets such as door-to-door sale and sale through vending machines of any kind of product	Turnover from survey of non-store retailers, or administrative data from tax returns which could be split by type retail trade not in stores, stall or markets. Examples are: - Mail order houses - Internet, television, other direct sales - Vending machines - Non-store auctions - Commission agents	Weighted appropriate price indices. Examples are: - CPI: Food and beverages - CPI: Pharmaceutical and medical goods, cosmetic and toilet articles - CPI: Textiles, clothing, footwear and leather goods - CPI: Household appliances, articles and equipment	Turnover from survey of non-store retail trade, such as retail sale via mail order houses or via Internet, or administrative data from tax returns	Deflated by partially representative CPIs or a general price index	Examples are: - Employment	

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